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EDITOR: Steve Bourne

SUB EDITORS: Andy Spate, Tony Culberg

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FRONT COVER: Fossil excavation in Blanche Cave, Naracoorte, South Australia.

BACK COVER: Sienna (18 years) and Narayan (15 years) Lawrence. 120 m pitch in Majlis Al Jin, Oman. Photo: Andrew Lawrence

IN THIS ISSUE

FROM THE EDITOR

The ACKMA Wee Jasper weekend is almost upon us! It will be great to catch up with old friends and visit a part of Australia that has had some rain this year.

This journal features articles covering a wide variety of topics. Kristen Lear is on a one year Fulbright scholarship from the US working at Naracoorte. Kristen has been a real asset to the bat research having the time to dedicate to solid data gathering that is so desperately needed with the critically endangered southern bent-wing bat. She provides an update of her progress.

Naracoorte features again with the latest palaeontological research from Liz Reed. Liz is currently funded through a Caring for our Country project and as mentioned in the last journal, has been keeping me busy assisting her.

Jenolan Caves won not one, but two, awards at the the Australian Tourism Awards. Congratulations to Jewel Cave in Western Australia for making the final, but there can only be one winner. Jenolan Caves is really at the forefront of cave tourism again, with state of the art infrastructure and lighting complemented by excellent interpretation. The ISCA Congress in 2014 will certainly open a few eyes by the standards being set by the Jenolan team.

Kent Henderson keeps finding out of the way caves on his journeys and reports on Thunderbolt's Cave, with Andy Spate contributing some information on additional Thunderbolt's Caves in Australia. I suggest someone might like to do a paper on "Cathedral Caves" and see how many they can find!

Garry K Smith reports on a visit to Sulewesi, a place that not too many of us have visited I suspect. As show caves, they are a long way from the Jenolan experience and they could learn a lot from Australian cave managers, although I suspect budgets may constrain desired development. As usual, the photography is spot on from Garry.

Many of us will travel from Wee Jasper to Yarrongobilly at the AGM weekend and Pauline Treble and her team have provided an update on their research at Yarrongobilly.

Parts of Australia has received huge summer rainfall and Buchan Caves has not missed out. Dale Calnin reports on flash flooding that swept through the valley. Dale has also notified me that the Caves Guides Workshop will be held at Buchan caves from 2-4 September 2012. Lock in the dates and further information will be provided in the next journal. These workshops are invaluable for staff involved at the "coal face" of cave presentation and I urge managers to budget to allow some of their staff to attend.

Another exciting happening at Buchan is the purchase of the significant Scrubby Creek Cave and land by the Rimstone Cooperative. They are seeking financial support to reach their target and secure the future of this cave.

Some fond memories of a trip across the Nullarbor were revived with a report provided by Lorna Charlton. Lorna worked with a number of people including ACKMA members to develop interpretation for Cocklebiddy Cave. Its a long drive to view it first hand but I am sure it will enhance the visitor experience for those visitors to make it there.

The International Show caves Association (ISCA) has formed a Commission on Interpretation in Show Caves. This is chaired by Zsuzsay Tolnay from Hungary with Dan Cover from Jenolan as vice chair. I look forward to seeing their work.

ISCA is busy preparing for its conference in November and for those who have been involved i conference convening, imagine the challenge facing the organisers for this event across two countries, Greece and Turkey. The circular reports increased complexity because of two different currencies, especially with volatile currency markets at present.

ACKMA's ISCA membership

Underground cavities are routinely found in the south east of South Australia, more by heavy machinery than cavers nowadays. I was more than a little excited when the photo below was sent to me, as I recognised the shed and tank in the background as the Tank Cave location. Tank Cave is a popular diving cave that almost connects to Fossil Cave (Green Waterhole is some texts) and has over seven kilometres of explored underwater passages. The cavity was discovered during roadworks on the Princes Highway but was unfortunately just a small cave with no passages and no connection through to Tank Cave.

Small cave adjacent to the Princes Highway

Some good news just in from Andy Spate for Ann Augusteyn and Capricorn Caverns.

A Savannah Guides School has just been hosted by Capricorn Caverns at which they were endorsed as a Savannah Guide Site and Enterprise joining similar enterprises at Kakadu, Undarra, Cobbold Gorge and Adels Grove as well as a number of tour operators across northern Australia. Savannah Guides is a fantastic operation dedicated to better interpretation of the wonderful resources of that region. Ann and Amanda Jennings have been accredited as Savannah Guides. More details from their website: http://sgltd.com.au Part of their site appears below.

Well done, Ann and team!

SAVANNAH GUIDES
protectors and interpreters of the outback

Savannah Guides is a network of professional tour guides with a collective in-depth knowledge of the natural and cultural assets of the tropical savannahs of northern Australia, north Queensland, Northern Territory and the Kimberley region of Western Australia. Savannah Guides Sites and Stations have been developed by privately and publicly owned enterprises and feature nature and/or culture based interpretive activities, while mobile Savannah Guides Operators and Master Operators conduct roving tours within and through the region. All Savannah Guides enterprises must incorporate natural or cultural interpretive activities as a prominent part of their business and demonstrate a commitment to conservation values.

Coming Events	
2012: 4-6 May	**ACKMA Annual General Meeting, Wee Jasper, New South Wales**
2012: 5-10 Aug	Brisbane: International Geological Conference with a symposium on Geotourism & Geoparks
2012: Sept	12th International Symposium on Pseudokarst, Galicia, Spain
2012: 6-15 Sept	World Conservation Conference. Jeju Island, South Korea
2012 13-15 Sept	International Congress of Scientific Research in Show Caves, Scocjan Caves, Slovenia
2012: 3-11 Nov	International Show Caves Association Conference Greece/Turkey
2013: 6-11 Jan	Australian Speleological Federation, 29th Biennial Conference, Galong, NSW, Australia
2013: 12-18 May	**ACKMA 20th Conference, Waitomo Caves, New Zealand**
2013: July 21-28	Brno, Czech Republic: 16th International Conference of Speleology
2014: October	International Show Caves Association, Jenolan Caves, Australia

PRESIDENT'S REPORT

Peter Chandler

Often there seems to be so much going on it's hard to keep up! My wife would probably say it is mostly self inflicted.

We are saddened to hear of the premature death of Peter Berril. We look forward to reading more about Peter.

Here at Waitomo and Tourism Holdings Operation, both Robert Tahi and Van Watson have been made redundant from their positions in restructuring moves. Van is finishing up on 31 March and Robert is taking a position with the Company as the head of the maintenance department (including Travis Cross). I can't help feeling that the loss of human capital from such an organisation's daily operations is a retrograde step. Only recently an academic discussed on NZ National Radio the importance of networks and business connections, and in this business age efficiency and profitability were ultimately more important than turnover. There is of course the triple bottom line.

We look forward to re-visiting Wee Jasper and enjoying the company of the local members and others, and seeing many of you there. We also trust that the headwaters of the Murrumbidgee have receded and the water supply via the Murray River to South Australia is ample!

Being resident in the temperate climate of Waitomo and annually our Spellbound tours having the Month of June off. It's a long time since there was a June ACKMA AGM! And from Auckland there are many flights to various Pacific islands.

A TRIP TO NUIE

Libby and I saw some accommodation and flight specials, this time last year, but by the time we had decided that the island of Niue would be a great place for a one week long escape, the specials were gone, we booked anyway! There are, of course, lots of holiday tips on line, we knew we could expect few tourists, lots of caves and coastal karst, and coconuts - Niue means "behold the coconut!"

Niue was charted and named the Savage Islands by Captain James Cook in 1774, as three times the Niueans did not let him land. It is one of the world's largest coral atolls, at 260 square kilometres and approximately 2400 kilometres northeast of New Zealand.

Niue is remote and its Polynesian people are culturally and linguistically different; between Tonga to the West and the neighbouring Cook islands to the South East. It is separately administered by New Zealand as a free association territory of New Zealand since 1901.

The local economy suffers from the typical small Pacific island problems of geographic isolation, very limited natural resources, and a small, decreasing population. In fact, the population of Niue continues to drop (*from a peak of 5,200 in 1966 to about 1300 in 2011*), with

Access to Tomo Chasm

substantial on-going emigration to New Zealand. Niueans can hold NZ passports and there are weekly flights.

An essay on Niuean issues and its future by Dr J Floor Anthoni can be viewed at www.seafriends.org.nz/niue/future.htm

The craggy limestone outcrops of Nuie.

Our luggage was dominated by two bicycles, not that we planned a cycle tour, snorkel gear and lights. Most other passengers' luggage was bags filled with foodstuffs.

Things got off to a bad start at Auckland airport when Libby's suntan lotion was confiscated. On arrival after checking out rental cars, we ended up with a small Toyota with a rattly boot and a broken door handle. This made trips to the numerous coastal karst features very easy. Not really caves, as daylight was always somewhere, though they gave the feeling that there were caves somewhere. The sharp and angular coral in the rainforest meant that without local knowledge navigation was pretty much impossible.

A guided cave tour was advertised, but not actually available! We hadn't figured this out till Sunday and Saturday was the cave tour day. Of course we were enthusiastic to participate/ visit Tali's cave tour, and thanks to Pauline Rex at the information centre, we got to do this with Tali's grandson, who was granted permission to take time off school! Like many Niueans, Tali lives in New Zealand and his son operates a garage in Niue.

The adventure cave tour, a through trip, was profusely decorated with notable black deposit on much of the cave's interior. An aluminium ladder had replaced the discarded wooden one. The guide was a lad of few words, he opened up a lot on the return walk, he had great knowledge of local plants. Drinking fizzy coconut milk out of a green coconut back at the van - an acquired taste - was a nice touch.

When we got home we found out there have been articles about Niue published, including in the New Zealand Speleological Bulletin. Paul Williams and Peter Crossley were there in 1985! There are extensions to some of the caves we did visit.

The idea of a post conference tour to Niue had some appeal, but was put in the too hard category, though we would like to return soon! We can thoroughly recommend it for anyone who wishes to extend their trip after the Waitomo conference in 2013.

Taval arches

Dear Editor,

I refer to my introductory remarks to the Bungonia Bridge story in the last issue of the Journal and to Joe Sydney's response. I will differ with Joe as to the history of the project. But that is incidental and irrelevant. What is relevant that after a long time various people and groups have stepped up and done something about ongoing damage at Bungonia. If I did not emphasise the role of the Highland Caving Group adequately I apologise. What I hoped to do with my introductory comments was to emphasise that Highland Caving Group, Canberra Speleological Society, and specifically Dirk and Joe, had achieved a long sought after goal. And got into the international bridge-building literature!

Andy Spate

OF MICE and MEGAFAUNA: NEW INSIGHTS into NARACOORTE'S FOSSIL DEPOSITS

Liz Reed
School of Biological Sciences, Flinders University, GPO Box 2100, Adelaide, SA 5001.

"The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them."
Sir William Bragg, British physicist (1862 - 1942).

BEGINNINGS

Father Julian Tenison Woods first visited the Mosquito Plains Caves (Naracoorte Caves) in 1857. Although he found the landscape singularly unremarkable, he was enthralled by what lay beneath the surface. He wrote in 1862 :

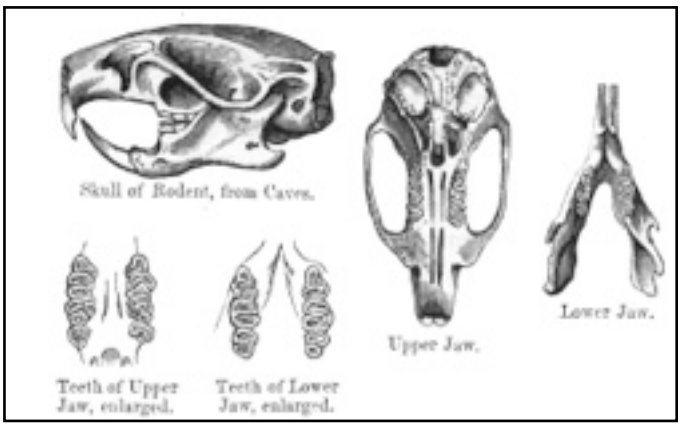
"..... in the midst of a swampy sandy country, plentifully covered with stringy bark, a series of caves are found, whose internal beauty is at strange variance with the wildness of the scenery around." (Woods, 1862).

In Blanche Cave, at the base of calcite columns, he found countless bones of small mammals. These he recognised as being of 'recent' origin; in contrast to the giant marsupial fossils previously discovered at Wellington Caves, New South Wales. He reported his discovery the following year and in doing so provided the first published record of vertebrate fossils from Naracoorte Caves (Woods, 1858).

Woods at Blanche Cave. From Woods (1862).

Megafauna bones were eventually discovered at Naracoorte in the late 19th and early 20th Century and reported by Edward Stirling, director of the South Australian Museum (Reed & Bourne, 2000). Fifty years later, cave explorers started finding fossil material during mapping and exploration trips to the caves. The crowning achievement came in 1969 when a party of cavers led by Grant Gartrell and Rod Wells discovered an enormous fossil deposit in Victoria Cave (Reed & Bourne, 2000). This discovery put Naracoorte on the map as a fossil site and ultimately paved the way for the park's World Heritage listing in 1994. Now considered one of the world's most significant Quaternary fossil localities, the caves within the Naracoorte Caves National Park contain literally dozens of fossil sites. Each one of these sites provides a window into the biodiversity and landscape history of the area during the past 500,000 years. While no one would claim the Naracoorte landscape is a scenic wonder, looks can be deceiving. The fossil record preserved in the caves reveals this unremarkable landscape has been a biodiversity 'hot spot' for hundreds of thousand of years.

Little did Woods know that what he had discovered in Blanche Cave was the remains of thousands of animals that had been brought into the cave by owls. The deposits were indeed 'recent' (geologically), but undoubtedly older than Woods suspected at the time. One can almost picture his disappointment at uncovering mice instead of megafauna. But if you were a betting person gambling on which of these would reveal more about climate and biodiversity change over time, you should probably put your money on the mice.



Rodent fossils discovered by Woods.

From Woods (1862).

DIGGING AROUND IN THE TOPSOIL

Announcing that one 'works' in the late Quaternary usually elicits a derisive snigger from those palaeontologists scaling the lofty heights of the Mesozoic and beyond. Despite still being 'warm' (geologically speaking), late Pleistocene and Holocene deposits

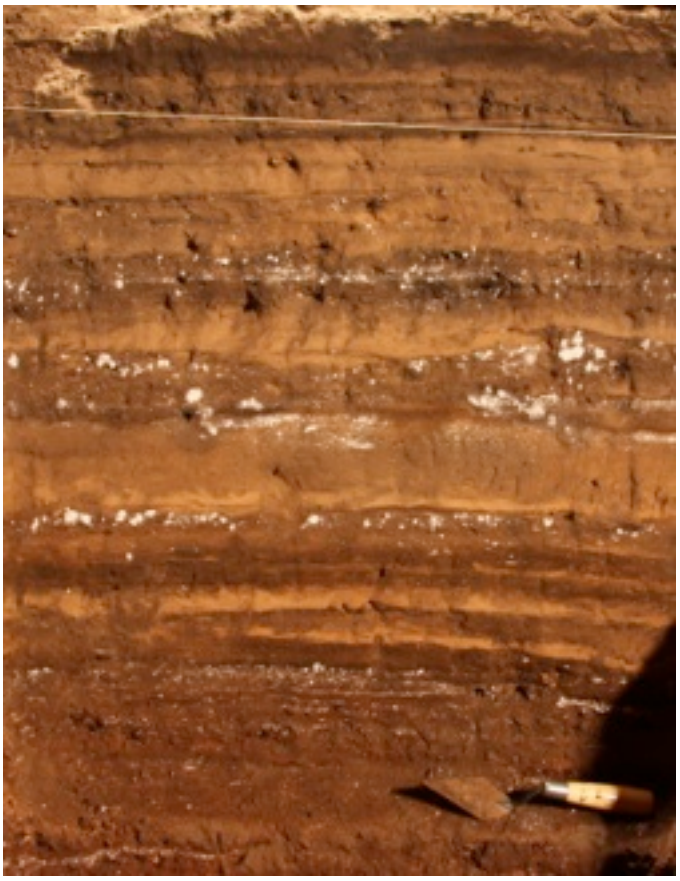
provide an opportunity to elicit finely resolved and detailed records of climate and biodiversity change in a way that significantly older deposits cannot. As these deposits represent largely 'modern' species and ecosystems they can be used to address questions relevant to current and future conservation of the natural environment.

Leopold *et al.* (1963) wrote:

"The first step in park management is historical research, to ascertain as accurately as possible what plants and animals and biotic associations existed originally in each locality."

Traditionally, this has involved trawling through biological survey data, publications, unpublished records and anecdotal evidence. All of these sources have an important role to play; however, they are limited by a 'short' time frame and the fact that in most cases they describe an anthropogenically altered landscape. Information gleaned from within the temporal constraints of recorded history cannot shed light on 'big-picture' patterns of change over significant timescales, particularly pre-human settlement. Using a fixed point in time as a blueprint for conservation doesn't take into account the range of natural variation experienced by ecosystems over ecological and evolutionary time (Hadly & Barnosky, 2009). Future conservation managers will need to broaden their strategies beyond preserving species within their current range. It will become increasingly necessary to develop tools for predicting where species can exist in light of rapid climate change, human expansion and habitat fragmentation (Hadly & Barnosky, 2009). The fossil record provides the only means for assessing long-term patterns of faunal change against climate and supplying meaningful data for such predictive models.

The role of palaeobiology in conservation has been highlighted by numerous authors (eg. Lyman, 2006; Hadly & Barnosky, 2009; Dietl & Flessa, 2011). Despite its promise, palaeontological data has seen little 'on the ground' application by conservation managers. In some cases it has been used to great effect. In Yellowstone National Park, palaeoecological data from Holocene cave deposits were used to assess elk populations and restore wolves to the park (Hadly & Barnosky, 2009). Other studies have revealed striking results that highlight limitations to our current understanding of ecological niches. Bilney *et al.* (2010) found that Sooty Owl (*Tyto tenebricosa*) pellet remains from sub-fossil deposits dating to the time of European settlement contained 28 mammalian prey species compared with just ten in contemporary pellets. This indicates severe decline and niche contraction of small mammal species which had a greater distribution and habitat diversity prior to settlement.



Finely stratified sediment section in Blanche Cave. Photo: Steve Bourne.

A CAVE IS A CAVE....OR IS IT?

So where does Naracoorte Caves fit into all of this? Naracoorte's deposits are well placed to contribute significant information to address 'big picture' ecological questions. Unlike most fossil localities, Naracoorte has multiple, contemporaneous deposits in a small geographic area (Reed & Bourne, 2000, 2009). This enables comparisons to be made between patterns observed in one assemblage and those in similar sites (eg. McDowell, 2001; Macken *et al.* 2012). Given the high resolution and faunal abundance of the 'young' sites, they have become the focus of current recent research at Naracoorte. Further, the South East region of South Australia is one of the most dramatically human-altered landscapes in Australia, subject to drastic biodiversity loss since European settlement (Croft *et al.*, 1999; O'Connor, 2001). Nearly 80% of major, pre-European plant communities are now considered rare or threatened in the region, with only 13% of native vegetation remaining (O'Connor, 2001). Of the surviving species, nearly 40% of vertebrates and almost 50% of plants now have a conservation status (Croft *et al.*, 1999). Clearing, grazing, drainage, introduction of pest species and habitat fragmentation have all played a role

in this devastation. It should be clear from these figures that estimations of the 'original' ecological niches in the region would be severely limited if based on data from modern surveys. If there is one region in Australia that should be using the 'recent' fossil record to inform conservation management it is the South East; coincidentally, a region with a wealth of Quaternary fossil sites (Reed & Bourne, 2000).

In order to investigate highly resolved patterns of landscape and faunal change over time and explore conservation applications, fossil deposits must meet a few important criteria. Caves are a good place to start as they typically contain deep, stratified sediment beds which are well preserved within the relatively sheltered confines of the cave (Reed & Gillieson, 2003). The site must have good stratigraphy with little evidence of re-working and post-depositional disturbance. It must also contain material that can be dated to provide a timeline for the deposit; and of course it must contain bones. However, not all caves are created (geologically as opposed to supernaturally) equal and there is no point comparing 'apples with oranges'. It is important to consider the taphonomic (site formation) history of the caves to ensure comparison between sites with a similar depositional history and accumulation mode.

At Naracoorte there are three broad types of cave deposit (Reed, 2003). The 'classic' pitfall trap cave has a deep, narrow solution pipe entrance which accumulates sediment cones via low energy water flow and slumping; leading to rather coarsely stratified deposits. Small and large animals fall into the cave via well concealed entrances. Large mammals are well represented and usually dominated by groups susceptible to entrapment such as kangaroos (Reed, 2003, 2008). These caves are warm and humid with stable within-cave conditions and virtually no light zone. Organic remains decompose rapidly, leaving deposits composed primarily of bones and sediment (Reed, 2009).

Other caves, such as Blanche Cave, have large roof-collapse window entrances with extensive light zones, vegetation growing on the cone, fluctuating temperature and humidity and generally drier within-cave conditions. Sediment accumulates as a cone beneath the entrance and is re-deposited further down slope by high energy water flow during storm events, resulting in finely laminated sediment beds (Reed, 2003). Decomposition is much slower, with animal remains and other organic material often becoming desiccated (Reed, 2009). While some animals do become trapped in these caves via pitfall, the major accumulation type is owl pellet deposition, with some contribution from regular cave inhabitants. These deposits are dominated by small vertebrates with smaller numbers of large individuals.

The third type of deposit is basically a variation on the roof window cave, where the entrance has further collapsed or been modified in some way to remove any vertical component to the entrance. Animals can literally just walk in and these caves serve as dens and shelter for predators and herbivores alike (Reed, 2003). In the past animals such as Tasmanian Devils would have used these caves as dens, bringing their prey back to the cave to consume and allowing bones to accumulate.

Solution pipe entrance and associated sediment cone, Sand Cave, Naracoorte. Photo: Steve Bourne

THERE'S NO CAVE LIKE HOME

Why is cave type important? The structure of the cave and its entrance/s has a profound effect on the nature of the accumulated fossil assemblage (Reed, 2008). It also influences the way in which bones, organics and geological materials are deposited and dispersed in the cave. The combination of physical characteristics of the cave dictate the 'recipe' for the deposits collected within. Environmental conditions in the cave, which in turn are influenced by the structure of the cave, have a direct influence on how and what materials will be preserved (Reed, 2009). Scientific research projects are based on a series of questions and hypotheses. The range of data and methods of collection must be appropriate to the questions being asked. In the case of fine-scaled palaeoecological questions at Naracoorte it is important to select the right cave for the job.

Due to their natural abundance, short generation time and undeniable popularity with bone-collecting predators, small mammals provide an excellent resource

Roof window entrance with large light zone, Robertson Cave, Naracoorte. Photo: Steve Bourne

for assessing faunal change over time (eg. McDowell, 2001; Macken *et al.*, 2012; Prideaux *et al.*, 2007). Some owl species roost in caves, leaving behind the remains of their prey in the form of regurgitated pellets (Andrews, 1990). In effect they act as biological surveyors, collecting a sample of the local fauna during each hunting trip. Over extended time periods, owls concentrate thousands of bones which become incorporated into cave sediments. Owl assemblages typically reflect the prey range and size of the predator and are biased towards small vertebrates. At Naracoorte, owls tend to use the more open, roof window type caves, producing deposits such as the ones discovered by Woods in 1857. These caves also collect larger animals via pitfall entrapment and are frequented by several species of mammals, birds, reptiles and amphibians (Reed, 2003). This enables a broad sample of the local faunal diversity to be accumulated. The sheer volume of material in owl deposits makes them highly suitable for the statistical analyses required to investigate fine scale faunal changes over time.

Rodent vertebra with digestive corrosion from owl consumption. Each species of owl leaves a different degree of modification. Scale bar = 2 mm.

A cave deposit is much more than the sum of its parts. While each individual component has a story to tell, powerful and robust interpretations are made by drawing together multiple lines of evidence. Traditionally, palaeontologists have primarily been concerned with bones. If the aim of the research is to reconstruct whole of landscape palaeobiology, then the bones will only take the story so far. To complete the picture, data are needed to elucidate climate, vegetation, geology and site formation history. Recent research at Naracoorte has shown that another positive aspect of the roof window sites is that these drier caves tend to preserve more than just bones.

LESSONS FROM THE PAST

A frustrating aspect of working on the Naracoorte fossil deposits has been the lack of palaeovegetation record. Vegetation reconstructions have relied on inferences made from the dietary preferences of the excavated fauna and pollen cores obtained from other localities. Attempts had been made to extract fossil pollen from Victoria Fossil Cave in the early days of excavation; but these were all unsuccessful (Rod Wells pers. comm.). It was considered there was no pollen record at Naracoorte and no further attempts were made. While completing a study of the various processes of accumulation and preservation in the caves, the author noted how different cave types preserved material in different ways. The deeper, more humid caves did not have the leaf litter and organic material seen in the open caves. Perhaps the previous attempts to obtain pollen had been unsuccessful because the samples were from the wrong type of cave? The dry, dusty, open caves might contain the right stuff!

Eucalyptus leaf in situ in an excavated sediment section, Robertson Cave. The charcoal from this layer dated to approximately 16,000 years BP. Scale bar segments = 10 mm. Photo: Steve Bourne

During a palaeontological survey in 2004, the author identified a potentially interesting site in the third chamber of Blanche Cave. Tegan Laslett, a Flinders University Honours student, completed a pilot study of the site in 2006 (Laslett, 2006). The site proved to be rich in vertebrate fauna, was well stratified with preserved scats and some small remnants of plant material. The author has continued excavation of the site, expanding the dig laterally and obtaining a chronology and geochemical profile for the site with colleagues from the Australian National University and University of Queensland (Darrenogue *et al.*, 2009; St. Pierre *et al.*, 2009). Radiocarbon dating has revealed the age range of the one metre deep sequence to be 14,600 ± 432 BP to 47,086 ± 2892 BP (St. Pierre *et al.*, 2012). Importantly, the sequence spans the Last Glacial Maximum (LGM) and the periods leading into and out of this major climatic phase. The lowest layers contain megafaunal species. Sediment samples were analysed for fossil pollen and yielded good counts throughout the sequence, providing the first vegetation record from a Naracoorte deposit. On a broad scale the pollen shows an abundant woody vegetation prior to the LGM, with an increase in herbaceous taxa during the LGM and an increase in woody-herbaceous taxa following the LGM (Darrenogue *et al.*, 2009). A detailed paper on the pollen record from Blanche Cave is currently in preparation.

The author's current research (funded by the Federal Caring for Our Country initiative), expands on this work and involves excavation and analysis of three roof window cave assemblages. This includes increasing the depth of the Blanche Cave section which has now reached two metres. The three chosen sites share a similar stratigraphic sequence, are contemporaneous and have comparable site formation histories. The aim is to analyse patterns of biodiversity change against climate during the past 50,000 years, utilising multiple lines of evidence from cave sediments, pollen, macro plant material (wood, seeds, leaves), speleothems, chronology, charcoal, scats and vertebrate faunas (amphibians, reptiles, birds and mammals). As part of this project Flinders University PhD student Amy Macken is conducting finely resolved analyses of the small mammal faunas from Blanche Cave to assess the utility of these assemblages as baselines for modern conservation management. Colleagues from Australian and international universities are also contributing to various aspects of this multi-disciplinary project. The project is interesting as it not only assesses the patterns present in one assemblage, but also aims to determine if similar patterns are discernible in the 'replicate' sites. The results will provide a detailed picture of the Naracoorte region during the more 'recent' past. Another important aspect of the project is to incorporate the results into on-site interpretation at the park and to share the lessons learned from the past. It is also expected to contribute information that will assist in conservation of the fossil deposits themselves and highlight methodologies that maximise information gain while minimising impact on the deposits. These are important considerations if the deposits are to benefit future generations and be preserved for their own intrinsic value.

Recent excavation in Blanche Cave will extend the fossil record beyond 47,000 years. Photo: Steve Bourne

CONSERVING THE PAST AND FUTURE

Bilbo & Bilbo (2006) wrote:

"Cultural resources should be protected and preserved, not only because there are laws saying so, but also because they are the basis of history."

Similarly, palaeontological and geological resources are the basis of the evolutionary and ecological history of a cave and its surrounding landscape. From a conservation and management perspective fossil deposits should be treated as whole entities, composed of multiple and varied materials that only reach their full scientific potential when studied as a single unit. It is not just the fossils themselves that warrant protection and a cave floor shouldn't be taken at face value. What may look like just a pile of dirt covered in leaves and rocks could be thousands of years old and an important link to pre-European biodiversity and climate change. Management of fossil deposits in caves has been discussed in detail by various authors (eg. Ramsay, 2004). Most managers and custodians recognise the need to preserve them and take measures to do so. In other cases, cavers and other groups have been instrumental in protecting important deposits in caves (eg. Spate 2011).

Given the current rate of technological advance it is logical that future palaeontologists will be able to investigate the Naracoorte deposits in ways that can only be imagined today. Fortunately, past custodians of the park had the vision to segregate some sections of the caves, leaving them untouched for future generations. Currently, reference sections receiving the highest level of protection are largely restricted to extensive megafauna pitfall deposits deep within the cave system. Naturally they are worthy of such levels of protection and to put it plainly, 'they're' not making them any more. They are a finite resource and their conservation recognises the intrinsic value and significance of the deposits. However, consideration should also be given to some of the younger sites, which in many ways have more potential to answer many of the questions researchers have been trying to address at Naracoorte for decades. Nearly all of these sites, including the ones discussed in this paper, occur in what is listed as show, adventure or wild caves in the current management plan (Department for Environment and Heritage, 2001). Many of these have been walked on, tunneled into or dug up for lighting cables simply because they weren't recognised as being as important as their flasher cousins. Part of the same fossil bearing sediments in Blanche Cave that are now yielding late Pleistocene material were once used as simulated excavation sites

for school children. Just 10 cm below the surface of a floor that has been walked on for more than a hundred years are 14,500 year old sediments, bones and fossil plants. Go down another 70 cm and there's megafauna!

This is not intended as a criticism of the way the park has been managed. On the contrary, conservation of the fossil sites has always been a high priority for managers and executed very effectively at Naracoorte. Indeed, the actual management of the park is considerably more advanced than the written plan and that is because managers work closely with researchers and others to develop management strategies in light of new information. What is being suggested here is a re-assessment of the sites of special value and what actually constitutes a 'fossil' deposit, so that some will be re-classified. As it stands, the official management framework for the park, i.e. the management plan, doesn't adequately reflect the World Heritage values as revealed by ongoing research.

In the management plan only five caves are listed as containing fossil deposits (Department for Environment and Heritage, 2001). Ironically, none of the sites that form the basis for the current research at Naracoorte are included; and many others are overlooked. This is no doubt due to the fact that when it was written there had been no research done on any of these younger deposits. It wasn't until the late 1990s that the first detailed work commenced on such sites (McDowell, 2001). Since then further research and palaeontological surveying has revealed the full scale of the resource at Naracoorte (Reed & Bourne, 2000, 2009). At the very least a representative selection of the various 'types' of deposit should be afforded the highest level of protection. In addition, those sites that are still collecting material today should get special consideration as they continue the strong tradition of accumulation that Naracoorte is famous for. Without these sites, the fossil record that has so much to tell about extinctions and faunal change is in danger of becoming extinct itself.

Science should always reveal more questions than it answers. Research over the past two decades at Naracoorte has paved the way for a paradigm shift in thinking about management of this important World Heritage site. New interpretations of Naracoorte's fossil record will be driven by technological advances, a greater awareness of the extent of the resource and the discovery of new facts. At a locality where science is such a core part of the park's function it is logical that the management framework should keep pace with the science and not be left behind. Regular reviews of the management plan should be an important part of future strategies for Naracoorte Caves National Park.

In the meantime, spare a thought for that dusty old cave floor when next caving. Those dry old gum leaves and bits of wood could be thousands of years old. Remember, in a cave, looks can be very deceiving.

Spot the difference. The samples on the left were sourced from the author's garden at the time of writing, those on the right were excavated from Robertson Cave and are nearly 20,000 years old. Photo: Steve Bourne

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AN AMERICAN in AUSTRALIA: MONITORING the MATERNITY COLONY OF SOUTHERN BENT-WING BATS (*Miniopterus schreibersii bassanii)* at NARACOORTE CAVES NATIONAL PARK, SOUTH AUSTRALIA

Kristen Lear

Abstract

The Southern Bent-wing Bat (*Miniopterus schreibersii bassanii*) is an obligate cave-dwelling bat with a restricted distribution, occurring only in southeast South Australia and southwest Victoria. It is currently listed as Critically Endangered due to a severe population decline from an estimated 100,000 - 200,000 individuals in the 1960s to approximately 30,000 individuals in 2009. In addition, this species is dependent on just two maternity caves: Bat Cave in Naracoorte, South Australia and Starlight Cave in Warrnambool, Victoria. From September 2011 to September 2012, I will be based at the Naracoorte Caves National Park to carry out my U.S. Fulbright Postgraduate Scholarship. The purpose of my study is to accurately estimate population numbers and trends at the Bat Cave maternity site so we can better understand how the population functions throughout the year. The information gathered from this project will help guide management strategies that will aid in the recovery of this Critically Endangered species. In addition, I will participate in community outreach projects throughout the year to help bring awareness and understanding of bats to members of the public.

Introduction

I graduated from Ohio Wesleyan University (United States) in May 2011 with a B.A. in Zoology and am in Australia for a year on a U.S. Fulbright Postgraduate Scholarship. The Fulbright Program is the largest U.S. international exchange program that supports students, scholars, and professionals to undertake research, teaching, or study in countries worldwide. I arrived in Australia in September 2011 and am spending the year at Naracoorte Caves National Park, South Australia to study the Southern Bent-wing Bat (*Miniopterus schreibersii bassanii*). While the Southern Bent-wing Bat is one of the most-studied Australian bat species, there is still much to learn about its ecology and the threats it faces. The aim of my project is to monitor the bats at the Bat Cave maternity site. I am working closely with Terry Reardon of the South Australian Museum, Steve Bourne of the Naracoorte-Lucindale Council, Lindy Lumsden of the Victorian Department of Sustainability and Environment, and Dr. Belinda Appleton of the University of Melbourne to conduct my project.

The author inspecting a bat, Bat Cave, Naracoorte. Photo: Steve Bourne

Southern Bent-wing Bat miniopterus schreibersii bassanii Photo: Steve Bourne

The Southern Bent-Wing Bat

The Southern Bent-wing Bat was listed as Critically Endangered under Australia's Environment Protection and Biodiversity Conservation Act of 1999 based on the fact that the sub-species has undergone a reduction in population of about 67% over three generations and that it has a highly restricted range, relying on only two maternity caves (Bat Cave in Naracoorte, South Australia and Starlight Cave in Warrnambool, Victoria). During the non-breeding season (April to August) individuals are distributed throughout the region, roosting in over 48 caves and rock crevices. In late August, however, the bats migrate to one of the two maternity caves, Bat Cave in Naracoorte, South Australia or Starlight Cave in Warrnambool, Victoria. These caves have unique structural characteristics which allow heat and humidity to reach ideal conditions for nursing young babies (Dwyer and Hamilton-Smith 1965). By October the migration is complete, with the

majority of both males and females (70% to 90% depending on the year) going to the Naracoorte Bat Cave.

The population size of the Southern Bent-wing Bat has declined dramatically in the last 50 years. In the 1950s and 1960s, there were an estimated 100,000 – 200,000 individuals at Naracoorte, the largest of the maternity caves (Dwyer and Hamilton-Smith 1965). Exit counts using video recording revealed that by 2001, numbers had declined to 35,000, and by 2009, the estimate was a mere 20,000 individuals (Bourne 2010, Kerr and Bonifacio 2009). At Warrnambool, the bat population declined from approximately 15,000 to 10,000 individuals over the same time period (Dwyer and Hamilton-Smith 1965, Gray 2000, Grant and Reardon 2004). Numerous threats have been proposed as potential factors in this decline, including loss and modification of roosting and foraging habitat, human disturbance, pesticides, disease, changes in food availability as a result of drought, and climate change.

The goal of my project is to accurately determine population numbers and trends at Bat Cave from September 2011 to September 2012. A large part of my project is to collect regular emergence counts so we can better understand how the population functions throughout the year, specifically when the bats arrive at the maternity cave, how activity levels vary seasonally and on a nightly basis based on weather conditions, when the young commence flying, and the level of breeding success based on the proportional increase in numbers leaving the cave. Monitoring throughout the year will allow us to detect issues that can be resolved with management intervention, and the information gathered from this study will help guide management strategies that will aid in the recovery of the Southern Bent-wing Bat.

Installing a data logger to record temperature and humidity near the nursery in Bat Cave, Naracoorte. Photo: Steve Bourne

Methods

I arrived in Naracoorte to begin my Fulbright scholarship in early September 2011. I am using two thermal imaging cameras (FLIR Photon 320 NTSC) and an automated counting system (Thermal Target Tracker (T3) System) based on missile tracking technology. The T3 software uses the bats' continuous flight motion to track each bat frame to frame within a video recording. The software gives output that includes egress (the number of bats emerging), ingress (the number of bats returning), and net emergence. The software also outputs an Excel file with a minute-by-minute count. I then verify a few of those one-minute counts against my own manual counts, and I run the video through different parameters as needed to get accurate numbers. I began taking emergence counts at Bat Cave in early September and have taken, on average, two to three counts per week.

Results and Discussion

My project so far has yielded some interesting results about the population of Southern Bent-wings Bats at Bat Cave including:

- The number of bats increased in the spring as individuals returned to the maternity cave from non-breeding sites. This was expected, as typically the majority of the population returns in August or September from over-wintering sites to Bat Cave, where the females give birth to and raise their young.
- Throughout the summer we have seen regular fluctuations in the number of bats present (up to 10,000 individuals per night), indicating that significant numbers of bats may use surrounding caves during the maternity season. We know from previous studies that Southern Bent-wing Bats use over 48 caves throughout South East SA as over-wintering sites (Mott and Aslin 2000), but the results from my project indicate that a significant proportion of the population may temporarily leave Bat Cave and use these surrounding caves during the summer as well.
- Our preliminary results also show an increase in peak population size from previous years. The highest number recorded for the 2011-2012 maternity season was 40,464 bats in mid-

February, 2012. This is a marked increase from the numbers recorded in previous annual summer video counts that showed a steady decline from 35,000 in 2000 to 21,000 in 2008 (Bourne 2010, Kerr and Bonifacio 2009). However, these counts were only taken one to three times per summer and may have been taken at times when a significant proportion of bats had temporarily left Bat Cave. These counts likely do not provide reliable estimates of the population size during those years, and we therefore cannot assume a sustained growth in population. More regular population counts are needed in order to get accurate numbers and determine population trends over the years.

These results highlight the importance of continued monitoring at Bat Cave throughout the year over multiple years. Effective management of surrounding caves that may be important roosting sites for the bats both in the winter and summer is also vital. I will continue monitoring the population at Bat Cave until the bats depart for their overwintering sites, and then begin again once they return in the spring. At the end of my project, I will submit a report to the South Australian Department of Environment and Natural Resources for use in a management and recovery plan for the Southern Bent-wing Bat. I hope the information gathered from this project will contribute to the conservation of this species.

Future Plans

The conservation and management of the Southern Bent-wing Bat is an ongoing endeavour. Future plans at Naracoorte Caves National Park include the installation of a permanent viewing station outside the cave entrance which will display the thermal imaging counts in real-time for visitors. Due to the sensitivity of the thermal equipment, it is currently impossible to take counts when it is raining, meaning that we miss information about the bats' behaviour on wet nights. The viewing station will allow us to take counts in inclement weather so we can gather more accurate information regarding the bats' behaviour in all types of weather.

In addition, Terry Reardon and students at the University of South Australia are developing a laser beam counting system that will remotely measure bat activity at the cave and provide us with an index of activity throughout the night. While the laser beam system will not show actual numbers, the information it provides will allow us to determine when the bats begin returning to Bat Cave in the spring, at which time we can begin taking regular thermal imaging counts.

Regular monitoring of Bat Cave throughout the summer months is important in order to get accurate population counts. However, due to the fluctuations in numbers at Bat Cave throughout the summer and the likelihood that bats are using surrounding caves during this time, additional monitoring of other caves in the South East region during the summer is needed. These checks should be targeted at times when the emergence counts from Bat Cave show a decrease in the population. A concerted effort should be made to conduct several one-day summer cave surveys of all the major surrounding caves to determine if bats are using these caves and if so, which caves are of most importance and should be targeted for specific management measures.

Inspecting Joanna Bat Cave, Naracoorte, with Catherine Sellars and Chris O'Connell. Photo: Steve Bourne

Conclusion

The preliminary results of this study highlight the importance of regularly monitoring the Bat Cave population throughout the year, over multiple years, to accurately assess population numbers and trends and determine overall population health. In addition, it is also vital to monitor and manage caves in South East South Australia for use by Southern Bent-wing Bats throughout the year.

Community Outreach

In addition to working on my research, I have been working in the local community to bring awareness and understanding of bats to members of the public. I have given several class presentations about bats to the students at the Naracoorte High School. They recently began their unit on ecology, so my presentations focused on bat diversity and how bats are important to the

ecosystem, as well as teaching the students about some of the bats and bat habitats in their own backyards. I am also helping with an after-school Youth Creating Habitat group comprised of a handful of the students. We are planning to install several bat houses in the creek site behind the high school and do a trapping session to survey the bat species present. These activities will be a great way to get the students involved with hands-on bat conservation in their own community. I am also planning to give several bat presentations to primary school students during the World Day for Biological Diversity on May 22.

I have also been volunteering with the Naracoorte Girl Guides, which has provided a great opportunity for me to continue my 17-year involvement with Girl Scouting and has provided a perfect outlet for me to share my passion for bats with girls from the local community. The girls (aged 7 to 15) are eager to learn more about bats and my research at the park. At their recent end-of-year campout, I took them to the park's Bat Observation Centre, where we watched the bats in the cave with infrared cameras. The girls were surprised to learn that the bats do not sleep through the entire day, and they enjoyed watching the bats grooming themselves and flying around the cave. Later that evening, we sat outside Bat Cave and watched the emergence. The girls were thrilled to be so close to the bats as they flew out of the cave. By the end of the campout, they had decided to use some of their unit money to Adopt-A-Bat from Bat Conservation International (BCI), which will help BCI preserve and protect bats around the world.

I am thrilled to be able to share my passion for bats with members of the community while in Australia. I hope to continue to bring awareness and understanding of bats to members of the public so they develop a vested interest in the conservation of these much-maligned animals.

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I would like to thank the U.S. Fulbright Program and the Australian-American Fulbright Commission for funds to carry out this project, the South Australian Department of Environment and Natural Resources for providing the thermal imaging cameras, and the Friends of Naracoorte Caves for providing equipment for the study. I would also like to thank Chris O'Connell for his assistance in the field and Terry Reardon, Steve Bourne, Lindy Lumsden, and Dr. Belinda Appleton for their continued support.

A skeleton of a Southern Bent-wing Bat still clinging to the roof of Marcollat Cave, Naracoorte.
Photo: Steve Bourne

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SUMMARY of SCIENTIFIC RESEARCH PROJECTS at YARRANGOBILLY CAVES, NEW SOUTH WALES

Pauline Treble, Andy Baker, Monika Markowska, Cath Jex, Jon Dredge, Nellie Hobley, Regina Roach, John Hellstrom, Jon Woodhead, Ian Fairchild and Carol Tadros

Speleothems are excellent archives of paleoenvironmental information, often preserving tens of thousands of years of scientific record. Environmental monitoring of caves is an important process towards understanding this information and relating it to cave and climate processes. Monitoring typically involves chemical and physical characterization of drip water (e.g. pH, drip rate, temperature, chemistry, isotopes etc) and logging of the cave atmosphere including CO_2, to understand how the cave atmosphere interacts with the outside environment.

As part of long-term environmental monitoring at Yarrangobilly Caves, a team of scientists from the Australian Nuclear Science and Technology Organisation, University of New South Wales, University of Melbourne, University of Newcastle and the University of Birmingham are undertaking a number of collaborative projects to better understand the relationship between drip water chemistry and climate history as well as assessing the potential of relatively new methods of paleoenvironmental reconstruction, such as aerosols and organic biomarkers.

The majority of this monitoring is taking place in, and above, Harrie Wood Cave, and we are grateful for the support of the Department of Environment and Climate Change (DECC) NSW.

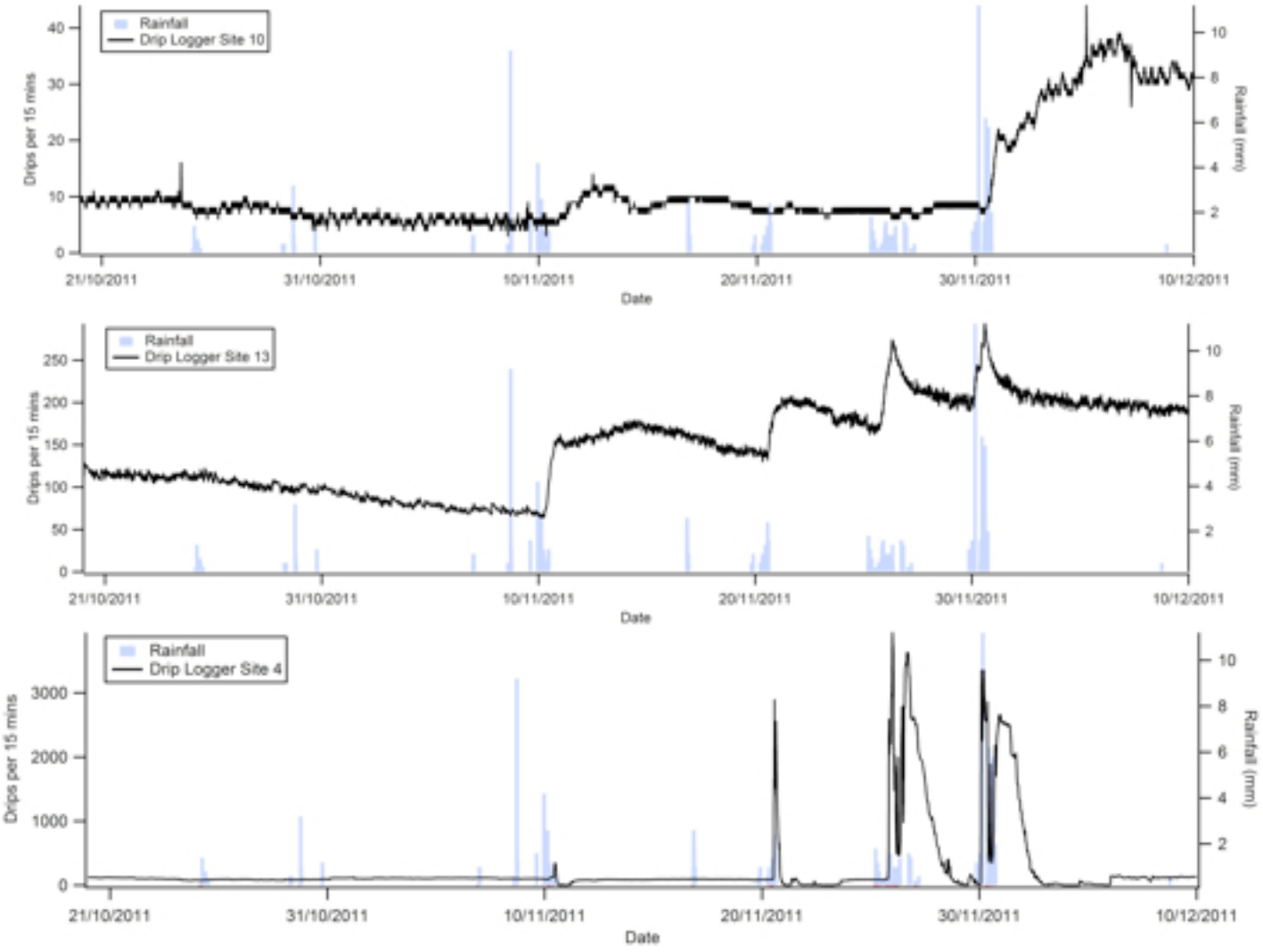


Figure 1. Hydrographs of three monitoring drip sites in Harrie Wood Cave. In order, Site 10exhibits an overflow response, Site 13 is responsive to most rain events and exhibits slow steady declines in drip rates post rainfall and Site 4 shows quick dramatic responses to rainfall events indicating fracture flow.

Research team photograph December 2011. From left: Monika Markowska, Adam Hartland, Andy Spate, Pauline Treble, Cath Jex, Regina Roach, Andy Baker

HYDROLOGY

Fortnightly collection of drip water is conducted to track seasonal variability in carbonate chemistry, oxygen isotopes, minor and trace elements. This information is being used to characterize the climatic information obtainable from drip water, as well as karst hydrological information. For example, by measuring oxygen isotopes in both rainfall events and drip water, we can assess how we may use oxygen isotopes in speleothems to reconstruct natural rainfall variability and air mass history.

The pathways of drip waters into caves can be quite complex. As a result, drip rate and temperature are being continuously logged at over 15 sites in Harrie Wood Cave. This will enable the temperature signal to be used as a tracer of rain events and to better understand the connectivity of surface water to cave water drips, including the potential mixing of different age waters. Drip rates are being recorded using stalagmite drip loggers, as featured in ACKMA Journal 81. Drip water temperature is being recorded using a novel application of a micro-T logging device originally designed for marine studies of fish.

Sampling for aerosol deposition.

Preliminary results have already shown that there is a number of different hydrological drip flow path regimes within the Harrie Wood cave. In fact, some drip sites that are less than a metre apart can show very distinctly different hydrological pathways. The figure below shows the responses of several drips in the cave to rainfall events. Site 10 shows little response to rainfall until a large event at the end of November tips a 'threshold' amount which triggers a steady rise in the drip rate. This could be representative of a water store above the drip which has filled and 'overflows' thus resulting in an increase in drip rate. In contrast site 13 shows a 'stepped' response to rainfall events, exhibiting small changes in drip rate after almost each rain event. After the initial response, drip rates stay higher and decline very slowly. This could indicate multiple drip sources. Lastly, site 4 shows a large rapid response to rainfall events which is short lived. This could represent a large fracture or fissure that is exploited in rainfall events and exhibits strong surface to groundwater connectivity.

SURFACE/SOIL MONITORING

Logging moisture, temperature and conductivity in the soils directly above Harrie Wood enables tracking of rainfall events into the soil and epikarst. Rainfall and other meteorological variables are monitored via a weather station.

BIOMARKERS AND THE SOIL CARBON CYCLE

Novel methods are being investigated to use lipid and lignin biomarkers to reconstruct records of past temperature and vegetation changes recorded in stalagmites. A branch of lipids called GDGTs, which are found in the cell membranes of naturally occurring bacteria and archae, are ubiquitous in the natural environment, but the relative distribution of different types of GDGTs has been shown to relate to air temperature. Lignin is a large organic molecule comprising the woody tissue of all plant material, and so can inform of vegetation types and water sources. As a relatively new area of scientific research, there are many unknowns about the exact environmental controls on the development of different types of lipids and their distribution, and the potential of lignin is yet to be fully realized as a palaeoproxy and tracer for water sources. The use of both of these proxies to study past environments and climates in karst regions is still very much in its infancy. Yarrangobilly is now the main site of investigation for these projects and the first in Australia. Specifically, routine collection of water, soil and cave samples will be made for analysis of these organic compounds. Routine characterization of these samples

Long-term monitoring of dripwater chemistry in Harrie Wood. Results have shown that drips located within 1 m are sourcing water from different hydrological pathways

and the modification of these compounds from the surface, through the karst aquifer into drip water, the cave environment and ground water during different environmental conditions (seasons and soil types) will prove to be a major global contribution to this area of research, and vital to development of these compounds as proxies of environmental change in speleothems.

In a related study, carbon isotopes including radiocarbon, are being measured on soil CO_2 gas and drip waters. These data will be used to understand soil carbon cycling at this site, as well as understand the processes that determine the amount of carbonate derived from limestone. The latter will enable more accurate speleothem chronologies to be developed using the radiocarbon dating technique.

Pauline Treble, Monika Markowska and Carol Tadros–Australian Nuclear Science and Technology Organisation (ANSTO)
Andy Baker, Cath Jex – University of New South Wales
Nellie Hobley – University of Newcastle
Regina Roach - NSW Department of Environment and Climate Change
Jon Dredge, Ian Fairchild – University of Birmingham, UK
Jon Woodhead and John Hellstrom – University of Melbourne

FIRE HISTORY

Blackened layers preserved in the speleothems of Jersey Cave are well-known to visitors to Yarrangobilly. These layers are thought to be derived from smoke being drawn into the cave during fires. Aerosol transport into Jersey and Harrie Wood Caves is being studied to better understand the nature of these deposits. It is hoped that this information may be employed to use the black layers preserved in the speleothem record to create a history of bushfire events through time, thus helping us understand how climate and fire interactions have change over hundreds of thousands of years.

SUMMARY

Yarrangobilly is thus a key site for further understanding paleoenvironmental signals preserved in speleothems as well as a setting for testing new methods such as biomarkers and aerosol transport. It serves as a natural laboratory for one of the most well-monitored cave sites in Australia. As well as filling knowledge gaps in interpreting past environmental change from the speleothem scientific record, it will also provide a host of new information such as improved understanding of the hydrogeological characteristics of karst systems, aerosol transport, and soil carbon cycling in cool climate regions of Australia. Ultimately, the speleothem scientific record at Yarrangobilly will be used to create a history of climate change, soil and vegetation changes and forest fire events for the region extending tens or possibly hundreds of thousands of years.

THE ORIGINAL GORDON-BELOW-FRANKLIN DISPUTE: BEATTIE, BHP and the MARBLE CLIFFS

Nic Haygarth

Abstract

In 1914, almost 70 years before Tasmania's Gordon-Below-Franklin Dam Blockade, people power stopped development of the lower Gordon River. The focus of the proposed development was karst—a limestone deposit known as the Marble Cliffs. Its principal defender was Hobart photographer and conservationist John Watt Beattie, who wanted a Gordon River national park. He was not only the most important figure in 19th and early 20th-century Tasmanian tourism but an early champion of its karst and caves. This was recognised in 1918. In the same year that Beattie campaigned for protection of the Hastings Caves, he was appointed to a Caves Advisory Board to assist the government take over the King Solomons and Marakoopa tourist caves.

Tasmania's lower Gordon River has been saved twice. In the summer of 1982–83 a blockade was staged to protest and publicise the Tasmanian State Government's intention to dam the lower Gordon as part of a hydro-electric power development. The dam would have flooded not just kilometres of the Gordon River but much of the magnificent, wild Franklin River, inundating the Aboriginal heritage cave Kutikina and untold, undiscovered archaeological sites. It took a High Court ruling to stop the dam. The Federal Government enforced its right to legislate on any issue in order to fulfil its responsibilities under an international treaty, in this case, the UNESCO Convention for the Protection of the World Cultural and Natural Heritage (Kiernan, 1989). Even 20 years later, in 2003, the overruled former Tasmanian Premier Robin Gray said he would still try to build the dam given his time again (Gray, 2003).

This 1862 map of the lower Gordon River shows Sarah Island (extreme top left), lime kilns at Limekiln Reach (centre) and carries a notation (just below centre) that gangs falling timber operated as high up the river as Butlers Island, just beyond the Marble Cliffs. Pyramid Island (lower right) marks the confluence of the Franklin River with the Gordon.
Courtesy of State Library of Tasmania, Launceston.

This was effectively a replay of an earlier conservation battle which had long been forgotten. Not only did people power triumph on the lower Gordon River almost 70 years before the Gordon-Below-Franklin Dam Blockade, but it did so by swaying a pro-development premier—a feat of which the Blockaders could only dream in the summer of 1982–83. The subject of the 1914 battle was karst—a 40-metre-high bank of limestone known as the Marble Cliffs (now Champ Cliff).

Limestone extends for up to 17 kilometres along the lower Gordon River (Kiernan, 1995). Convicts from the nearby Macquarie Harbour penal station based at Sarah Island were the first to quarry limestone in this area in the years 1822–33 (Maxwell-Stewart, 2008, pp.31–32). A convict-era kiln, later reused by a mining company (Beattie, 1908b), can still be found at Limekiln Reach. Caves were probably discovered in the limestone karst during lime burning or logging operations along the lower Gordon during the convict era.

The culling of Huon pine on the Gordon River and later the advent of mining in the Mount Lyell district gradually made the Gordon River accessible to would-be limestone quarriers. In 1886 there were efforts to sell Tasmanian 'marble' in London, where it was hoped it would compete with Sicilian marble. Two syndicates fought for possession of the Gordon River's Marble Cliffs about 25 kilometres upstream of the mouth of the Gordon River ('By Electric Telegraph', 1886). Four years later, polished samples of this limestone exhibited in the mineralogical exhibition at Crystal Palace in London were said to be especially suitable for use in churches, both for altar pieces and flooring ('A New Tasmanian Industry', 1890).

There was quality. Was there quantity? Government Geologist Alexander Montgomery said there was not enough 'marble' at the Marble Cliffs to make a quarry viable (Montgomery, 1890). More ominous was the interest of a Broken Hill Proprietary Ltd (BHP) director Daniel Griffith, who claimed that the Marble Cliffs represented 'one of the most admirable fluxes in existence' ('Mining Intelligence', 1891).

Photographer John Watt (J.W.) Beattie on the Moores Pimple Track, West Coast of Tasmania, possibly in 1890. His wooden tripod is strapped to the rest of his photographic gear on the horse's back. Beattie's horse wears not only blinkers but puttees to ward off the mud. Courtesy of State Library of Tasmania, Launceston.

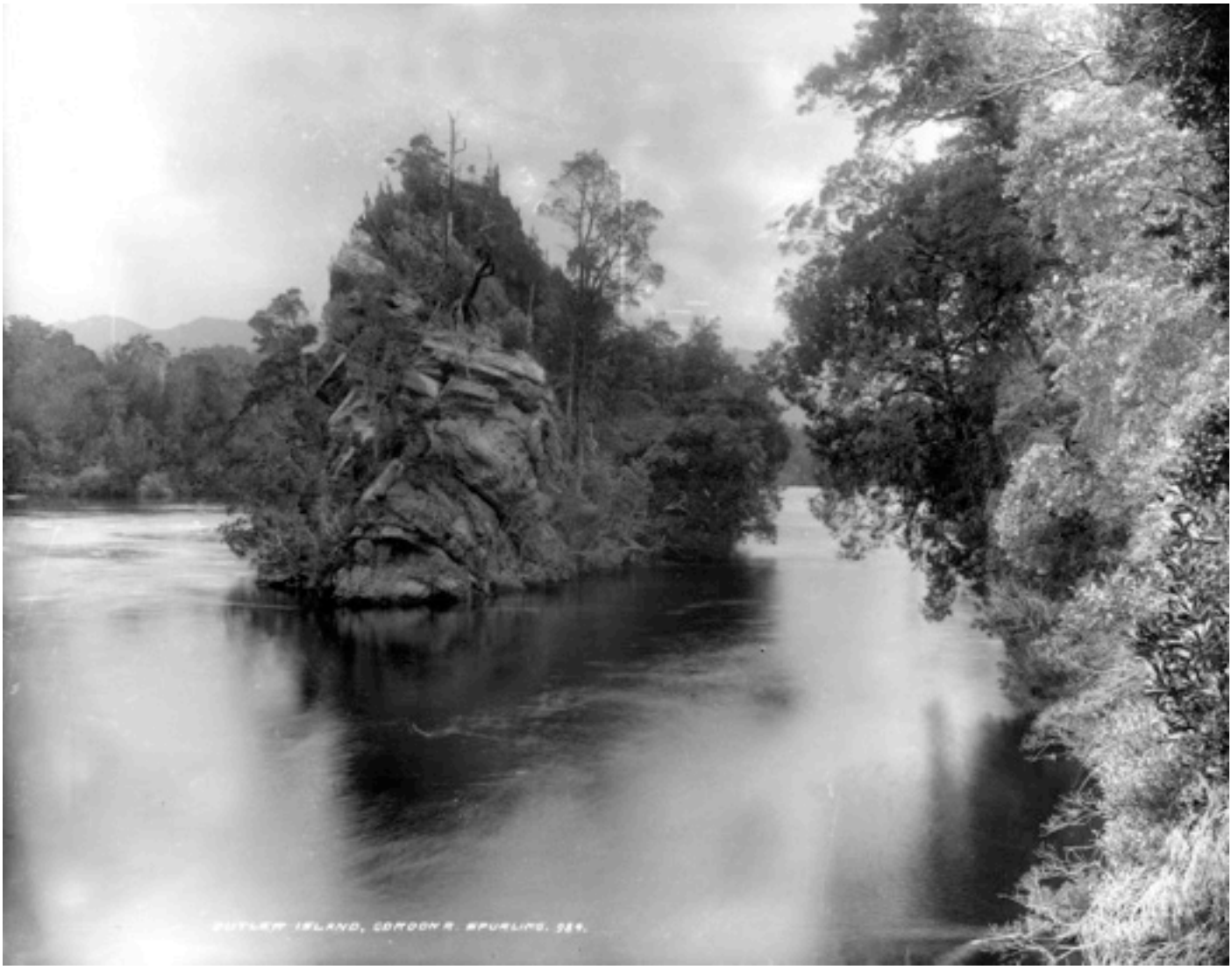
It was at this time that the Hobart photographer John Watt (J.W.) Beattie (1859–1930) made his first trip to the West Coast (Haygarth, 2008, p.64). Beattie, the most important figure in 19th-century and early 20th-century Tasmanian tourism, was not one of those wilderness photographers who excluded people from his photos. He worked in the aesthetic of the Sublime, typically depicting a man awestruck or at least wonderstruck by God's immense creation, nature. Beattie was himself sometimes transfixed by nature, declaring that

> I love the bush, and nothing gives me greater delight than to stand on top of some high land and look out on a wild array of our mountain giants. I am struck dumb, but oh, my soul sings! (Beattie, 1930)

While an unmemorable 1897 Beattie shot of Wet Cave is probably Tasmania's oldest surviving photo of a limestone karst, his interest in caves seems to have begun earlier with the rock shelter on Grummet Rock (Small Island) in Macquarie Harbour. During the years of the convict settlement, the rock had housed probationary prisoners and the prison hospital (Maxwell-Stewart, 2008, pp.20, 23–24). As a passionate amateur historian, Beattie celebrated and helped de-stigmatise Tasmania's convict past (Young, 1996). No other place suited Beattie quite like the West Coast, where frenetic enterprise, wondrous scenery and brutal penal history were fused.

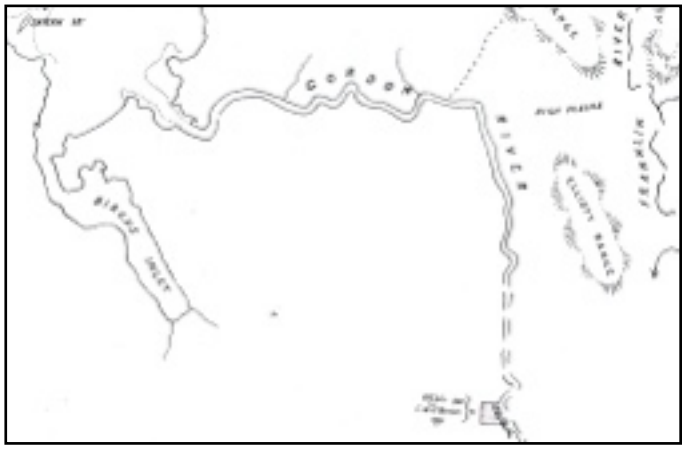
'Grummet Rock, Showing Entrance to the Prison Cave no. 481B' (1890?). J.W. Beattie photo. Courtesy of Ross Ellis.

In the mid 1890s the Mount Lyell copper mine prompted the last 19th-century Australian mining boom. The mine, worth more than £4 million in 1897, was the powerhouse of the Tasmanian economy (Blainey, 1954, pp.79–80). As a result, by 1901 one in seven Tasmanians lived on the mining fields (Blainey, 1956, pp.71–73). Sensibly, the booming West Coast tried to diversify economically by placing tourism alongside mining. To this end, John Ware, in his 1908 tourist guidebook *Strahan: Macquarie Harbour* wrote a poem 'The Gordon', which described the river 'rippling on unruffled, past fairy grottoes and caves', in the fantasy mode fashionable at the time (Ware, 1908, p.9). The Marble Cliffs were said to be one of the three gems of the river, along with Sir John Falls and Butler Island. These featured in photos, postcards, lettercards and lantern slides which advertised Gordon River cruises. Most of these photos were taken by two superb landscape photographers, J.W. Beattie and Stephen Spurling III.



(Above) Butler Island; (below right) Sir John Falls; and (below) The Marble Cliffs, the three 'gems' of the lower Gordon River, probably taken 1907.
Stephen Spurling III photos.
Courtesy of Stephen Hiller.

It is easy to imagine that Beattie and Spurling's photos of the lower Gordon and King Rivers were influential in the creation of 100-metre-wide reserves along the banks of these rivers in 1908 ('Correspondence re Deputation', 1914). Beattie, a frequent lantern lecturer (that is, he gave public lectures in which he projected images on glass slides, using a device called a 'magic lantern'), campaigned to have the 1908 Gordon River Reserve extended. He recognised at this time that Tasmania was not yet ready to accept reservation of an area simply because of its intrinsic qualities, rather, that reservation needed to be justified on purely economic grounds. Beattie therefore asserted that the Gordon River was worthless to timber cutters, to miners, to farmers and to settlers. Attracting the tourist pound, he implied, was its only chance of redemption (Beattie, 1908a, p.35; Bonyhady, 2000, pp.102–12). The same rationale was used by other campaigners for two early Tasmanian national parks, those at Mount Field (Crooke, 1913; 'Suggested National Park', 1913) and Cradle Mountain-Lake St Clair ('The Proposed New National Reserve', 1921).



Proposed limestone lease at the Marble Cliffs, 1914. Courtesy of the Tasmanian Archive and Heritage Office.

The Mount Lyell mine was inextricably linked to BHP. Geoffrey Blainey has described how Bowes Kelly and other BHP directors bought the Mount Lyell gold mine and turned it into a copper mine (Blainey, 1954, pp.57–58). In 1914, at a time when BHP planned to expand into steel manufacturing at Newcastle, Kelly, now a director of both companies, appears to have reminded BHP of the potential of the Marble Cliffs as a smelting flux. BHP applied to lease the site. The company believed that shipping from western Tasmania to Newcastle would be economical if a bar across the Gordon River was removed, the limestone being back loaded on vessels delivering coke and coal to Mount Lyell and other West Coast mines (Ross, 1915).

It was the advent of World War I, when the West Coast mines were being badly affected by the closure of the European metal markets. The plan to quarry limestone was therefore very popular on the West Coast, even though it threatened one of the three major attractions of Gordon River tourism ('Queenstown: Mount Lyell Tourist Association', 1914; 'Queenstown Municipal Council', 1914). West Coast (Wilmot House of Assembly electorate) member Edward Mulcahy suggested that limestone could be hacked invisibly from the back of the Marble Cliffs deposit (Mulcahy, 1914). BHP's proposed lease, however, reached right to the water's edge, leaving no doubt of its intention to mine the cliff's river-side face. John Ware, gusher of Gordon River poetry, now dismissed the Marble Cliffs as 'puny' and 'disinteresting', merely the turning-around point for cruise services (Ware, 1914). Some justified the scheme by its creation of jobs (Watkins, 1914) and on the 'more accessible' social justice argument: by providing accommodation, a small mining settlement at the Marble Cliffs would make Gordon River tourism cheaper, opening it to the masses ('OEW', 1914). Such justifications would become staples of development proposals in Tasmania.

Elsewhere in the State, the plan was greeted with horror. In Launceston, Weekly Courier editor Frederick Pritchard pleaded for the Gordon's preservation for future generations (Pritchard, 1914). In Hobart, Mercury editor William Henry Simmons expressed 'horror and anger' at the proposed 'Vandalism' (Simmons, 1914). One protestor offered Junee Cave limestone to the developers as a trade-off for the Marble Cliffs (Marriott, 1914). Beattie stepped out of the cover of economics for ever by attacking the mining scheme as 'unpatriotic' and 'the thin edge of utilitarianism'. He declared that the Gordon River should be a 'sacred reserve for all time', and blasted the 'ridiculous' existing riverbank reservation (Beattie, 1914). Beattie was a member of the Tasmanian Tourists' Association, which also implored the government to refuse the BHP exploration licence ('The Gordon River: Marble Cliffs Question', 1914).

The premier of the time, John Earle, was Tasmania's first working class leader. He had developed an interest in politics at 18 or 19 years old while working as a humble blacksmith at the remote Lucy Spur gold mine, above the middle reaches of the Pieman River on the West Coast (Ireland, c1913). Later, on the Zeehan silver field, Earle and his future minister for mines James Ogden were prominent figures in the Amalgamated Miners' Association (Howard, 2006, pp.295–96).

Mining was in Earle's blood, and in the shadow of war his traditional supporters in mining communities expected government relief. Co-operative arrangements with miners enabled some work to continue at the Tasmania gold mine and the Mount Bischoff tin mine (Roberts, 2007, p.285; Mount Bischoff Tin Mining Company, 1914). The Earle Government established the Electrolytic Zinc plant in Hobart to save the zinc that was ending up on West Coast mine dumps (Townsley, 1991, p.268). The generation of hydro-electric power for this plant effectively marked the beginning of hydro-industrialisation, a dogmatic policy of Tasmanian governments up until the Gordon-Below-Franklin Dam Blockade of 1982–83.

Earle was a pro-development premier—but not a rapacious one. His Labour government in the years

The middle Pieman River below the Lucy Spur mine, western Tasmania, 2010.
Nic Haygarth photo.

1914–16 also took control of tourism, passed more effective conservation legislation (the Scenery Preservation Act, 1915) and established Tasmania's first national park at Mount Field. These measures reflected a growing appreciation of the environment in Tasmania. Perhaps those years of working in 'nature primeval' on the middle reaches of the beautiful Pieman, a river of similar grandeur to the Gordon, had worked on Earle's soul. Under pressure from tourist associations, newspaper editors, the high-profile Beattie and the general populace, Earle decided to refuse the BHP application. His explanation for the decision suggests that it was not politically convenient to admit that he had intervened in the name of nature preservation:

> There was no indication that a genuine industry was likely to be established [at the Marble Cliffs]…he looked upon the scheme as a wild cat one. He considered it was doomed to failure, and would only result in the destruction of beautiful scenery ('Melrose lime deposits', 1915).

The logic of this statement seems to have been lost on Earle's own cabinet members: to accuse the highly capitalised BHP, of all companies, of a 'wild cat' operation was bizarre. Moreover, why, after making that accusation, did he now endorse the same 'wild cat' BHP limestone quarry at a different location, Melrose, on Tasmania's north-west coast?

The West Coast took the news badly ('A Contrast in Policy' (editorial), 1915; Zeehan and Districts Development Committee, 1915). BHP, however, was not all fazed by the decision, because the company was welcomed with open arms at Melrose. The Tasmanian Government bent over backwards to help get a railway built in order to bring BHP's smelting flux out to the wharf at Devonport ('Melrose lime deposits', 1915). Renouncing any interest in the Gordon, BHP operated its Melrose quarry from 1915 until 1947 (Gardam, 1996, pp. 68–-70). BHP general manager Guillaume Delprat envisaged another practical use of the lower Gordon besides limestone extraction anyway. He pronounced the river ideal for hydro-electric power generation ('Queenstown: the Gordon River', 1914). Beattie's Gordon River national park (which would be called the Franklin-Gordon Wild Rivers National Park) was still 67 years

Above: Newdegate Caves 1918.
Below: King George Cave.
Photos: JW Beattie

Waiting at Scott's Cave. Photo: JW Beattie

away—and its proclamation would not prevent a second Gordon below Franklin battle.

J.W. Beattie continued to play a significant role in the conservation of Tasmanian karst. Not for nothing is Beattie Cave at Hastings named after him. Newspaper reports of the discovery of what is now called Newdegate Cave near the then timber village of Hastings induced Beattie and E.T. Emmett, director of the Tasmanian Government Tourist Bureau, to inspect the cave in February 1918. A local mineral prospector, David Inns, then reported two other caves nearby. Inns dubbed what he believed the largest of the three discoveries The King George (later King George V) Cave, and the next biggest (the original find) The Newdegate Cave, after Sir Frances Newdegate, Tasmanian Governor 1917–20, thus sanctioning the proper regal and vice-regal relativity (Beattie, 1918b). Beattie was presumably satisfied to occupy third place on this honour roll when his name was applied to the smallest cave. Emmett immediately called for the area to be reserved (Emmett, 1918). Beattie's images helped sell his own and Emmett's descriptions of these caves as a fragile treasure in need of protection (Beattie, 1918a).

Later in 1918 Beattie's prominence as a tourism promoter and conservationist was recognised by his appointment to a Caves Advisory Board, to assist the government's takeover of caves at Mole Creek ('The Caves', 1920). The board backed Jenolan Caves caretaker Voss Wiburd's recommendation that the King Solomons and Marakoopa show caves join Baldocks as state possessions—which these caves did in 1920 and 1922 respectively ('The Caves', 1920; 'Mole Creek Caves', 1923).

There is an ironic postscript to the story of BHP's limestone quarrying at Melrose, or Eugenana, as the site was later called. Quarrying in the Ordovician Gordon Limestone led to the discovery of a small cave which contained what have become known as the Eugenana Beds, that is, a deposit of sandstone, carbonaceous sandstone and cave breccias with a spore content indicating Middle Devonian age (Banks and Burns, 1962; Kiernan, 1974). The beds were given Geological Monument status. The area is now part of a State Reserve. So something good came of a great deal of environmental destruction.

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THUNDERBOLT(S) CAVE(S):New South Wales

Kent Henderson and Andy Spate

Signage to Thunderbolt's Cave

Kent Henderson writes: In January, I was driving in northern New South Wales towards Queensland on the New England Highway and a bit north of Armidale I noted a large brown 'tourist sign' to *Thunderbolts Cave – 1.7 km*. I thus made a screeching u-turn (as you do), and made my way to this obviously-desirable-to-visit local tourist mecca (of which I had previously heard nothing).

Having traversed the said 1.7 km (the last 0.7 km of the 'road' – *track!* – was pretty ordinary) I arrived at a small car park. I figured I was in the right place as, conveniently, a sign just outside the car park pointed to *Thunderbolts Cave Car Park*. That was, sadly, the last of the signage. One then made the *circa* 200m trek down a bush track to the cave; which was quite easily found.

The cave entrance

The cave is in basalt (lava) and is a true cave – I was sort of expecting a cliff undercut or similar (although I don't know why). The dome-shaped entrance was roughly 2-3+ metres across and maybe a metre high; so only gentle stooping was necessary to enter. The depth of the cave was, maybe 8-10 metres – a 'small room' – and inside about 2 metres or so high so you can pretty much stand up. While 'dull' inside, no torch was needed.

There is a small daylight window to the left hand side. The floor is largely flat, with a little forest debris and a few bones maybe – it might be worth an archeological dig...? The cave itself was devoid of any secondary deposition, unsurprisingly.

So, what to make of it? I went to the tourist centre in the nearby (10 km north) town of Guyra. Yes, they had heard of it, but no they had no information on it either verbal or written. I was a bit surprised, given Guyra was not obviously replete with tourist attractions. The puzzle deepened when, later, I searched the internet. Aside from a (very) few anecdotal blogs of visits – virtually nothing.

I did discover that the Guyra Lions Club had undertaken the 'first stage of development' to Thunderbolt's Cave as a tourist attraction in May 2009. They are responsible for the current signage (such as it is).

Evidentially, around this time *the car park was relocated to the top of the hill to facilitate access for vehicles and caravans, and a turn around circle suitable for caravans has been developed*. That said, it would be

a brave caravan that ventured down the access 'track', in my view.

Of course, many Australian bushrangers have been associated with caves – Jenolan and Abercrombie in particular. Captain Thunderbolt was an infamous bushranger, who roamed northern New South Wales and southern Queensland, committing as many as 200 crimes across a six year period.

Thunderbolt's real name was Frederick Wordsworth Ward (15 May 1833 – 25 May 1870). He is probably Australia's 'second most famous' bushranger after Ned Kelly. Indeed, there is a Kelly's Cave (oh yes) near Beechworth in Northern Victoria – more on that in the future, perhaps.

A view looking out the cave entrance.

I will largely leave it to readers to research Ward if they are interested. For my purposes here it is suffice to say he took the pseudonym of *Captain Thunderbolt* around 1ate 1863, and from 1864 to 1870 he committed his many dastardly deeds, mainly robbery, across stock routes as far north as Warwick in Queensland and as far south as Port Stephens.

This certainly encompasses the New England District, the location of 'our' cave. As is the way with bushrangers, he eventually came to a sticky end.

The car park signage.

Returning to the said cave, I can find no reference or evidence that Captain Thunderbolt ever inhabited the cave named after him – for that surely is the implication – that he used it as a refuge.

Maybe he did, but… One would imagine he would have to have had more than considerable luck stumbling across this particular *needle in a haystack*, and a very good GPS to re-find it (without any roads or landmarks) even today! Forgive me for being a tad sceptical.

There is obvious commercial traction in naming anything after a famous local identity. There is also a Thunderbolt's Lookout, a Thunderbolt's Rock, a Thunderbolt's Way – and probably matching Thunderbolt bedside tables in the local antique shop. As to the historical veracity of any of it, who knows?

What is slightly more annoying is that I have been unable to gain any geological or management information on the cave. It may exist; I just have not been able to find it. I assume the cave is on unallocated crown land…

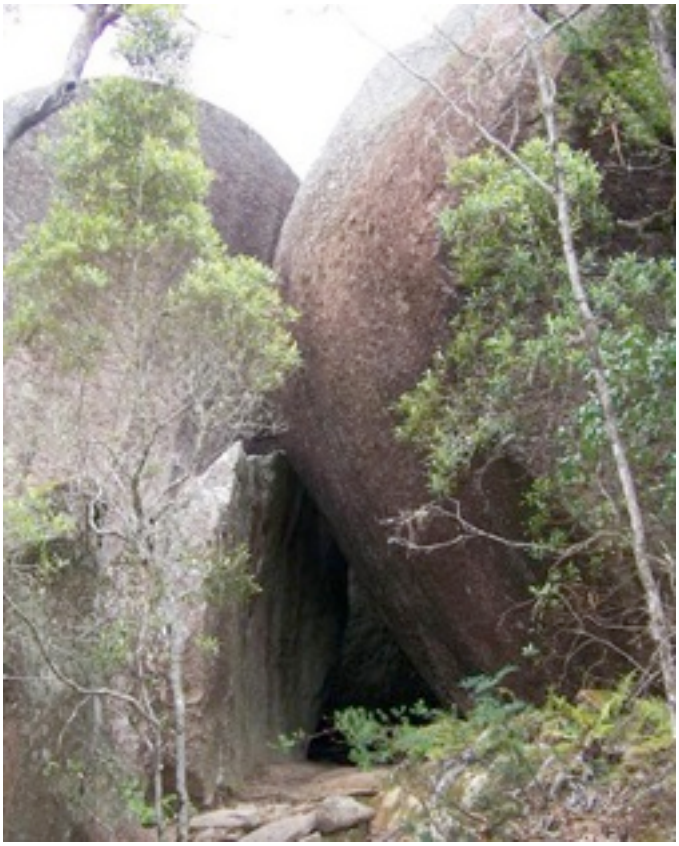
Of course, I did phone the 'font' of all New South Wales cave knowledge, Andy Spate, who had no immediate answers – but he did some research; the result of which follows…

A view inside the cave.

Andy Spate writes: Frederick Ward, alias 'Captain Thunderbolt' was the last, and most successful, of the professional bushrangers in New South Wales (Crittenden, 1976 – see below).

Kent sent me his article (above) on Thunderbolts Cave which he had spotted on his gyrations around Australia – this led to some confused discussion between us as to its location because I recalled a Thunderbolts Cave north of Tenterfield, near the Queensland border. 'Kent's cave' is south of Armidale – some 225 km away by road. It appears from his pictures to be a classic, small and simple lava cave. 'My cave' is also small and it is a classic and small granite boulder cave. Some information from the web is reproduced below. A query to Dr Armstrong Osborne led to the 'discovery' of a third Thunderbolts Cave which he described in an email – "I have been to the [Thunderbolts] cave at Mt Kaputar and it is quite complex in morphology". Most unlike the first two!

Perhaps Armstrong can add further detail in a future issue of the Journal. Mt Kaputar is about 140 km as a crow flies west-north-west of 'Kent's cave'. These three caves are in the Murray-Darling Basin.



Thunderbolt's Cave near Tenterfield – 'Andy's Cave'.

To add to the confusion, east of the divide, there is Thunderbolts Way which runs north from Port Stephens through Gloucester and Uralla to Queensland linking both Kent's and my caves.

> *In September 1863, "Sergeant Grainger came upon the escapees attempting to hold up a mail coach at the "Split Rocks" (soon to become known as "Thunderbolt Rock" [Kent's cave]) south of Uralla. Fred Ward was shot through the knee but managed to escape.*
> *…The two men separated and Ward alone robbed the toll bar at Campbells Hill near Maitland. He proceeded to pound on the wall of the office and demanded the surrender of the toll money. It was this act which earned him the name 'Thunderbolt'.*

Thus began the bushranging legend of Fred Ward, also known as 'Captain Thunderbolt'. The following list records crimes purported to have been enacted by Thunderbolt and his gang over the following years:

- 25 mail coach robberies
- 16 hotels and stores
- 16 stations and residences
- 6 hawkers
- 1 tollbar safe
- 80 thefts of horses
- 1 escape from lawful custody; and
- numerous firing[s] on Police in their line of duty."

[http://www.thunderboltsway.com.au/resources/thunderbolt_leg end.pdf which also has more biographical detail by Arnold Goode of Uralla, titled *Defiant Scoundrel or Gentleman Bushranger?*]

A view looking out of Thunderbolt's Cave near Tenterfield – 'Andy's Cave'.

Some googling revealed the following about the granite boulders north of Tenterfield:

> *On our scenic drive to Stanthorpe, after 12 kms, we came to the Brown tourist sign, stating Thunderbolt's Hideout was located on the L/H side of the road.*

I did the walk, only a short one, I guess about 500 metres return from the parking area. The area is full of colossal sized Granite boulders. This is where his hide out was, between two that formed two Caves. No wonder he chose this location, I could see for quite a long way! He also used it to plan attacks on the north-south road. This area is so rocky, I think he would have been very hard to find.

[The website: http://members.virtualtourist.com/m/p/m/1ff3b1/#ixzz1pAnIRzaG gives details about 'Captain Thunderbolt who was known as a Bushranger and a Gentleman!

Frederick Ward, by Samuel Calvert.
State Library of Victoria, IAN 18/06/70/116

Ward, Frederick (*Captain Thunderbolt*)
1835-1870

(Victor Crittenden: Australian Dictionary of Biography, 1976.)

Frederick Ward (1835-1870), bushranger, alias 'Captain Thunderbolt', was born at Windsor, New South Wales. He was working as a drover and horse-breaker at Tocal station on the Paterson River when arrested with James Garbutt and indicted for stealing and receiving seventy-five horses at Maitland on 21 April 1856; Ward was sentenced to ten years' hard labour on 13 August on the receiving charge.
Released conditionally from Cockatoo Island late in July 1860, Ward worked as a horse-breaker at Cooyal near Mudgee until his ticket-of-leave was cancelled on 17 September 1861 for 'absence from Muster' and he was tried on 3 October for horse-stealing. Returned to Cockatoo Island to complete his original sentence with an additional three years, Ward escaped with Frederick Brittain about 11 September 1863. In 1864-65 Ward lived quietly with his 'wife', Mary Ann, née Bugg, a half-caste Aboriginal, on the Culgoa River near Bourke with two children. He adopted the name 'Captain Thunderbolt' in the early 1860s. He carried out a series of armed robberies near Bourke with three associates, including a 16-year-old boy John Thomson, who was shot and captured by the police at Millie near Moree. Ward and two others robbed inns and mail-coaches in the Liverpool Plains District; in December 1865 at Caroll near Gunnedah they held up an inn and danced and drank until the police arrived. They wounded a policeman and escaped, abandoning three pack-horses. Ward separated from his companions and never again made a stand when the police approached.

Alone, with a reward of £200 on his head, Ward held up mailmen and on 3 February 1867 was almost captured while drunk near Manilla. He took an accomplice Thomas Mason, a 16-year-old orphan, with whom he robbed the mails in the New England and Upper Hunter areas as well as the Liverpool Plains District. While hiding out in the Borah ranges they became separated, Mason was captured in August and convicted of highway robbery. Mary Ann followed Ward whenever possible; at Stroud in March 1866 she had been sentenced to six months for vagrancy but was released in April, because the conviction was not accurately drawn up.

Ward's next companion was William Monckton, a 13-year-old runaway, with whom he robbed travellers and the mails in the New England area. Late in 1868 Monckton abandoned Ward who then worked alone and less actively; on 25 May 1870 he was surprised while testing an inferior horse and was chased and shot by Constable Alexander Binney Walker at Kentucky Creek near Uralla. A Protestant, he was buried in Uralla cemetery without religious rites.

Ward was 5' 8" (173 cm) tall, slight, and of sallow complexion with hazel-grey eyes and light-brown curly hair. He undoubtedly had great nerve, endurance and unusual self-reliance and his success as a bushranger can be largely attributed to his horsemanship and splendid mounts, to popular sympathy inspired by his agreeable appearance and conversation, and to his gentlemanly behaviour and avoidance of violence; he also showed prudence in not robbing armed coaches, or towns where a policeman was stationed. The last of the professional bushrangers in New South Wales, Ward was the most successful.

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WATER FUN PARK and TOURIST CAVES, AMIDST TROPICAL TOWER KARST

Garry K Smith

A recent caving trip took me to the karst area of Bantimurung Bulusaraung National Park, in the Maros regency, Pangkajene district of South Sulawesi, Indonesia. The nearest commercial Airport is at Maros, just under an hour's drive from the National Park. In the other direction (South) from the airport is the major city of Makassar where most essential supplies can be purchased. Bantimurung National Park (NP) is 43,750 hectares in area and 45 kilometres to the north of Makassar. It contains the limestone tower karst of Maros Pangkep, the second largest tower karst area in the world after an area in South-Eastern China.

Tower karst in Bantimurung Bulusaraung National Park

Bantimurung NP is one of those out of the way places often overlooked by tourists, yet it offers such a diverse range of karst landscape and amazing flora and fauna. The area certainly has not been commercialised in order to encourage foreign tourists, so one can still become immersed in the culture of the local people.

Alfred Russell Wallace, a British scientist who visited Bantimurung between 1856-7, dubbed the place the Butterfly Kingdom. The locals now take great pride in proclaiming the area as "butterfly capital of the world". We saw numerous children and adults running around with butterfly nets as they can earn up to $100 US per day catching specimens. Local butterflies as well as imported specimens from New Guinea and other countries around Asia are pressed flat and mounted in picture frames for sale to the tourists. Some of the local elders we met were very concerned that the butterfly population had been dramatically reduced in their lifetime.

Bantimurung NP is a magic place of tower karst, rainforests, tufa waterfalls and caves. While in the area we visited a number of limestone caves which were open to the public. Other caves, not open to tourists, were also visited under permit arrangements, but are not discussed in this article.

Tufa waterfall packed with people in Bantimurung National Park

For tourists the entry to the part of the National Park containing the aquatic fun park is 20,000Rp (about $2.20 AU) per day, locals, however pay considerably less than that. The fun park is in a small valley, enclosed with tower karst up to 100 metres high on three sides.

During the day, visitor numbers swell into the thousands, particularly on the weekends. By far the majority are locals and Indonesian tourists from other islands. It is a place where families come to spend the day for a picnic, social or just a day out with their children. Car tubes can be hired for a small fee to ride the rapids below the tufa waterfall. A flying fox (aerial runway) is set up over a large pool for thrill seekers and water slides for young and old. There are many natural pools as well as man made wading pools for toddlers and deep pools for diving. Live bands play on a stage overlooking several pools, while food stalls, street artists, buskers and magicians are all out to impress for

your dollar or rupiah. The place is alive with the sounds of music, conversation and laughter filling the air.

A substantial stream flows constantly from the vast area of tower karst clad in lush tropical rainforest and monkeys swing through the trees overhead. Many varieties of brightly coloured butterflies dart back and forth though the trees and among the people. A spectacular 15m tufa waterfall is the centrepiece, as a large volume of water plunges with a roar to the start of the rapids used for tubing and on through the rest of the aquatic park. The water is surprisingly warm, but cool enough to be refreshing, hence very popular with the tourists. Standing under the tufa waterfall and riding car tubes down the rapids is certainly a very popular activity here.

This was our gateway to the three tourist caves within the National Park. On one of our recreational days away from the permit caves, I walked from the park entry gate up past the tufa waterfall. Above the falls the river runs slowly through the deep gorge, fed from a large karst outflow. The roar of the waterfall grows dimmer and the one is surrounded by the natural sounds of jungle animals. The gorge walking track eventually leads to a cave entrance less than 10 metres above the stream. A small group of locals greet you at the entrance and offer dim lead torches for hire, if you don't have your own light.

I join the waiting cave tour group just inside the cave and to my surprise two women immediately leave their husbands to latched onto my sweaty arms. I don't know if it was my bright caving light or because I was the only lily white Caucasian in the group, which attracted the women to me! Anyway it did make the tour rather difficult for me with these women constantly attached.

Gua Batu (Stone Cave)

This cave consisted of two poorly decorated chambers with a tacky mud floors. The chambers were connected by a short narrow passage with several wobbly stepping stones to keep visitors' feet out of the ankle deep water. Given that the majority of visitors were Indonesian, who preferred to remove their thongs or shoes and cave in bare feet, the stepping stones made no sense as most people washed their feet instead of using the unstable stones. The temperature underground felt like 27°C and

Neil Anderson in Isotona Toakola Cave.

with a lather of perspiration, I would guess near 100% humidity.

Entry to the cave is free, however there was an unofficial cave guide who appeared to belong to the budding entrepreneurs hiring torches to the tourists. My own caving light was far brighter than the ones for hire and that of the self appointed guide sporting an old kerosene Tilley lamp.

The Indonesian guide told tales of decorations which look like imaginary something-or-others as he directed people through the cave with the dim lamp. Thankfully an Indonesian on the tour translated the stories to English for me. Eventually we came to a small drip pool the size of a hand basin, in which it is obligatory for all visitors to wash their face and hands "to bring good fortune". I followed the guide's instructions and shuddered at the thought of how many sweaty hands and faces contacted that small pool per day.

Istona Toakola Cave

Access to this cave is via the path leading to Gua Mimpi Cave, as discussed later. Istona cave consists of one large cave passage several hundred metres long. The decorations are very large and quite spectacular. Access to the cave is easy by walking down a dirt and rubble scree slope leading to the relatively flat floor of the cave passage. The floor is generally damp earth with very little mud. There is no infrastructure in this cave and of the three tourist caves within the aquatic park this cave is least visited, despite the entrance being just 20 metres from the Gua Mimpi Cave main entrance.

Gua Mimpi (Dream Cave) is considered a "self guided" cave by the National Park management.

This cave originally had one entrance, then in the late 80s a second entrance was opened up by digging at the rear of the cave. This made it possible for a 900m through trip. Around 1989 a rock and concrete path was constructed to the entrance and a hardwood timber walkway installed through the cave's length. This included several staircases up to 8m high with staging platforms and viewing areas. The majority of the 2m wide walkway was constructed on timber stilts about 1 m above the muddy cave floor.

The narrow winding concrete pathway leading up the hillside to the cave entrance, has greatly uneven height steps flanked by a concrete rail or barricade (both sides of the very narrow path). It looked more like a drain constructed to direct running water down the side of the mountain, not as a single lane tourist path.

At the start of the cave the timber walkway looks very impressive but within a short distance it quickly degrades to a suspended series of occasional planks. Visitors still use the walkway until they reach a point where it just becomes too difficult to straddle between the missing planks. Here it becomes safer to walk in the mud beside the broken down structure.

Presumably there was originally some form of lighting along the path as electrical cable and clips can still be seen attached to part of the structure. In its hey day this cave when lit would have been very impressive as there are some very interesting decorations scattered throughout the large passageways.

Barefoot tourists in Gua Mimpi Cave.

Top: Tourist walkway in Gua Mimpi Cave.
Bottom: Neil Smith on the same walkway.

One of our party who had visited the cave in 2003 said the structure was unusable at that time. Today the walkway has deteriorated to such an extent that it is very unsafe to use, but many tourists per day still make the perilous journey through the cave, dressed in good clothes, footwear grasped in hands and one dim torch between 8 or 10 people. I found it quite amusing as groups of bare feet tourists passed by dressed in good clothes, mothers clutching babies, dads holding the hands of youngsters, feeling their way through the cave by the glow of a dim light. The timber work strewn over the floor squelched in the tacky mud as people pass by. The landings and stair case ladders are sort of intact, held together with electrical cable, rope or fencing wire and the handrails are just hanging on, ready for the slightest weight to push them over.

The majority of the timber itself appears to be in good condition as planks are still solid and unbroken, however it is the steel bolts and nails which have rusted through to allow the structure to fall apart. I am sure this expensive structure would have still been standing solid if non corroding fasteners had been used during the initial construction.

The exit from this cave is up a very slippery mud slope with just a few toe notches kicked in the mud. Then there are a few precariously suspended flexible timber planks to tightrope balance across in order to reach the surface. From here a narrow goat track winds its way between tower karst covered in lush vegetation. The track is a far cry from what most would consider tourist friendly as it traverses sections of exposed cliff where one wrong step could result in a fatality.

The path eventually leads out of the NP, down to a gravel road, through part of a village and back to the park gate.

The pristine water from the various streams in the National Park /aquatic area converge to form a river at the park boundary, then flows under the single lane road bridge near the park entry gate. On the downstream side of the bridge, dwellings and shops overhang steep banks of the river. I was amazed at the considerable amount of rubbish in the creek just outside the National Park. The source soon became apparent as I gazed down stream to see a huge basket full of rubbish (food scraps, bottles, plastic etc) being thrown out the back window of a restaurant, straight into the swiftly flowing clear water.

Despite the considerable pollutants, this whole river is diverted several kilometres downstream into a large concrete and stone canal which flows for tens of kilometres through villages and rice fields. People can be seen bathing in it with soap, washing clothes and in many places water is siphoned off to grow rice and other crops.

GENERAL COMMENTS

The aquatic park is a fantastic playground for locals and tourist alike and the facility is kept very clean and tidy by employed cleaners. It blends in well with the environment and certainly brings great joy to thousands of people on a daily basis.

I found the Indonesian people are very friendly, helpful, patient and polite. I think many westerners could learn a lot from their culture in this respect. Having said that, there are several practices relating to rubbish disposal which Indonesians could greatly improve.

For cave management authorities, lesson to learn from Gua Mimpi Cave is that it is not worth the expense of putting infrastructure into a cave unless it is designed to be aesthetically pleasing, non polluting and durable. i.e. must be able to withstand the corrosive and destructive nature of a cave environment.

What an asset for tourism and additional revenue earner for the National Park these caves could be if the infrastructure had been constructed with lasting fasteners and the lighting maintained.

All Photos: Garry K Smith

Two views of timber walkways in Gua Mimpi Cave

Neil Anderson in Istona Toakola Cave

29th Biennial Conference of the Australian Speleological Federation Inc.

6 – 11 January 2013 - Galong. NSW. Australia
Hosted by the New South Wales Speleological Council

If you have an interest in caves and caving the 29th Biennial Speleology Conference of the Australian Speleological Federation (ASF) is an event not to be missed. The organising committee invites you to ***get along*** to TROGalong, at the St Clements Retreat and Conference Centre, Galong, NSW from Sunday 6 to Friday 11 January 2013.

This national conference provides an ideal forum for anyone with an interest in the science or exploration of caves to share in the knowledge, research and exploration experiences of Australia's caves and karst landforms. International presenters will also be most welcome. Presentations will be variable and nominally 20 minutes duration although longer presentations may be negotiated. Absentee presentations may also be accommodated. Posters are encouraged and will be displayed throughout the duration of the conference.

Experience some of NSW tourist or wild caves on the pre and post conference field trips.

All accommodation, meals and conference events will be on site so there will be lots of opportunity for socialising and relaxing. The venue has comfortable motel style accommodation with some limited camping option, an in-ground swimming pool and extensive gardens set on the peaceful 800 acre rural property with a rich pastoral history dating back to the 1820's. The venue was also a former Monastery and Minor Seminary.

Further details on costs, closing date for abstracts, program and events will be advised shortly. Please visit www.asfconference.org.au/2013 for more information and registration details.

SCRUBBY CREEK CAVE PROPERTY and PURCHASE by RIMSTONE COOPERATIVE

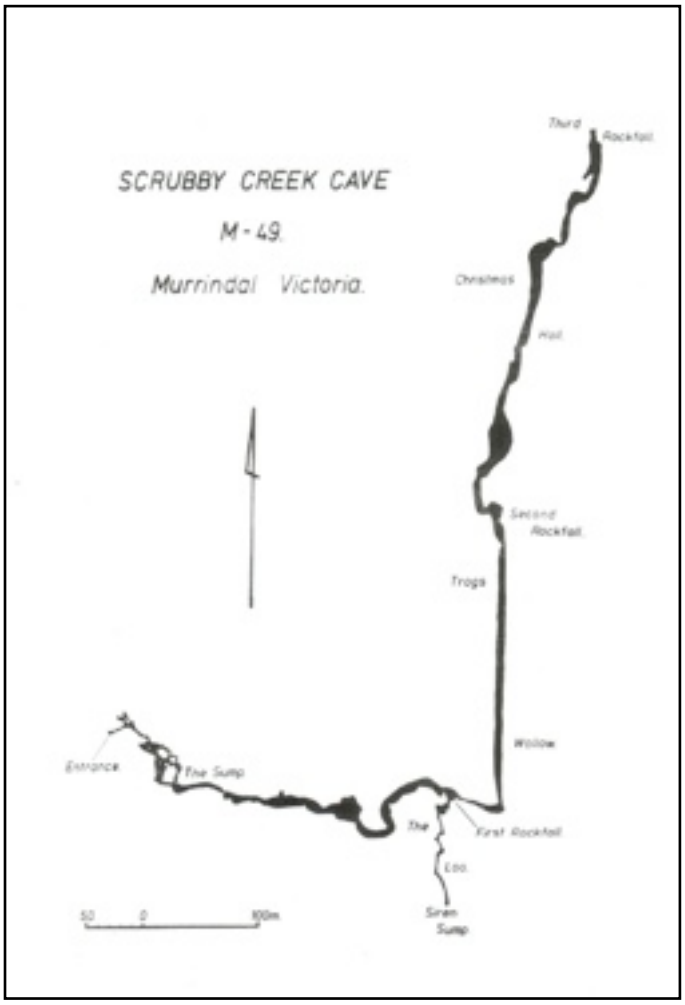
Nicholas White

For many years I have applied myself to the better management of caves. Most of the thrust has been through influencing the caving community to not damage caves. In fact Rauleigh Webb was the first to extend the sort of cave conservation principles to something with a more modern grab - the ASF's "Minimum Impact Caving Code". This has been enormously successful and has been adopted by various management agencies as a guideline document for caving in protected areas. The other side of the coin is to have important cave areas put into protected status or to have important private land cave properties acquired to protect the caves. This is effective and in recent times such acquisitions have included Allotment 22A at Murrindal, Victoria "The Potholes" with at least 20 important caves which was acquired by the State. In SA in recent time the Sand Cave Property was acquired by the state for addition to Naracoorte Caves National Park. Several properties around Mole Creek, Tasmania were acquired by the State using Federal Funds as part of the Regional Forest Agreement for addition to the Mole Creek National Park, including the Herberts Pot Property.

Not all cave properties are such that they belong in Parks. This is not to diminish their value, just that a balance needs to be drawn between what the State spends its money on and what private individuals protect themselves. In 2009, I went to the UIS Conference in Kerrville, Texas. I made a point of spending a few days with Emily Davis and Mike Warner looking at the North East Cave Conservancy properties. These properties were among the first caves to be acquired by private institutions to protect caves and provide for both conservation and recreational interests. On a separate trip in 2011, I was able to go Hawaii caving on the island of Hawaii, which has a large number of lave tubes as they call them. The Hawaiian Cave Conservancy is actively acquiring properties with lava tubes on them. The organisation seems to be able to acquire several properties each year with lava tubes. This is partly because the land is almost barren due to recent (less than 1000 years old) lava flows and is subdivided into residential blocks and bought by US mainlanders for winter holiday retreats.

Scrubby Creek Cave holds a special place for Victorian cavers. Scrubby Creek in its upper reaches for the most part is dry, its water having been captured from seepage along the contact of the volcanics and the limestone. The water emerges at the foot of a bluff depositing extensive tufa as it flows down a waterfall to rejoin Scrubby Creek on its way to the Buchan River.

The Scrubby Creek resurgence was known but it was not until 1960 that the Sub Aqua Speleological Society (SASS) tried to dive the resurgence with little success, but then they looked at a small hole slightly above the outflow at the base of the bluff. With a bit of enthusiastic digging, progress was made and several trips later SASS members managed to get back down to the water and after several hundred metres of beautiful passage the stream disappeared into a sump. Water levels were high and it took several trips before this sump was passed. Several more trips were needed to get as far as a muddy passage known as Trog Wallow. This led to a large rock fall that was difficult to find a way through but which opened into a large chamber, now known as Christmas Hall. It was so named as the explorers had a camp during the Christmas week to further explore, map and collect invertebrates. Various people including John Driscoll, Peter Matthews, Peter Robertson and Elery Hamilton-Smith participated in this and the other early trips which explored the cave. Along the floor of Christmas Hall the stream can be followed to where it emerges from rocks. The cave now extends for some 1.5 km of passage, including the high level extensions.



Scrubby Creek Cave map Copyright M. Pierce and VSA

Neil Wilson in sump, 2011. Photo: Daryl Carr

Since these first major discoveries, there have been several high level decorated galleries discovered, as well as a passage which leads to Siren Sump which is related to Storm Water Tunnel, M-43, a related cave which takes a lot of water after rain events. There was a series of unsuccessful attempts to climb to what appeared to be some high level passage in Christmas Hall and various cavers have to no avail poked at the rock fall at the end of Christmas Hall where the stream emerges. SASS and subsequently VSA have worked with the owners, the Woodgate family for some 50 years to ensure that all caving was responsibly conducted.

Now that the property is for sale it was the opportunity to put words to deeds; hence, the Scrubby Creek Acquisition Project. Rimstone Cooperative Ltd decided to sign a purchase contract to buy the cave. We sought and received support from the ASF Karst Conservation Fund.

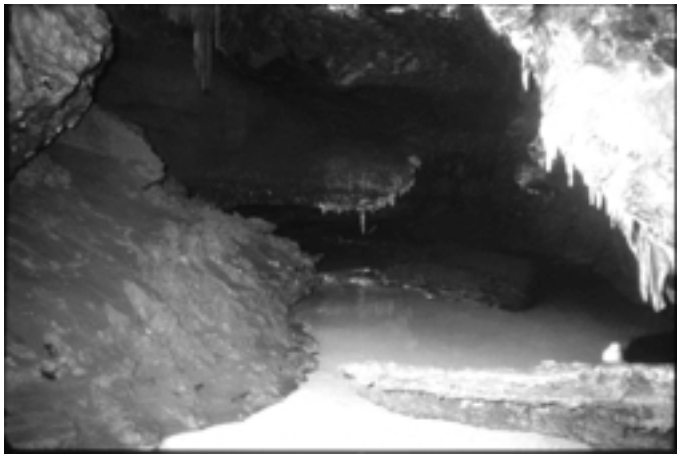
Rimstone Cooperative Ltd is a Community Advancement Society with speleological aims. It cannot distribute dividends or property to members but on winding up it has to give its assets to an organization with similar aims. Rimstone Cooperative has for 38 years owned and operated Homeleigh at Buchan for its members and the caving community. Rimstone Cooperative Ltd is an ideal vehicle for establishing a caver owned and operated Karst Conservancy in Australia.

The Scrubby Creek Cave property is 105 acres and will be managed to protect the caves and karst. The Victorian Speleological Association will be asked to continue the Scrubby Creek Cave leadership scheme that it has had in place for several decades and to advise on cave access. The tufa terraces will be protected from stock and blackberries and weeds removed. The property will be managed in a sustainable manner to minimise any adverse effects on the karst. It will be available for stock agistment or lease to provide income for rates, fencing and other improvements. Rimstone Cooperative Ltd will work towards a protective covenant for the property. There is an opportunity to develop an interpreted karst walk showing the tufa terraces and the remnant rain forest vegetation along Scrubby Creek.

Rimstone Cooperative Ltd will be able to settle the contract to purchase the property in May 2012 due to the support already received plus the personal loans of a number of supporters but more donations are needed to cover these loans. The property will be used to protect the caves and karst. For further details contact me directly via email <nicholaswhite@netspace.net.au>.

Reference: Lloyd Mill, *Scrubby Creek Cave* ASF Newsletter **85**, (1979).

Daryl Carr at the end of Trog Wallow 1967, Credit VSA slide set.



M49 Stream way and decoration, Credit VSA slide set.

Donations can be made by following the instructions on the donation form downloadable from the Karst Conservation Fund page of the ASF Website at;

http://www.caves.org.au/i_giftfund.html

JENOLAN gets the GOLD!

Dan Cove

The 2011 Qantas Australian Tourism Awards were announced at a gala dinner at the Cairns Convention Centre on 2 March. It was a great night for Australian show-caves generally, as both Jenolan and Jewel Cave, Margaret River, were contending for the title of Australia's best tourist attraction – the first time that two show-cave systems have reached this level of recognition and achievement. In addition, Jenolan was a finalist in the category of "Cultural/Heritage Tourism". Competition was naturally fierce for all categories, with the Australian Tourism Awards finalists being the winners from each State and Territory. A small delegation from Jenolan dusted off tuxedos and posh frocks and made the trip north for the big night.

In what turned out to be an amazing evening, Jenolan Caves became the only tourist attraction in the country to win two gold awards, picking up both "Best Tourist Attraction" and "Cultural/Heritage Tourism". This was the first time that Jenolan has achieved success on the national awards stage, following on from the record haul of two gold and two silver awards at the NSW Tourism Awards last November.

This success was the culmination of an enormous amount of hard work on the part of all staff. The world's most extraordinary natural attraction by itself is not what wins an award, it is the great people that transform the visitor experience that do this and Jenolan is truly fortunate to have so dedicated and professional a staff. The judges for the awards made particular note of the continuing spirit of innovation and reinvention evident in the product offering and approaches of staff to presentation of tours and activities.

In a case of "no rest for the wicked", life continues to be hectic at Jenolan. With the receipt of grant funding from the NSW Government, we are now working on the development of new interpretive product. A new version of the self-guided audio tour of the Nettle Cave will focus upon the Aboriginal Cultural Heritage of the area and the Dreamtime creation stories of the Gundungarra people, including incorporating elements of the story told in the Gunundgurra dialect. The three main surface walks are also being transformed into themed walks exploring respectively the geological heritage, Aboriginal Cultural heritage and the European Cultural Heritage/engineering history. These will incorporate new signage, and development of a new smart-phone app with GPS triggered commentary and images.

Dan Cove and Peter Austen are all smiles after success at the Australian Tourism Awards

FLASH FLOODING HITS BUCHAN CAVES RESERVE - FEBRUARY 2012

Dale Calnin

In February earlier this year, Buchan Caves Reserve was hit by flash flooding from a severe thunder storm that occurred in the late afternoon. Over 70 mm of rain fell in the Fairy Creek catchment area causing the water level in the creek to rise quickly, breaking its banks flooding car parks, the main access road, staffing facilities and the adjacent work sheds - damaging stored material, carpets and electrical equipment.

Although the caves were unaffected by the event, roads, car parks, and bridge abutments throughout the reserve suffered undermining and scouring. Service lines in one area were left exposed, creek banks and bridge abutments damaged. The strong winds with the event caused damage to a number of the heritage trees throughout the reserve affecting day visitor areas and walking tracks.

New and old tree material washed in from the Fairy Creek catchment blocked culverts and made a significant mess. The camping area was generally unaffected although some campers chose to leave early the following day. As a result the Fairy Cave was closed for a number of days due to inaccessible road conditions and the lack of visitor facilities.

Just what the Buchan operation needed as we were hastily preparing for the Easter holiday period ahead.

Ranger staff, with assistance from local excavation contractors and staff from the Department of Sustainability and Environment, “knuckled in” and achieved a massive amount of repair and replacement work over a five day period to allow the commercial business operation to return to normal.

STAMP of APPROVAL

Lorna Charlton

"There are fantastic new interpretive panels out at Cocklebiddy Cave in Western Australia. Honestly, they are the best thing out there ... besides the caves, of course." Dr Peter Buzzacott

It's very rewarding to receive such praise when you have put in a lot of hours to produce an interpretive product you feel worthy of presenting to the public, especially when it comes from a specialist in the topic and someone who has a passion for the place.

In this case Peter is referring to two large, interpretive panels that were recently installed at Cocklebiddy Cave on the Nullarbor. Peter is a diving scientist and former instructor with wide-ranging interests including diving physiology, research in caves, high-altitude diving, occupational diving and diving epidemiology (injuries and fatalities).

The installation of the panels at Cocklebiddy Cave is the culmination of a lengthy, complex process that is perhaps not readily evident in the panels' brief messages and simple design. Here are some insights into that process, which made this a very special and memorable project.

DESTINATION NULLARBOR

When the opportunity arises to develop interpretive panels for a site on Department of Environment and Conservation (DEC) managed estate I start with desktop research to become familiar with the location and its values so that I have an understanding of the site before I make my first visit. Fortunately I had the opportunity to visit Cocklebiddy Cave in 2003 as a tourist several years before the project began. At this time the cave was still open to the public. I had previously crossed the Nullarbor several times by car and train, the sort of trip where your focus is on the endless line of bitumen ahead and the scenery on either side is just a blur, but this time my destination was the Nullarbor.

I spent two glorious weeks exploring homestead ruins, historic wells, the plains and woodlands, the cliffs and whales of the Bight and of course some of the caves. I didn't have the equipment or the experience to enter these caves and so Cocklebiddy was a great opportunity to do so. For a non-caver it was quite an adventure to descend deeply into a cave that has not been developed for tourism – one without artificial lighting, stairs or boardwalks. My lasting impressions are of cool water on my fingertips, the peaceful stillness and utter blackness in that large space, and the small reassuring circle of sunlight in the distance that marked my return route to the cave entrance and the surface. It truly was unlike anything I had ever experienced and worth every step along the steep, boulder-strewn slope that led down to the water's edge.

KEY MESSAGES

My experiences as a tourist on the Nullarbor and in Cocklebiddy Cave were just the beginning of a growing appreciation for this unique landscape. When asked to create interpretive panels for the cave several years later, the challenge then lay, as always, in the ability to convey the wonders of a place in just a few words. To encourage readability, interpretive panels have tight word limits. This means that we avoid unnecessary use of facts and figures, which are easily forgotten, and place greater emphasis on important take away messages. After reading numerous scientific and newspaper articles, attending fascinating talks by Jay Anderson on karst and John Long on the megafauna, and scanning management strategies and stories posted on the internet, it became clear that the Nullarbor karst contained a wealth of stories and values. In a nutshell this is what I discovered ...

Cocklebiddy Cave is one of many thousands of caves that dot the Nullarbor 'karst', the largest arid area of exposed limestone in the world. These caves are significant because they contain unique terrestrial and aquatic communities, endemic species, unusual formations and the fossils of an extinct Australian megafauna. For many thousands of years the Nullarbor Region has been the traditional country of the Mirning and Ngadju Aboriginal people. Natural features in this karst landscape are therefore also of great cultural significance.

Cocklebiddy Cave is arguably the Nullarbor's most famous cave, for being the object of numerous expeditions and the world's longest cave diving penetration in 1983 when a distance of 6.24 kilometres from the cave entrance was reached. The cave was extended in 2008 by Craig Challen to 6.380 km and this has been declared the end of the main passage. The interpretive panels at Cocklebiddy Cave were designed to help visitors understand and appreciate this great diversity of natural and cultural values. The panels also promote minimal impact and safe behavior.

A CREATIVE COLLABORATION

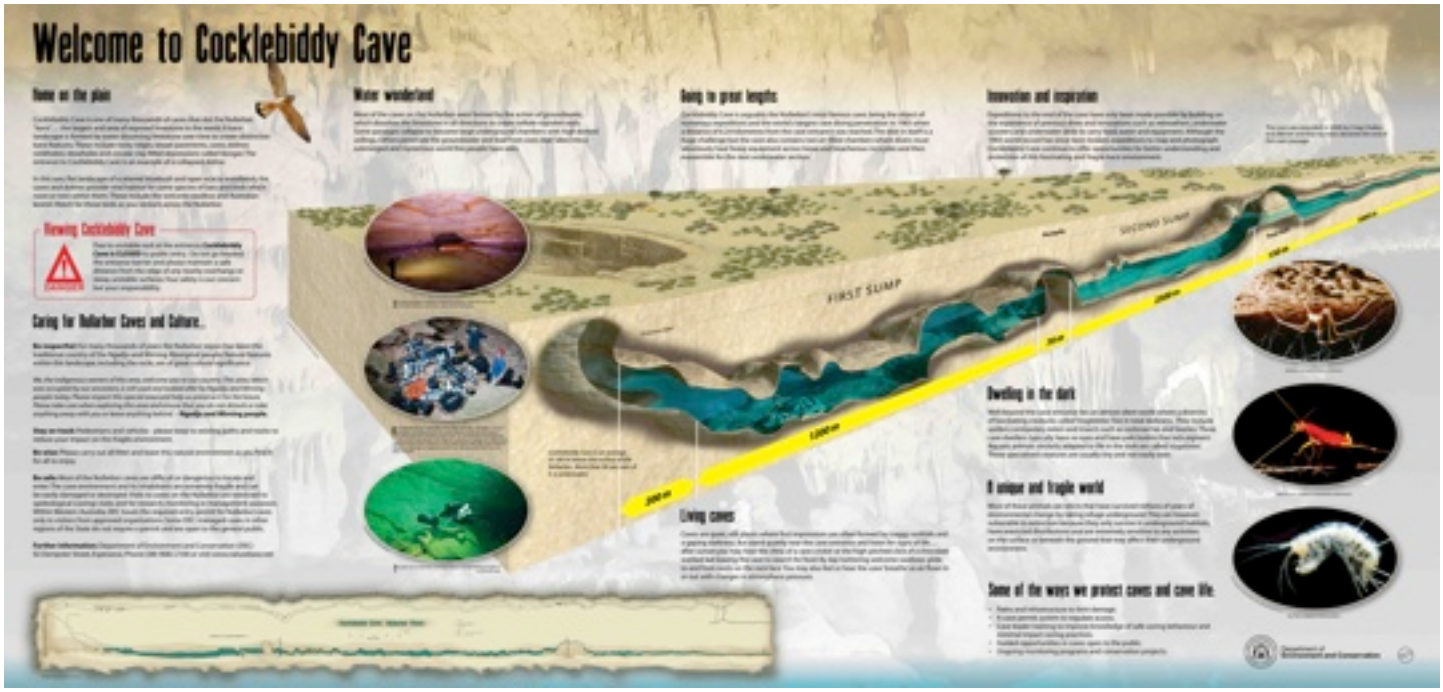
As the project progressed I also consulted with DEC Esperance staff and specialists in caving, cave diving, karst geology, ecology and management, palaeontology and cultural heritage. This group included individuals who provided invaluable help with references, images and feedback on the draft panels and included Gavin Prideaux, Peter Buzzacott, Steve Trewavas, Norman Poulter, Ken Grimes, Susan and Nicholas White, Stefan Eberhard, Paul Hosie and Tim Payne.

When all of the elements had been gathered together, Shaun Bunting, a Senior Graphic Designer with DEC's

Interpretation Unit, worked his magic. He selected a colour palette and fonts suited to the topic and setting and created a design that leads readers on a visual journey across the two large panels. The images include a stunning collage of the Australian megafauna painted by noted Australian artist Peter Trusler for Australia Post. You may recognise them from the stamp series, which was released in 2008.

With a myriad of knowledgeable and passionate stakeholders, this proved a complex but rewarding project. Now that the panels are complete and installed in the shelter that stands near the entrance to Cocklebiddy Cave, it's a terrific outcome to get Peter Buzzacott's stamp of approval.

Lorna Charlton is Senior Interpretation Officer with Department of Environment and Conservation's Interpretation Unit at Kensington, Western Australia.



Interpretation panels at Cocklebiddy Cave.