

*Journal of the*

# Australasian Cave and Karst Management Association



## The ACKMA Journal

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**FRONT COVER:** Christmas Star Cave, Western Australia. Photo: Ross Anderson

**BACK COVER:** Sand Cave, Naracoorte. Photo: Steve Bourne

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## FROM THE EDITOR

Thank you for the positive feedback on the June journal although it was later than I would have liked. I will endeavor to deliver the next journals closer to their due date and to do that, I need your contributions.

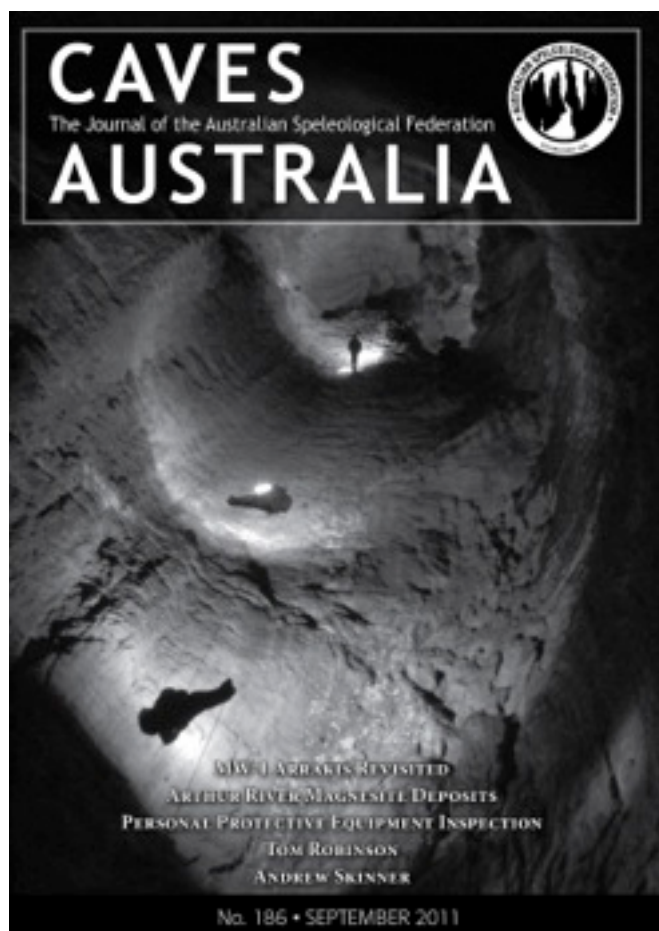
The September journal contains two papers from the ACKMA conference held in Tasmania. Anne and Peter Wood's contribution on Managing Caves in the Digital Age is highly relevant as cave and land managers try to maintain some control over their assets when so much information is freely available. I have also published Moira Lipyeat's personal account of the Christchurch earthquake, so we could have it in print.

Rauleigh and Sam Webb have completed the Proceedings of the ACKMA Conference held at Ulverstone, Tasmania. It is the largest ever ACKMA proceedings and I congratulate the authors for their contributions and Rauleigh and Sam for collating so promptly.

The June Australian Caver newsletter contained a report by Garry K. Smith on efforts to protect an area of Timor karst from quarrying. This has been reproduced here along with a comment from the quarry proponent. I also enjoyed an article by Stephen Bunton discussing the issue of keeping cave locations secret and issues that can arise, complementing issues discussed in Anne and Peter's paper. The next issue of Caves Australia will be out shortly.

Maintaining secrecy of cave locations has recently created an issue around Mount Gambier, where caves with Indigenous rock art have been threatened, and in some cases, inadvertently damaged through lack of knowledge. Those who attended the ACKMA conference in Buchan will remember Robert Bednarik's presentation on Australian rock art. Robert suggests the South East of South Australia has one of the largest collections of cave rock art in the world, yet very few people know about it! Robert and local amateur archaeologist Geoff Aslin have documented 40 caves with rock art, virtually all on private property, and have used secrecy as a means of protection. That has not proved successful with a cave with one of the largest collections filled in and now totally inaccessible. Robert has started a project to develop effective management and protection, and gain recognition for these sites.

The next ACKMA Annual General Meeting will be held at Wee Jasper Caves, New South Wales. Some months back, Geoff Kell, who will host us at Wee Jasper, hosted the wedding of Adam Farquarson and his bride Alana in Carey's Cave. Adam is the son of ACKMA members Brett and...As only Geoff can, he has immortalised the occasion with a poem, which I have published in this journal. I encourage members to book early and make their way to Wee Jasper next year for the AGM, it will be a fabulous weekend.



Cape Range has been inscribed on the World Heritage List and Andy Spate has provided an overview of the area. This incredibly rich and diverse landscape is certainly worthy of World Heritage listing, I just wish it was easier to get to from South Australia!

I have been investigating electronic versions of the ACKMA journal. Rauleigh placed the previous journal on the ACKMA website as a PDF and I received some positive feedback. I was recently sent a link to *Calcite*, the Journal of the Highland Caving Group. It is certainly worth a look at <http://hcg.org.au/publications/>.

Sand Cave has recently been added to the Naracoorte Caves National Park. The cave was purchased over 12 months ago after nearly two years of negotiation, mostly internally with the Department. The focus for me trying to purchase the 80 hectare block was of course the cave, however the surface provides an important link in the landscape along the Naracoorte Caves Range. A project is underway to revegetate the land above the cave. By the 2015 conference in Naracoorte the vegetation should be growing well. The back cover has two images from Sand Cave to whet the appetite, its only three years to ACKMA comes back to Naracoorte!

# PRESIDENT'S MESSAGE

Peter Chandler

Greetings,

From our recent AGM in Ulverstone no doubt the biggest challenge for our organisation, was to make the transition to a new Journal era, following Kent Henderson's long and dedicated term as publications officer. I would like to congratulate our Publications Officer, Steve Bourne on the result, and all those who have contributed material. The cover picture by Ross Anderson certainly has set a high standard for the future! And its not that Steve is idle with a new Job and a new house as well !

The ACKMA committee conducted a trial meeting via Skype in early August. This was a successful exercise, though technically difficulties reduced it to audio only and unfortunately without Geoff Deer at all due to interference.

Although this would be much better as a film review, Libby and I viewed Werner Herzog's 'Cave of Forgotten Dreams' at the NZ Film Festival, Auckland, in July . For cave enthusiasts the sights of and the story of the discovery of Cave of Chauvet-Pont-d'Arc Cave in southern France is a must see! That it is in 3D is an added bonus.

To see the trailer in 2D <http://www.wernerherzog.com/index.php?id=64#c148>

We understand it will return in October.

Locally it is interesting that this year some cave tour prices have increased a month earlier than the usual date of October 1. It is easy to conclude this is more about increasing sales revenue during a popular sporting event than covering increased costs during recessionary times . Note that the proposed theme for the 2013 Waitomo Conference is-" Triple bottom Line- Environment, People and Profit"

Although they have their opponents, the very good travel review websites and their not so good copies are driving the expectations of an increasingly discerning public .

And for those whose Cave and Karst livelihoods are affected by annual bulk funding, lets hope this work is continued and not cut back.



*Above: President Peter Chandler and family  
Right: Cave of the Spirit*



# MANAGING ACCESS to CAVES in the DIGITAL AGE

Anne Wood Department of Environment and Conservation  
Peter Wood Cavers Leeuwin Inc.

## Abstract

After an explosion of caving activity in the south west of WA in the 1960s to 1980s, controls have been gradually put in place to better manage the resource. WA speleological groups initiated the Caves Access Committee to manage access to the more vulnerable sites. Measures included voluntary restriction of group size and trip frequency as well as gating select sites. Later Government initiatives included the formation of the Caves Management Advisory Committee, the introduction of the Cave and Abseil Permit System, removal of restricted access caves from maps, and the introduction of a Cave Leader Course. These initiatives have seen a reduction in cave rescues, a reduction in non-show cave visitation, and a reduction in visitor impacts.

Several developments in recent years have the potential to reverse much of the progress made in the past two decades. The power of the internet and associated search engines, the development of GPS technology and its infiltration into broader society, and the activity of geocaching are examples of digital technology that can potentially impact on the management of access to caves and increase undesirable visitor impacts.

## Introduction

There is no doubt that the age of the internet, web pages and GPS technology brought massive managerial change to our natural world. In one small, but destructive, instance demonstrated by the U.S. military blowing Al Quaida operatives out of the remote Tora Bora caves in Afghanistan. But closer to home, the same technologies are having implications in recreational caving in the delicate and irreplaceable environment of the aeolian calcarenite of the Leeuwin-Naturaliste ridge.

The sites we are concerned with in this paper are the non-show cave sites in the Leeuwin-Naturaliste National Park (LNNP), in the extreme south west of Western Australia. They range from sites that may be visible from a public road to an astute observer to sites that are well off the beaten track. They may be difficult to find, in karri forest or dense coastal heath with no path indicating the location. Many of these sites rely on their obscurity as their main protection.

## Recent History and Management Initiatives

As background to this paper, we will briefly outline the history of cave access in the LNNP. Prior to the 1990s, access to the caves was pretty much unfettered, self-governed quite successfully by caving groups, with the

support and blessing of relevant government agencies. Following an explosion of recreational and commercial access in the 1980s and early 1990s, with, at some sites, major environmental degradation, a permit system, cave management classification and leader accreditation was introduced. Caving groups and other stakeholders in WA stood at the forefront and took ownership of the whole process, indeed dragging the department that is now the Department of Environment and Conservation (DEC) into cave management. Consequently the over 100 caves with dark zones, and the myriad other karst features in the LNNP are now classified as public access, adventure or restricted access, with a permit and leader accreditation required for access into all caves in the LNNP with the exception of Calgardup Cave and Giants Cave, which are operated as show caves.



Classification		User Group	Recommended Management
<b>PUBLIC ACCESS</b>	<b>TOURIST CAVE</b> (Guided or self-guided) e.g. Crystal Cave, Yanchep National Park (YNP); Calgardup Cave, Leeuwin-Naturaliste National Park (LNNP)	General public	Developed and managed for tourist use and/or as an educational resource; Clearly signposted with access restricted to specified times. Payment of a fee required for entry. Infrastructure installed to facilitate access, decrease visitor impacts and improve safety.
	<b>ADVENTURE CAVE</b> – Class 1 e.g. Tunnel Creek, Kimberley.	General public	May be required to register at the cave entrance and/or pay a fee. May be some infrastructure and signage to decrease visitor impacts and improve safety.
	<b>ADVENTURE CAVE</b> - Class 2 (horizontal) eg. Golgotha Cave, Calgardup Window Extension (LNNP) Yonderup Cave, Mambibby Cave (YNP). - Class 3 (Vertical) eg Mill Cave (LNNP)	Novice groups (general public) lead by an experienced leader, e.g. school groups and licensed commercial tour operators. Speleologists.	General protection Entry permit needed. DEC approved leader needed. May be limited infrastructure.
<b>RESTRICTED ACCESS</b>	<b>RESTRICTED ACCESS</b> Note: All caves are in this category unless designated otherwise.	Experienced and responsible speleologists, scientists.	Maximum protection Entry permit needed DEC approved leader needed. Speleological club visits. Research, monitoring or management purposes.

## DEC CAVE MANAGEMENT CLASSIFICATION SYSTEM (2006)

**Results**

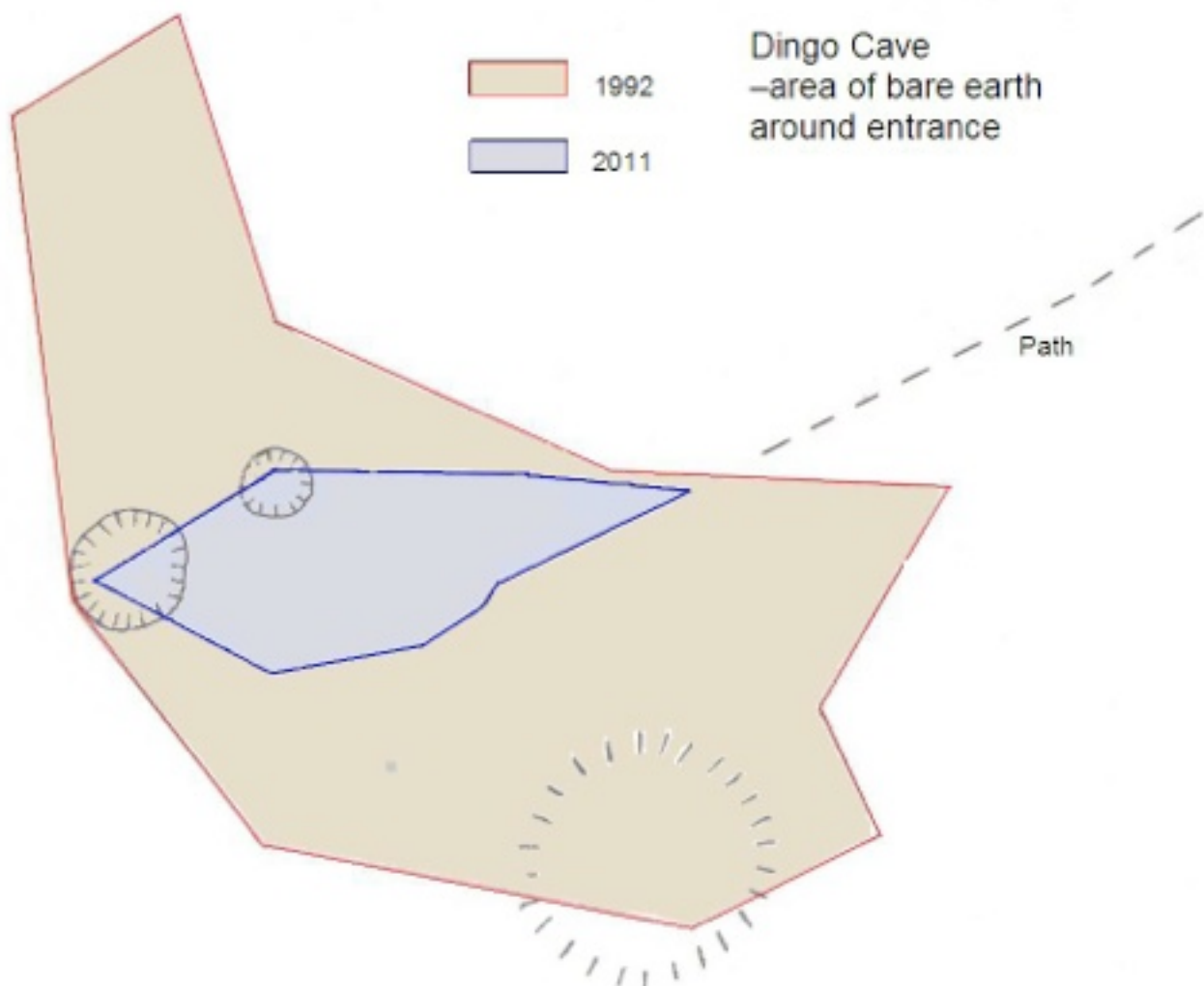
The management initiatives that have been introduced since 1990 can be expected to have resulted in changes to visitation figures for adventure caves and karst abseil sites, the number of cave rescues, and visitor impacts.

Visitation figures for cave and abseil (karst) permits show a steady decline from 1993 to 2010, reflecting in part the increasing number of hurdles to be jumped to obtain a permit; in chronological order – self registration as a leader, a current first aid certificate, cave leader accreditation, requirement to maintain currency by keeping a log book, registration as a single pitch abseil guide under the National Outdoor Leader Registration Scheme (NOLRS) for vertical entry sites and abseiling. Other factors may be the increasing amount of administrative paperwork required for out of school excursions and the change in the perception of risk and adventure in a society where people spend ever increasing amounts of time in front of a screen. These figures do not include entry into Giants and Calgardup Caves, both managed as unlit self-guided show caves, where visitation is increasing.

There have been no cave rescues in the last 10 years. The most common sites for rescues in the past were Giants Cave, Bride Cave, and Terrys Cave. Giants Cave is now track marked, with infrastructure such as stairs and boardwalks through some sections, and people enter under the direction of DEC staff or under the control of an accredited leader. Bride Cave, which is accessed by abseiling, is only available to groups with an accredited leader. Some questionable practices such as star jumping and angel jumping have been banned. Terrys Cave was popular with commercial adventure tour operators prior to 1992 when the permit system was introduced, but was classified as a restricted access cave and is no longer available for that use.

On a subjective, qualitative basis it can be claimed that visitor impacts have decreased since the introduction of the Cave and Abseil Permit System and associated initiatives. However there is little quantitative evidence for this. One example is a study of surface vegetation around the entrance of Dingo Cave.

The first time the authors visited Dingo Cave was in the very early 1990s. After we made our way down from the “pretty” section into the main rock breakdown chamber as we were exiting the cave we encountered about 40 boy scouts. They were swarming like ants over every surface in the chamber and asked if the cave went anywhere else. We replied “no” fairly safe in the belief that they would not find the way on. We made our way up past more scouts and only two adults. After the introduction of the permit system the maximum group size for this cave was set at six people. The authors selected this site to carry out a “limits of change” survey in 1992. Part of this involved measuring the devegetated area around the cave entrance. At this time the bare area surrounding the entrance was extensive. Recent measurements and the accompanying photographs show the vegetation is now quite extensive, covering all but the access path.



*Surface vegetation degradation at Dingo Cave entrance*

### New Challenges

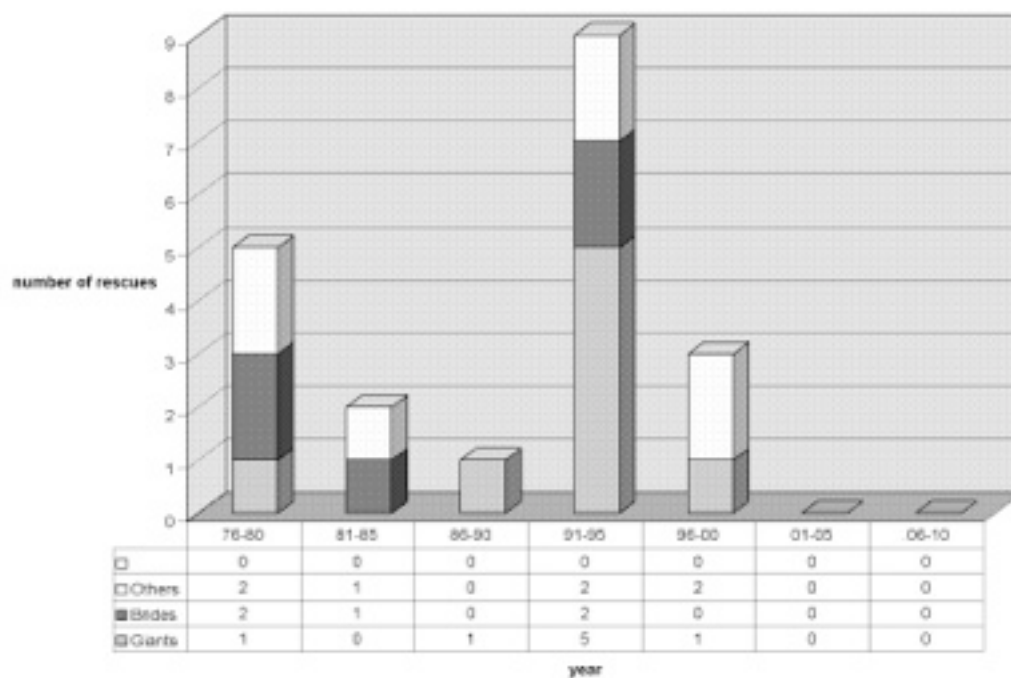
Given the apparent low rate of non-compliance with the permit system over the past few years, the decrease in rescues and the decrease in environmental impacts in many areas it is easy for managers to rest on their laurels.

However many of the emerging generation of cavers were either in nappies or at best primary school when the very hot war regarding access to these cave systems was being debated. Our two decades of an inclusive management culture is seeing the arrival of a generation of computer and internet savvy instant communicators whose initial research into the world of caves involves accessing websites with GPS in hand, ready to download, before they pass by their local Anaconda franchise on their way to their latest adventure. The old days of joining a caving group and sitting for 12 months at meetings in awe of those who “held the maps” are over.

Allied to this brave new world are the caving groups and the ASF themselves, large portions of whom are promoting and coordinating a national programme, the Karst Information Database or KID, with the object of electronically centralising all cave locations for Trip Leader access. The temporary nature of many

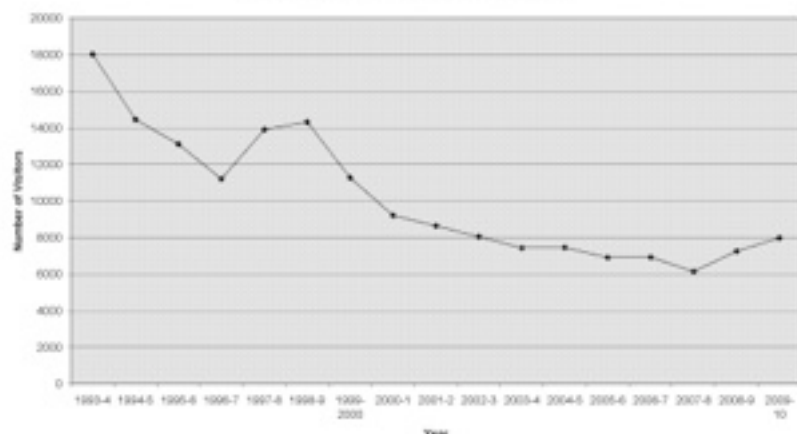
individual’s affiliation with caving groups is obvious testament of the ability of the whole system to “leak”.

Many people of course dispute that particular assertion; however the same sort of anecdotal evidence that prompted the initiatives of the early 1990s is being again witnessed in the LNNP. That is, chains at cave gates that have been padlocked being cut with bolt cutters and carefully replaced to appear intact, poorly equipped and untrained groups rigging at vertical sites and the “re-exploring” of track marked caves, all in contravention of permit conditions, minimal impact caving codes and other ASF standards. The frequency of such events appears to have increased significantly over recent months. The incident that prompted the topic of this paper occurred in February when four people reported that the gate on a restricted access cave was not locked. These people were not cavers but had a “mate” with a GPS full of cave locations, and they had been visiting several of them. As managers our question is - how many people are wandering around with a GPS full of cave locations and from where or whom do they source this information?



*Cave rescues over the past 35 years*

Visitation for Cave and Karst Aisled Sites in the LNNP



these new lovers of all things karst related any access, we just insist that environmental standards are adhered to and that those standards are seen to be adhered to. We all know that broken calcite and mud deposition is always the result of the previous or next party's activities.

3. Policing. DEC has put regulations in place for fining miscreants in National Parks. Given that there is a system of access and a stream of activity for all levels of activity, and those streams are under near constant review, we must ask: why not apply on the spot fines?

4. Increased public education and awareness.

## Solutions

So the solutions, which will hopefully be found before we witness any repeat of the random and unacceptable environmental damage of the late 1980s. The following list of Cave security options is adapted from a table in the DECC NSW Cave Access Policy. Further information on rationale, advantages and disadvantages of each option can be found in that document.

### Cave Security Options

- Legislation
- Permit system and/or access policy
  - Confidentiality of information (particularly sensitive cave locations)
- Public awareness and education
- Psychological deterrents
- Divert access
- Accompanied access/guided tours
- Isolation/rerouting of tracks
- Installation of remote surveillance/monitoring
- Camouflage
- Signage
- Built security measures (gates fences and barriers)

Most of the options listed here are in place to varying degrees. The only options not implemented in the LNNP are camouflage and installation of remote surveillance.

Some specific targeted actions include;

1. Increase in monitoring. On the premise that knowledge is power we need to get out and find just who is accessing these sites and how they are gaining that knowledge.

2. Consultation. On the premise that there may be an organised body of some sort that has contacts with this new generation, or at least some of them. Is it ASF affiliated? Four wheel drive clubs? Geocaching websites? Education Departments? Leaking from commercial groups? After all we are not trying to deny

5. Digital information. Coming back to our original point. When an information savvy young potential caver enters "caving south west WA" into a search engine, one option needs to be "Regulatory framework to protect an irreplaceable resource", with leads onto DEC and other relevant information. All explained clearly and concisely, which is a problem in itself because the system in the LNNP, having been designed to accommodate so many diverse groups, is very convoluted.

On the same subject we personally, (and we say personally because it is not any official position taken by DEC or our ASF affiliated caving group, Cavers Leeuwin Inc), are concerned as to just where the ASF's drive toward embracing the KID process is taking the rest of us. Please call us old fashioned, it's a title we sometimes wear with pride, but we thought the system was good, in the security sense, when caving groups zealously guarded cave locations and maps in hard copy. Before every cave location in Australia is divulged to someone who may only be a trip leader or full member of a caving group for 12 months before falling out with that group and walking away with loaded GPS, we should take a good look over the cliff. Although ultimately there's not much we can do about the information factor in this age, we can deal with the protocols that govern its use. It is ultimately a problem we share with fishermen fighting over fish stocks, miners arguing over mineral deposits, and we could even spare a sympathetic thought for Al Quaida, not to mention the caves and karst features that they were holed up in.

## Conclusion

Many of the caves in the LNNP and other karst areas rely on the confidentiality of their location as their prime protection against unauthorised access. In this time of GPS and internet technology it will be a challenge to maintain this protection. The front cover photograph shows an example of what is at risk.

# CANTERBURY EARTHQUAKE CAUSES DAMAGE to LOCAL CAVES

Moira Lipyeat

## Abstract

Living at Redcliffs, 12km from the centre of Christchurch, I have been associated in many ways with the appreciation of local caves. My book, *Delving Deeper: The first 50 years of Caving in New Zealand* was launched in one and I have taken many groups to visit them.

Though our prehistoric history doesn't compare with that of Australia, Europe or South Africa, von Haast in 1872 excavated Moa Bone Point Cave (very near our home) and it can be seen from the results of this work that caves were very important gauges of geology and climate changes as well as of Maori occupation.



*The author speaking at Ulverstone*

However, on 22 February, 2011, a second earthquake was centred under our volcanic Port Hills. At 12.51 pm, within a period of 24 seconds many places, including a number of CCG members' homes, were reduced to rubble and trampers and residents were killed in rock falls. I was terrified when the red cliffs near our house started noisily crumbling down. Throughout the city area nearly 200 were killed and our city centre of Christchurch, (only 12km away) was devastated including many heritage buildings. Some of our local caves and climbing areas were geographically altered forever, with huge boulders, the size of cars tumbling down.



*After the Event. Cave at end of our street.*

## Introduction—Geological History

Geological time covers a tremendous period. It is hard to visualise the building of Canterbury over millions of years of huge pressures caused by earth movements and volcanic activity. Over 60 million years ago we (NZ) separated from Gondwana, were immersed under the sea and afterwards thrust up to gradually form the Southern Alps. Subsequent climate changes melted glaciers to form the Canterbury plains.

Volcanic activity commenced 12 million years ago and alternate layers of ash and lava were pushed up to form Banks Peninsula and our Port Hills. As a result of these forces we were blessed with an exciting environment of caves, tors, rocky crags and deep harbours. This was great country for rock climbing, mountain biking, walking trails, photography and some lava caving.

On 4 September 2010 at 4.38 am, a 7.1 magnitude earthquake altered forever some of this landscape that had been forming for aeons. The epicentre was located approximately 40 km inland. Some rocks were dislodged, but apart from a severe shaking, there was little damage to the Port Hills. Around 24,000 people, including many local cavers had chosen to live in the Port Hills environment and smugly felt the rock beneath us was "solid as".

## A Place to Live and Love

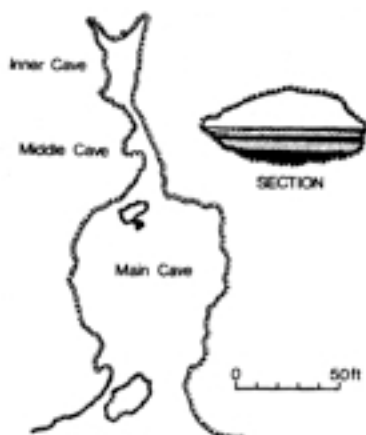
My love affair with these caves and rocky crags goes back to 1985 when we moved into this area. I was thrilled to have a cave virtually at my back door. I had shown to the Museum various objects of Maori flax art preserved inside caves nearby. So we lobbied that the Council should have two caves and a house purchased by Council and therefore protected. Our request was unsuccessful.

The more research I did the more important the site became. Moa Bone Point Cave was first recorded in 1872 by officers of the survey ship Acheron, and moa bones were found. These were later sent to Richard Owen at the Museum of Science in London to be identified. Julius von Haast also found this a most important archeological site and in 1872 he drew the first cave survey in New Zealand of this cave. He excavated to a great depth and recorded that it was evident there had not been any geological upheaval in the last thousand years.

Moa Bone Point Cave  
near Sumner, excavated  
(and map surveyed) by  
Julius Haast in 1872.  
Canterbury Museum

First Cave  
Surveyed in NZ

From Page 18 of Dorking Deeper



Showing map of Moa Bone Point Cave by Julius von Haast  
1849

### Local Damage

Five hundred metres away a landslide had exposed Moncks Cave in 1899 during roadwork nearby. Important and rare Maori artifacts (Fig 3) were found and these can be seen in Christchurch Museum (when it is declared safe to enter!). Though damaged, it is fortunate that this cave has survived at all. (the supermarket adjacent was being completely demolished owing to liquefaction.)



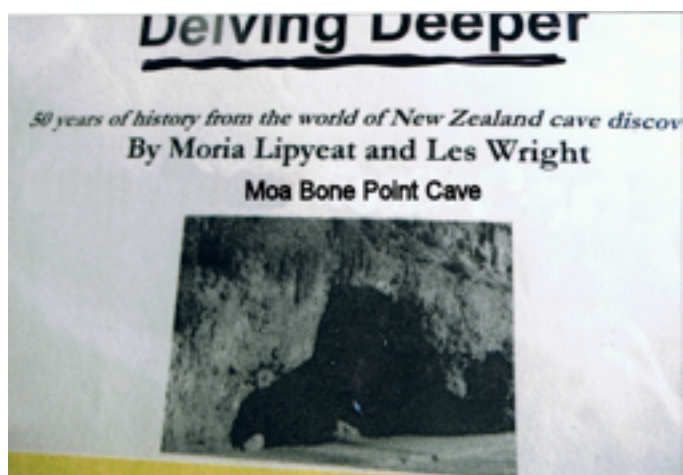
Moncks Cave Site after February 2011

Nearby in Barnet Park a walkway leads to another lava cave. The steps to the cave area are damaged and are still cordoned off. My husband Derek (over 80) enjoys this area to keep fit for more serious caving. The historical cave residences at Taylors Mistake, four kilometres away, are also barricaded. At the end of our street is a cave which was suitable for youth groups. Access will be impossible now as enormous rocks have blocked the entrance.



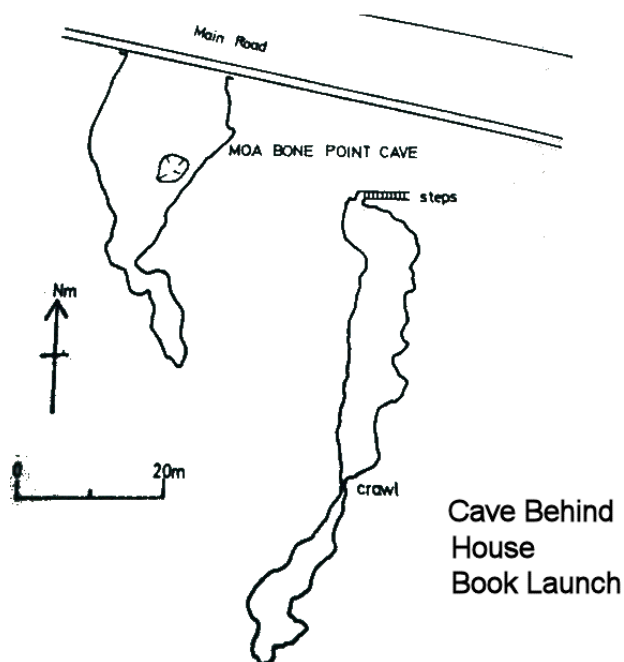
Shag Rock as named, now tumbled to a pile of broken rock

Nearby a landmark volcanic monolith has been reduced from Shag Rock to Shag Pile. On Sumner Beach, three kilometres away, Cave Rock has always been a popular volcanic site as a cave goes through its centre. The entrance rock has been modified but fortunately little or no damage has occurred to the inside.



### Delving Deeper

Some of you may own a copy of “Delving Deeper: Fifty Years of Caving in New Zealand” (Fig 6). I compiled this book with Les Wright’s able assistance. The book launch was convened in Moa Bone Point Cave. At that event, Richard Holdaway, palaeontologist, spoke on the human history of the area. He referred to the thorough investigation by officers of Christchurch Museum and evidence of at least 600 years of Maori occupation in Moa Bone Point Cave. Following Richard’s talk we moved to another cave nearby (discovered in 1928). The latter had been opened as an “Event Centre” – a very suitable place to have a cave book launch, with candlelight, ample wine and nibbles with soft music. However there would have been no soft music on February 22<sup>nd</sup> 2010 when a gigantic boulder collapsed the entrance.



Map of Moa Bone Point Caves

A house built over a cave was teetering over the edge waiting for an aftershock to collapse it on to the road below. This house should not have been built and the area should have been protected.



*A house built over a cave is tottering over the edge waiting for an aftershock to collapse it on to the road below.*

### Aftershocks

We have had over 6,000 aftershocks since September! Millions of years of land formation have been shattered in seconds. Forces of nature can be fickle – some parts of Christchurch were very little affected.

### Every cloud has a silver lining.

A group of cavers has purchased land to build a cave base on the West Coast of the South Island. With recycled material from a retirement village (that had to be demolished after the September 2010 earthquake), we have built a cabin on the land as a work base to build a “Cave Lodge”. There is now plenty of recyclable material!

However grants and donations we were hoping for will now all be needed for earthquake rehabilitation.



*Moira Lipyeat and friends in Tasmania*

# NHVSS CHALLENGES TIMOR LIMESTONE QUARRY APPROVAL in the LAND and ENVIRONMENT COURT

## NHVSS v. UPPER HUNTER SHIRE COUNCIL and STONECO. No.2 [2010] NSWLEC 104

Garry K. Smith & Jodie Rutledge



*Legal team and friends representing NVHSS*

### **Brief Background**

The Timor limestone quarry, located in the upper Hunter Valley north-west of Newcastle, was first proposed in November 2008. It attracted over 30 objections from local residents and other community members concerned about the likely environmental and social impact from the development. The quarry owners (Stoneco Pty Ltd) were proposing to operate the quarry 6 days a week, over a 30 year period, extracting up to 100,000 tonnes per year, removing approximately 2.4 million tonnes of limestone in total. The extracted material is to be transported by truck over 35km of narrow winding local roads to a crushing plant located close to the New England Highway. Despite NHVSS

raising considerable environmental concerns, the Upper Hunter Shire Council (UHSC) approved the development, and consequently in July 2009, NHVSS lodged a class 1 Appeal with the NSW Land & Environment Court (L&EC).

The NSW Environmental Defender's Office (EDO) agreed to act on behalf of NHVSS in appealing the Timor quarry approval, on the basis that it was 'important public interest litigation'. Barristers Patrick Larkin (ASF Fellow) and Chris Norton agreed to act on our behalf on a pro-bono basis. A number of experts from various fields also agreed to provide their services to compile reports and provide evidence in court at a very reduced cost.

During a 2 day site access trip in mid September 2009 under a court order, the legal teams, experts and NHVSS cavers Garry Smith & Jodie Rutledge, were able to inspect the karst area to be quarried in order to assist with the preparation of evidence required for the proceedings.

L&EC hearings were held during November 2009 and again in May 2010 with an initial judgement handed down 31<sup>st</sup> March 2010 and the final judgement handed down on 23<sup>rd</sup> June 2010.

*Note: The court and most published literature refers to this development as a quarry, however due to the intended use of the extracted material (limestone), the development is regarded as a mine for the purposes of the Mining Act 1992.*



*Court and experts at the proposed mine site*

## Issues in the Court Appeal

NHVSS had numerous concerns with the quarry development as approved by UHSC and considered that the assessment of karst and other environmental issues in the Environmental Impact Statement (EIS) was grossly inadequate. Some of the issues raised in the L&EC during the appeal are:

- There was inadequate study concerning the likelihood of caves on the project site, even though substantial caves containing significant cave fauna occur on nearby properties.
- Any caves present on the project site, and the fauna they might contain, were likely to be significantly impacted upon by the quarry and as such, a precautionary approach should be adopted.
- The potential for damage to groundwater dependent ecosystems due to quarry run-off into the karst aquifer below and impact on vegetation communities was not properly considered in the EIS or dealt with adequately by the conditions of consent, approved by UHSC.

- NHVSS argued that the vegetation communities covering the project area were in fact an endangered ecological community (EEC) protected by both NSW and Federal legislation (the "White Box – Yellow Box – Blakely's Red Gum Grassy Woodland" which is listed as an 'Endangered Ecological Community' at Commonwealth and State level).
- The site contained habitat for the Squirrel Glider (*Petaurus norfolcensis*), a State-listed threatened species which could be adversely impacted by damage to its habitat as a result of quarrying.



*Grass Trees Xanthorrhoea glauca on the mine project site*

## Outcome of Court's judgment

In March 2010 the L&EC handed down an interim judgment in which it held that the proposal was appropriate for approval only if appropriate conditions could be drafted that addressed issues raised by the court - namely, issues surrounding a protocol to be followed in the event of intersection of caves during quarrying, the impact on cave fauna, impact on the EEC's and Squirrel Gliders, roads and bridges infrastructure needs and a plan for rehabilitation of the site.



*Massive limestone outcrops extensively over the proposed mine site*

The resumed hearing in May 2010 dealt with these conditions and ultimately the Court granted consent to the quarry in June 2010. However, the decision allowed mining to proceed, only after many prerequisite conditions are satisfied. The court also imposed many additional restrictions and monitoring protocols which were not considered in the original UHSC approval. Many of the court's newly imposed conditions focused on the protection of Timor karst values and biodiversity covering the project site during the life of the mine. The conditions of the resulting approval are far more stringent than those originally imposed by the UHSC. The overwhelming majority of imposed restrictions and ongoing monitoring would not have been in place had NHVSS not filed the appeal with the L&EC with the assistance of the NSW EDO. Our legal team has also indicated that the conditions imposed by the court will provide an important precedent for the types of conditions which may be imposed on similar quarries and mines in the future.

Presiding over the L&EC challenge was Hon. Justice Brian J. Preston and assisted by Acting Commissioner P. Adam. The final 85 page judgment was handed down by Justice Preston on the 23<sup>rd</sup> June 2010. Key conclusions in the judgment include:

- Agreement had been reached concerning a pre-blasting assessment protocol in which the recommendations of NHVSS's experts were adopted; and also in respect of a biodiversity management plan.
- The final conditions would ensure adequate offset was provided for the loss of the EEC.
- NHVSS's appeal should be upheld, as the Court was granting consent on a different basis that on which UHSC had granted it.

Among the stringent conditions, the quarry will not be able to start blasting for at least a year, as it is required to monitor for caves, voids, fissures and geodiversity of significance, and to sample for underground fauna species on and outside the site for at least one year before the first blast takes place.

#### **Specific outcomes of the court's judgement**

In recognition of the value of the biodiversity on the site and the endangered ecological communities which will be affected by quarrying, the operator/owner is required to conserve in perpetuity 66 hectares of land as a "biodiversity offset". This includes 6 ha of prime vegetation containing the endangered ecological

community White Box - Yellow Box - Blakely's - Red Gum Woodland, which the quarry owner is now required to purchase as an offset to compensate for the area to be destroyed by quarrying. During the first five years of operation, the quarry is required to plant and establish additional trees to compensate for destruction of portion of the endangered Squirrel Glider habitat. During the Court proceedings Stoneco also reduced the size of its proposed stockpile area to lessen impact on the Squirrel Glider habitat and karst. The court imposed restrictions on the project site so that stands of *Xanthorrhoea glauca* (grass trees) and *Figus ribiginosa* will be protected.



The quarry owner is required to submit a site "Rehabilitation Plan" which is to be agreed upon by the experts. Rehabilitation must be completed once the mining ceases in 30 years. Once rehabilitated, the 5.85 hectare quarry site is to be added to the conserved 66 hectares of offset land conserved in perpetuity.

There are 8 individual management plans which must be submitted to UHSC and approved before development commences. These include "Soil and Water", "Air Quality", "Biodiversity, Environmental", "Landscape", "Vegetation", "Rehabilitation" and the "Lower Chert Band". As part of the ongoing monitoring, boreholes are to be drilled into the alluvial and limestone aquifers, and monitored on a regular basis for the presence of groundwater dependant ecosystems (GDE) including stygofauna, which if discovered must be identified to species level. Additionally, any new species found are to be described to species level.

An independent panel of 5 experts must be established before quarrying commences and they will monitor the development over the life of the quarry. The nominated experts must, between them, have expertise in:- geology, geomorphology, hydrology, vertebrate palaeontology, cave biota and ecosystems.

The court's conditions stipulate that if any voids or caves larger than 0.5m in diameter are discovered during the mining operation, the operator must trigger the "Cave Discovery Protocol", which addresses many of NHVSS's primary concerns. Under the protocol, quarrying may cease whilst the cave's values are assessed and a decision is made as to whether the cave, or some of its contents, should be conserved. This is a very good outcome for NHVSS and the caving community at large, who are very concerned about the impact of quarrying on any limestone caves which may be present.

"A number of significant caves exist in similar limestone in the area, indicating that there may be caves on the site. The Court took a precautionary approach in this case and held that adaptive management principles must be applied. The result is that the quarry must monitor extensively for limestone caves and for any subterranean fauna species that might be living in the limestone for a year before it can commence blasting," said Ms Natasha Hammond-Deakin, a solicitor at the Environmental Defender's Office.

The Court allowed evidence from local residents during a one day sitting at the Scone court. This allowed those who had objected to the proposed mine during the UHSC - public exhibition period, to air their concerns and present evidence in court without the need to take on the responsibility of becoming a party to the proceedings with legal representation.

In handing down its conditions of approval, the court took into consideration the concerns of local residents by imposing restrictions which require the transport roads, passing lanes and bridges to be appropriately upgraded before quarrying commenced. Hence, for the project to commence requires construction of two new bridges to replace old structures, and a bridge bypass. Numerous other concerns of the residents were addressed in the conditions, including strict guidelines to mitigate environmental disturbance and included the monitoring of ground water, blasting, stormwater runoff, dust and noise for the duration of the mine.

You're probably wondering by now why I have not mentioned caves on the quarry site. The answer is rather complex. It all stems back to the fact that prior to this court appeal, members of NHVSS had never been granted access to the property, save for a few hours while the Council was assessing the development application. Most of the known caves on neighboring properties have been found over many years of searching and a considerable amount of digging due to how they were created. Renowned karst geomorphologist Dr. Armstrong Osborne investigated the Timor geology as a result of this court appeal. Armstrong determined that the caves on the west side of the Isis River are hypogene

caves – that is, caves formed by groundwater rising up through cracks in rocks under the influence of heat and pressure, dissolving out mazes and rounded chambers, rather than through direct passage of water from the surface. Therefore, the cave entrances at Timor generally only occurred when a chamber or passage collapses to form a soil filled doline, which after digging, allowed entry to the caves. This means that a significant cave can form with no direct entrance on the surface. As a result of a several hours site visit permitted by the quarry operator and a later 2 day inspection permitted under a Court order, we identified several small caves only a few metres in depth and a number of potential digs which could lead to caves. Despite this we had no concrete evidence (without digging), as to whether or not there are substantial caves in the massive limestone covering the project site.

### **Acknowledgements for outstanding support**

Now that the dust has settled on the Court challenge against the approval of the Timor Limestone Mine, it is time to reflect on what has been achieved and to thank all the people who have been involved and given so freely of their time, knowledge and expertise. Also to thank the ASF executive, affiliated clubs and individual members for their support including those who provided financial donations toward this landmark court appeal.

We are also very much indebted to the following experts in their respective field who toiled tirelessly studying the area to mount a case and then follow it through with lengthy submissions and cross examination in the court. Our experts worked on a pro-bono basis or at minimal cost which made it possible for NHVSS and the ASF to mount the challenge. It was noted during one of the roundtable discussions that many of the experts involved had been a caver at some stage of their life or were still active caver. This is an outstanding achievement for ASF and the speleological community as a whole, to have so many outstanding experts in such diverse fields, pooling their knowledge and resources for a common goal.

The panel of experts who took up the cause included the following people:-

Patrick Larkin – (Barrister & ASF Fellow)  
 Chris Norton – (Barrister & ASF member)  
 Dr Armstrong Osborne – (karst geology and hydrology)  
 Dr Ann Marie Clements, Tony Rodd, Rebecca Burley, Lucy Jewell, all from Anne Clements & Associates (ecology and botany)  
 Dr Andrew Smith (ecology – flora and fauna)  
 Dr Peter Hancock (cave invertebrates)  
 Dr Pam Hazelton – (soil expert)  
 Neva Collings and Natasha Hammond-Deakin of the Environmental Defender's Office - our solicitors  
 Representing NHVSS were Jodie Rutledge and Garry K. Smith plus many others who assisted throughout the appeal.

Thank you also to Chris Norton for final review of this article before going to print.

NHVSS has in the past recdeivedand continues to receive the full support of Timor residents, which we very much

appreciate. Without the support of the Vaughans, Moores, Eagles and Mr. J. McIntyre to name just a few, it would have been very difficult to gain an overall picture of the Timor Karst and vegetation in order to mount a case for the L&EC appeal.

In closing, NHVSS would especially like to thank our extremely professional legal team and expert consultants for their dedication in bringing about a suitable outcome. Words cannot express my/our (NHVSS's) appreciation and gratitude for all the hard work leading up to and during the court appeal. We certainly learnt a lot along the way and gained a much greater appreciation for the legal system. What really impressed us was the meticulous methodology with which each of the experts applied their science over the study area to arrive at their findings. A special thank you must go to Patrick, Chris and members of the EDO, for their tireless work and outstanding professional approach leading up to and during the court proceedings. We found it rather demanding just keeping on top of what was happening in the court room each day and can not imagine the constant mental strain placed upon both Patrick and Chris during these proceedings.

Further information on the timeline of events leading up to and during the court appeal can be found in "Newcaves Chronicles" 31 to 34, the official publication of the NHVSS Inc.



*Geoff McDonnell at karst spring*

## Land and Environment Court of NSW Judicial Newsletter

27 April 2010, Volume 2 Issue 2

Pages 21 & 22

### Threatened Species

*Newcastle & Hunter Valley Speleological Society Inc  
v Upper Hunter Shire Council and Stoneco Pty Ltd*

[2010] NSWLEC 48 (Preston CJ and Adam AC)  
s 98(1) of the *Environmental Planning and Assessment  
Act* 1979.

**Facts:** the first respondent, Upper Hunter Shire Council ('the Council'), granted development consent to the second respondent, Stoneco Pty Ltd ('Stoneco') to establish a limestone quarry at Timor Creek, in the Isis River Valley. The applicant, Newcastle and Hunter Valley Speleological Society Inc (NHVSS), lodged an objection to the grant of consent during the exhibition period. Following the grant of consent, NHVSS appealed to this Court under Issues: there were three broad sets of issues raised in the appeal by NHVSS:

#### (1) surface ecology issues:

- (a) whether the vegetation over the whole of the project site comprised the endangered ecological community ('EEC') of the White Box Yellow Box Blakely's Red Gum Woodland ('the White Box EEC') and the habitat of the threatened species *Petaurus norfolcensis* ('Squirrel Glider'); and
- (b) whether the proposal was likely to have a significant effect on the White Box EEC and the Squirrel Glider so as to require a species impact statement ('SIS') to accompany the development application by reason of s 78A(8)(b) of the *Environmental Planning and Assessment Act* 1979.

#### (2) impacts on caves, other karst features and cave dwelling fauna:

- (a) whether the limestone on the Project Site was likely to contain caves and other karst features; and
- (b) whether the proposal was likely to cause serious or irreversible damage to these karst features and fauna.

#### (3) other issues raised by resident objectors:

- (a) whether the proposal was consistent with the current zoning of the site and compatible with other land uses; and
- (b) whether the conditions of consent could adequately address concerns relating to the provision of adequate road infrastructure and natural resource management requirements.

**Held:** upholding the appeal and granting consent:

#### (1) surface ecology issues:

- (a) the vegetation on the Project Site comprised the White Box EEC and the habitat of the Squirrel Glider: at [78] and [119]-[121];
- (b) in assessing whether there was likely to be a significant affect on the White Box EEC in this case, only three of the factors in the seven-part test in s 5A(2) of the *EPA Act* 1979 were

applicable: ss 5A(2)(c), 5A(2)(d), and 5A(2)(g): at [87];

- (c) the current formulation of s 5A(2)(c) differed materially to the previous formulation of the section (s 5A(c)) and the evaluative conclusions reached in cases considering the former section may not assist in making the evaluative judgment required under the current section: at [90], [100] – [101]. Section 5A(2)(c) required evaluation of the likelihood of removal or modification of an area of an EEC placing a "local occurrence" of the EEC at risk of extinction. The local occurrence of the White Box EEC included the whole of the 60 ha Project Site, however only 6 ha of vegetation would be cleared within that area. Hence the Court must evaluate whether the clearing of 6 ha within the 60 ha local occurrence of the White Box EEC was likely to place the whole of that local occurrence at risk of extinction: at [98];
- (d) a mere quantitative comparison of the EEC to be removed or modified with the area of the local occurrence of the EEC, may not be sufficient by itself to evaluate the likelihood of removal or modification of the area of the EEC placing the local occurrence of the EEC at risk of extinction: at [104]. Other factors may need to be considered and a qualitative analysis undertaken;
- (e) the proposed action would not result in the Project Site becoming fragmented or isolated from other areas of the White Box EEC habitat for the purposes of s 5A(2)(d). There was no evidence to suggest that the 6 ha "hole" in the local occurrence of the White Box EEC would result in adverse effects such as to place at risk the long term survival of the EEC: at [109]-[110];
- (f) the modest scale of the clearing required by the proposal relative to the extent and distribution of the White Box EEC, would not be a basis for an overall assessment of significant impact such as to require completion of a SIS. The test in s 5A(2)(g) was therefore not triggered: at [112];
- (g) the proposal was not likely to significantly affect the White Box EEC and a SIS was not required: at [118]; and
- (h) with the reduction and modification of the stockpile and handling area, and the conditions that would apply to a consent, the impact on the Squirrel Glider population was not likely to be significant. A SIS was therefore not required: at [127].

#### (2) impacts on caves, other karst features and cave dwelling fauna:

- (a) it was likely that there were small, interconnected voids and fissures in the limestone to be quarried: at [152]. The presence of large caves was unlikely;
- (b) although there was an absence of site-specific information on biota in the limestone, the presence of biota in caves and groundwater in the near vicinity of the site and the increasing number of studies elsewhere that established

the presence of biota in the limestone and made it scientifically likely that some form of biota would be found within the limestone on site: at [177]; and

- (c) it was beyond mere possibility that biota would be present and the scientific likelihood was sufficient to engage the precautionary principle. A step-wise or adaptive management approach was an appropriate response to the threat of environmental damage. This would involve the imposition of conditions of consent requiring monitoring linked to adaptive management: at [183]; and

(3) other issues:

- (a) the proposal was consistent with the applicable zone objectives of the Rural “A” zone in Murrurundi Local Environmental Plan 2003: at [191]-[193]; and
- (b) the proposed conditions of consent would sufficiently minimise and mitigate the adverse impacts of the proposal on surrounding land uses: at [192], [197]-[198].

### Editor’s comment

This article was previously published in the Australian Caver, the newsletter of the Australian Speleological Federation. I thank Garry for the offer to reproduce it in this journal. The Cave Discovery Protocol interests me. In my previous job, I reviewed many limestone quarry applications and one of the usual conditions was for quarry operators to advise authorities if they discovered any voids. This has been particularly successful where a positive relationship has been developed, such as with the Henschke family at Naracoorte, where we have retrieved many important megafauna fossils from several small caves discovered during operations. Through cooperation, we have managed to undertake research at these sites while quarry operations continue around us. At the other end of the spectrum is the Sellick’s Hill issue where a significant cave was destroyed despite assurances it would be protected. A number of reports on this case have been published in the Cave Exploration Group of South Australia (CEGSA) newsletter, or for the extended version sit down with ACKMA Treasurer Grant Gartrell.

I sought a comment from the Stoneco, the operator of the Timor limestone quarry and I thank Andy Spate for the communication.

### Mr Scott Murdoch has supplied the following statement to the ACKMA Journal.

Mr Scott Murdoch, Stoneco’s owner/operator at Timor, confirmed that the company was pleased with the judgment of the NSW Land and Environment Court allowing the quarry to be approved albeit with many Consent conditions.

The Consent conditions include the development of;

- A Cave Discovery Protocol;
- A Groundwater Fauna Sampling Protocol;
- A Lower Chert Band Protection Protocol;
- A Pre-blasting Protocol; and
- Others for dust, noise, transport and so on.

Mr Murdoch feels the implementation by the Court for a Cave Discovery Protocol may prove a positive step towards managing karst features and balancing the commercial viability of limestone developments generally.

The foundation of this Protocol are the mechanisms to report and manage potential karst features, for scientific values ONLY, whilst allowing the continued operations of the quarry. It adopts a precautionary approach. Any features collected or recorded ultimately become the property of the scientific community.

Mr Murdoch points out that no caves have been discovered on the quarry site after in excess of 500 man hours of investigation by caving groups and independent consultants.

Mr Murdoch’s family have operated limestone and dolomite mines throughout NSW for over 60 years and is a long standing member of the Limestone Association of Australia.

Limestone is a critical raw material for many agricultural and industry pursuits including cement, water purification, glass manufacture, pharmaceutical preparations and many, many others. The benefits from the utilisation of high grade limestone products is a well known. And the limestone mining industry is becoming increasingly environmentally aware and is developing environmental management practices worldwide.

The majority of limestone producers throughout Australia are family owned and operated businesses that live and directly support their local communities.

Mr Murdoch wishes to thank Dr Stephen Swabey for assistance through the Court approval process and Protocol development and Mr Andy Spate for help in establishing the baseline assessment of environmental factors.

# INFECTIOUS DISEASES ASSOCIATED WITH CAVES - AN AUSTRALIAN PERSPECTIVE

Nicholas White, Andy Spate and Janeen Samuel

A recent article published in the journal *Wilderness & Environmental Medicine* (2011, Volume 22, pages 115-121) may be of interest to cavers, cave managers, scientists and others who visit caves, especially outside Australia. The article, titled *Infectious Diseases Associated with Caves*, is by Dr Ricardo Pereira Igreja, from the Department of Preventive Medicine, Faculty of Medicine, Federal University of Rio de Janeiro, Brazil. It seems to be aimed primarily at clinicians, but it summarises the infectious risks for cave users, and some of the precautions that can be taken against them, in a readable fashion. The paper should be read in conjunction with this discussion. It is somewhat simplistic in its discussion of who visits caves and why they do. It doesn't cover all the diseases that might affect Australian cave users. Read it in full at [http://www.wemjournal.org/article/S1080-6032\(11\)00069-X/fulltext](http://www.wemjournal.org/article/S1080-6032(11)00069-X/fulltext).

The abstract reads:

In recent times, caving has become increasingly popular, with almost 2 million people visiting national park caves each year in the United States. Although the 2 million tourist visits are extremely low risk, smaller numbers of sport cavers are at risk for some high risk conditions, and expedition cavers are at risk for some obscure infections. Infectious diseases like histoplasmosis, rabies, leptospirosis, and tick-borne relapsing fever may be transmitted by the underground fauna. To reduce the risk of illness or injury while caving, knowledge of potential risks before engaging in this activity is important. Caving preparation needs to be carefully planned and executed, including vaccinations, prophylactic medications, and advice regarding safe conduct and behaviors.

Below are some comments on the different sections of the paper, with particular reference to the situation in Australia. They are not complete in themselves but are intended to be read in conjunction with the paper. Please note that none of the three authors of these comments is either a medical doctor or an expert on any of the diseases discussed, so if you are concerned about a possible exposure you should consult your medical adviser and/or the Department of Health.

**There are at least three potential disease vectors associated with caves - bats, arthropods and birds. We will discuss each of these in turn below with the diseases in the same order as in Dr Igreja's paper**

## BATS

In discussing the role of bats, it is important to note that the Order of bats, or Chiroptera, is divided into two main groups: the Megachiroptera ("megabats") and the Microchiroptera ("microbats"). The megabats include the flying foxes; they are all fruit, nectar or pollen eaters and they do not occur in the Americas or Europe. The microbats are found on every continent except Antarctica. Most are insectivorous and some are cave-dwellers; in Australia all cave-dwelling bats are microbats. However, some microbats in the Americas eat fruit or nectar and may be referred to as "fruit bats" - and some African and Asian megabats live in caves. The largest microbats are bigger than the smallest megabats, as exemplified in Australia by the big "micro" ghost bat and the little "mega" blossom bats.

The distinction between the two groups is important because, in the last fifteen years, several "emerging" diseases affecting humans have been traced to a possible origin in one or more species of bat, and in almost every case these have been megabats.

So, although Dr Igreja is right in saying bats are linked to the transmission of the three diseases he lists, this is an oversimplification. Any bat may give you rabies, no bat will give you histoplasmosis, and only a megabat (as far as we know to date) will give you Marburg haemorrhagic fever.

## Histoplasmosis

Histoplasmosis does occur in Australia. There are reports of cases in cavers from Wee Jasper, Bungonia, Timor (NSW) and Chillagoe as well as in geologists using mines, and one death apparently associated with the demolition of a battery hen building in South Australia. The disease is acquired **by exposure to Histoplasma spores in dust generated by disturbance of dry guano**, not directly from bats nor from other infected animals or people. Bats can become infected, and thus could theoretically transfer the causative fungus from one cave to another by faecal contamination.

Smith (1994) and Spate (1994: available on the ACKMA CD) provide discussions of histoplasmosis in Australia. Whitten's very personal paper (1992) makes for interesting reading as it indicates how the medical profession can overlook the possibility of diseases such as histoplasmosis.

It's a good idea to wear a proper mask (not just one of those *el cheapos* you get in hardware stores) wherever there's a likelihood of heavy exposure to dried guano,

whether bird or bat. This mask should be of the particle filter type and fit well. NIOSH (2005: National Institute Occupational Safety and Health: *Histoplasmosis Protecting Workers at Risk* See: <http://www.cdc.gov/niosh/docs/2005-109/>) provides detailed advice. Should you suffer pulmonary or upper respiratory problems within about two weeks of caving it would be prudent to advise the medical system of your possible exposure to histoplasmosis. Anti-fungal treatment may be warranted and this is quite different from treatment for tuberculosis. **In some individuals progression to disseminated histoplasmosis can be a life threatening disease.**

### Rabies

“Classic” rabies doesn't occur in Australia, but the closely related Australian Bat Lyssavirus, which is present here in megabats and some species of microbats, produces an identical disease and has killed two people. **In one instance the source of the transmission to humans was a bite from a fruit bat and in the other from handling a microbat, the non-cave-dwelling yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*). The Australian Bat Lyssavirus has been isolated from four species of megabat (flying foxes) and from the yellow-bellied sheath-tail bat. Antibodies to the Australian Bat Lyssavirus have been found in seven genera representing five of six families of microbats in Australia. Some of these are cave dwelling bat species (Anon, 2009).**

Experts are divided over whether the virus has always been in Australia or is a recent introduction. If the latter is the case, it could still be expanding into new species. Certainly, overseas bats of the same genera as our common cave-dwelling species have been shown to carry Lyssaviruses. **All** bats should be regarded as potential carriers. Anyone likely to be handling them (e.g. for research or rescue purposes) should receive prophylactic vaccination. Ordinary cavers should stay out of chambers with bats in them, thus avoiding both disturbance of bats and risk of infection.

### Marburg – and Ebola – Haemorrhagic Fevers

These only need to be considered if you are going overseas – mainly to Africa. In Africa, human infections with both these viruses have been linked to infections in various species of megabat. In the case of Marburg virus, the bat involved is a member of the genus *Rousettus*. This is the only genus of megabat that lives in caves (and echo-locates.). There are **no** cave-dwelling megabats in Australia, but there are some species of *Rousettus* in Asia.

Recently a type of Ebola virus has been discovered in the Philippines. However, it is different in that, so far, it does not seem to cause disease in people and it has not been

detected in bats.

### Hendra Virus

This virus has no connection to caves or microbats. We include it because it has been in the news lately, with deaths of horses in Queensland and northern NSW, and statements by some prominent people along the lines of “we must kill all the bats”!

Hendra virus is a new type of virus which first appeared in Brisbane in 1994. It is now known to be carried by flying foxes – i.e. megabats. It has never been found in microbats. Horses are apparently infected by the flying foxes, and in some cases have then passed the disease on to people (and to one dog). There have been no cases of people being infected directly from the bats. Because the virus is frequently fatal to horses and people it is causing grave concern, but it should not be an excuse for killing either mega- or micro- bats. It is hoped that a vaccine for horses will be available by next year, and this should prevent further occurrences.

A similar virus, Nipah virus, is found in megabats, particularly of the genus *Pteropus*, in Asia and parts of East Africa. In the initial outbreak, in Malaysia, pigs were infected first and passed the virus on to people; however, the virus can sometimes be passed directly from bats to humans. There are so far no records of it in cave-dwelling megabats.



*Grey-headed flying foxes have been causing major concerns because of Hendra virus*

### Severe Acute Respiratory Syndrome (SARS)

SARS was a viral disease that emerged in China in late 2002. It spread rapidly, thanks to air travel, to several countries in Asia, Europe and North America, and killed several hundred people before it was eradicated. It is thought that the ultimate source of the virus was Chinese horseshoe bats (*Rhinolophus sinicus*), since a similar (though not identical) virus has been found in

them. It is likely that another type of animal was infected by the bats and then passed the virus to humans. Closely related viruses have been found in other species of *Rhinolophus* in Europe. Horseshoe bats are microbats and cave-dwellers. We have three species in Australia, with *Rhinolophus megaphyllus* being found all along the mainland east coastal strip, and there is no reason to think that they do not carry similar viruses. It should not be cause for alarm but another reason to treat bats with respect and to observe good hygiene when in contact with any sorts of animals or their excreta.

### Leptospirosis

This disease does occur in Australia and the bacteria are carried by many types of animal. It is present in native rodents, especially in the tropics, in marsupials including wombats, bandicoots and possums (possums in New Zealand too), and in megabats, but doesn't seem to have been detected in microbats – probably for want of looking. It is also found in many introduced animals including rats, house mice, deer, cattle and pigs. With the possible exception of caves in the tropical north, the greatest risk to cavers might be in a wet cave contaminated by effluent from dairies or piggeries, or if they explore drains or sewers – but then there would be other risks too, such as salmonellosis.

### ARTHROPODA

Tick-borne relapsing fever hasn't been recorded in Australia but there are a few rickettsial diseases carried by ticks or mites, not to mention the paralysis toxin produced by the scrub tick. And we have plenty of mosquito-borne diseases (Dengue, Ross River, Barmah Forest Fevers, Murray Valley Encephalitis,). We imagine all these would be more of a risk on the surface than in a cave, except in the entrance area. The idea of wearing insecticide-impregnated clothing inside a cave, as suggested by Dr Igreja, concerns us. This could be fatal to any cave-dwelling arthropods, which are likely to be harmless and maybe even rare and vulnerable, rather than disease-carrying.

### BIRDS

Cryptococcosis and psittacosis both occur in Australia, but so far no cases are known to have been associated with caves. People who are immuno-compromised or suffer from pulmonary disease should seek expert medical advice before caving, particularly if there is a likelihood of exposure to bird or bat guano.

### IT GOES BOTH WAYS

Animals that live in caves may occasionally pass diseases on to people, but it works the other way too:

People may very easily carry disease-causing organisms from one cave to another, with devastating results to the inhabitants. So, please, be careless if you like about your own disease risk – Earth has no shortage of humans – but be very careful about cleaning and disinfecting your clothes, boots and gear between one cave area and another, and be absolutely over-the-top obsessive about it when moving between continents.

**Perhaps it is worth mentioning with regard to all the newer human infectious diseases derived from animals (zoonotic diseases) that these appear to be due to human interference with the animals themselves or their habitats.**

### SUMMARY

In summary, the paper discusses a number of diseases which pose risks to cavers, cave researchers and others. Of those listed histoplasmosis is certainly a risk for people entering bat caves in Australia. The paper will be of interest for cavers and speleologists visiting other parts of the world.

### ACKNOWLEDGMENTS

Our thanks go to Joe Sydney for bringing Dr. Igreja's article to our attention and to Ken Grimes for his valuable comments on the text.

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## A VISIT to SMOO CAVE - the only SHOW CAVE in SCOTLAND

John Brush



*Inlet from above the cave entrance*

Smoo Cave is a short but spectacular limestone cave near the village of Durness on the remote northwest coast of Scotland. The first two chambers of the cave have free public access while the inner reaches are open as a show cave during the summer months and on holiday weekends.

The cave is a popular local tourist attraction and at one time, the local press billed it as “Scotland’s answer to Wookey Hole”. With a huge main entrance (40m wide and 15m high), Smoo has also been described as the largest sea cave in Britain. But that is only half the story. While the cave is located at the head of a narrow, 600m long inlet and wave action has played an important role in enlarging the entrance chamber area, Smoo is also an active karst system with a stream sink, a 25m waterfall plunging into a fresh water lake and a small side stream emerging from a sump.

Smoo Cave attracts some 40,000 visitors a year according to the Smoo Cave website. However it is not clear if this is the number of people who pay to see the inner parts of the cave or whether it is an estimate of the total number of visitors to the cave.

The Highlands Council owns the cave and has provided visitor facilities such a parking area, public toilets, access paths, a wooden viewing platform within the cave and rudimentary cave lighting. The show cave operation is leased out to Colin Coventry, a local identity and member of the Edinburgh-based Grampians Speleological Group (GSG).

Marjorie Coggan and I were fortunate to be able to visit Smoo Cave with our UK friends, Kirsty and Martin Mills, during a trip to Scotland in July this year. As Kirsty and Martin are good friends of Colin Coventry, we were given a special tour, but more of that later.

From the sealed car park right beside the (A838) highway, it is a short walk along a network of paths down to the main entrance and, optionally, past the stream sink entrance and a daylight hole. Members of the public can wander at will into the entrance chamber and along a boardwalk to a wooden viewing platform in the second or lake chamber. A roof over part of the boardwalk protects visitors from things that fall, or are thrown, in through the daylight hole. Lighting allows



*Smoo Cave entrance*

visitors to see the waterfall plunging into the cave on the far side of the lake.

For visitors who would like to see more, in fact all, of the cave, Colin's informative but low-key tours are just the thing. At the Smoo Cave visitor centre and ticket office – in reality a pile of loose stones and a small wooden table set up in the entrance chamber, Colin's assistant extracts £3 (about \$5) per person and issues safety helmets. A tour, normally lasting 20 or so minutes, involves a boat trip around the lake chamber, under a low natural archway and into a side stream passage. Here, everyone alights from the boat - a large inflatable rubber dinghy - and walks on wooden planks along a stream passage. It is just a short distance up the shallow streamway to a sump and terminal aven. Although the stream passage is less than 2m high in places and thus there is some risk of visitors bumping their heads, the main reason for the helmets is for protection when the boat eases under the wooden viewing platform - which it must do to access the loading steps at the beginning and end of each tour. At the time of our trip, Colin had a nasty gash on his head, suggesting that he too should wear a helmet or duck a bit faster, or perhaps both.



*Smoo Cave ticket office and visitor centre*



*Looking out of Smoo Cave entrance*

Colin was a mine of information on the local geology and on the history and formation of the cave. He was also keen to tell us about exploration activities in the cave – much to the bemusement of the two (non-speleo) members of the public who joined our somewhat extended tour. It took Colin nearly an hour to conduct the tour while regaling us with stories of his exploration efforts.

According to Colin, an attempt was made to dive the small sump pool. Unfortunately, the divers were forced to retreat after progressing just a few metres, as the water very quickly became turbid. Having observed these efforts, Colin thought there had to be a better way and so came to acquire a miniature remotely controlled submersible equipped with a video camera. As a sea faring person of some standing (he is a member of the local branch of the Royal National Lifeboat Institution), Colin decided to navigate the submersible himself. Unfortunately, this exploration effort was also unsuccessful. Even though the submersible had just a tiny propeller, it still stirred up silt and quickly obscured the view on Colin's monitor. So much so that he was unable to navigate back out of the sump pool and the sub was only retrieved by dragging it out by its communications cable.



*Smoo Cave stream passage*



*Entrance showing daylight hole and covered walkway*

A further attempt to extend the cave by climbing the terminal aven was also unsuccessful, but it did result in some wonderful stories. Colin and a fellow GSG member, Iain Greig, decided the best way to climb the terminal aven would be to use a safety-certified 10m long aluminium ladder borrowed from a local painter. As the pair carried the paint-splattered ladder into the cave, a group of American tourists couldn't resist asking what they were doing and Colin responded that he was a painter and decorator who had the task of making the drab cave walls more attractive for tourists. The mortified Americans were left shaking their heads as the 'painters' ferried the ladder across the lake and then pushed it up the shaft. Colin made the first ascent and managed to get half way up before shaking knees (or was it the ladder) forced him to retreat. Iain then had a go and gingerly climbed to the top of the ladder where he could see two small shafts continuing above, but decided the flowstone walls were too slippery to climb safely. The pair retreated in defeat, but Colin says another attempt may happen one day ...

As we headed back towards the entrance, Colin told us of the rich cultural and archaeological history of the cave. An early recorded visitor was the famous Scottish novelist and poet, Sir Walter Scott, who made note of his 19 September 1814 visit in his diaries. In 1858, the journal of Richard Charles Weld describes how locals would take visitors for a boat trip across the lake chamber for 15 shillings and more if lights were required.

In the two centuries prior to Sir Walter Scott's visit, the cave had a somewhat gruesome reputation. In the 16<sup>th</sup> Century, a highway robber named McMurdo used the blowhole entrance, according to local legend, to dispose of his enemies. In the 1720s, locals lured raiders from the Clan Gunn into the cave where all members of the raiding party were slaughtered. Two decades later, at the time of the Jacobite rebellion of 1745, there was a small distillery operating in the cave. The Government, keen to stamp out illicit stills, ordered an Inland Revenue Supervisor and an Excise Officer into the area, with powers to arrest and confiscate. The officials heard rumours of a still in the cave and engaged a local to take



*Colin Coventry explaining Smoo Cave geology*



*Colin Coventry and boat in Lake Chamber*



*Base of waterfall*

them into the cave by boat. Unfortunately for them, the boat was manoeuvred under the waterfall where the boat capsized and the officials drowned. Shortly afterwards, the still was discreetly removed. Or so the story goes.

Earlier use of the cave is not well documented. However, excavations in and around Smoo Cave in 1904 and in the 1990s suggest a complex archaeological history dating from the Mesolithic period, through the Iron Age and into medieval times. It is thought that Norse mariners were regular visitors to the cave and may have regarded the inlet as an important natural harbour to shelter from stormy seas. In fact, it has been suggested that the name Smoo is derived from the Norse Smuga, meaning a rift, cleft or cave.

The first attempt to operate regular commercial trips into the inner parts of the cave was in 1977. However, it was not until the mid 1980s that serious efforts were made to 'develop' the cave. The Highland Council purchased land around the entrance in 1985 and set about established parking facilities, paths and picnic facilities. In 1986, the Royal Engineers helped the council by making steps down to the entrance and building the viewing platform and a bridge over the creek near where it plunges into the cave. In 1991, the cave was "modernised" (as the Smoo website quaintly puts it) with improved paths and the addition of electric lights in the lake chamber and along the inner stream passage.

With time pushing on, we eventually returned to the Visitor Centre where we thanked Colin and bid hasty farewells, as he had more people patiently waiting for their tour of the inner reaches.

A visit to Smoo Cave is thoroughly recommended. It is an impressive, albeit relatively short, cave with an interesting history. If time and circumstances allow, it is well worth doing a tour of the inner parts. At just \$5, it would have to be one of the lowest price show cave tours anywhere. Colin's yarns alone are well worth the admission price.

## Sources

Information for this article was obtained from:

The Smoo Cave website ([www.smoo Cave.org](http://www.smoo Cave.org));  
The Bulletin of the Grampians Speleological Group, Fourth Series, Vol. 4(2):30-31, October 2009 and Vol. 4(4) March 2010;  
GSG members (Colin Coventry, Kirsty and Martin Mills); and  
The North West Territorial (newspaper), Volume 9, spring 1987.

# BORENORE RE-VISITED

Kent Henderson



*The main entrance of Arch Cave, Borenore*

Recently, I found myself in Orange, New South Wales, on business, and I took the opportunity to again visit Borenore Caves – which are located 17 km to the west, off the Orange–Forbes road. It is years since I was last there; the previous occasion was in the company of Ernie Holland and Mick Chalker – not quite in the Pleistocene, but close!

Actually, my last visit was in late 1998 – about twelve years ago... It is probably marginally useful to quote from my resultant ACKMA Journal Report at that time:

*One fine (hot!) morning, Mick bundled me into his Hilux, and 'dragged' me off on a full day trip to Abercrombie and Borenore. .... After leaving Abercrombie, we drove onto Borenore Caves, near Orange, which last year was passed over to the management of the Jenolan Caves Reserve Trust. And the new Manager of Borenore? You guessed it – Mick Chalker! One has visions of Mick being manager of most of Australia's karst, the way it's going! Upon arrival, we were met by Ernie Holland and thereafter spent several hours trying to keep up with him as he tromped the karst. I had visited Borenore some years ago, but this was my first extended look. I was previously unaware just what a substantial karst area it is, and how cavernous. We checked out several entrances in our sojourn, but just a fraction of those tagged. The biggest management problem*

*currently is feral flora, particularly blackberries, with a spraying program urgently needed. It was rather late that night when we finally got back to Wombeyan – considerably later than expected after somebody lost his car keys (which were finally found), but I will not embarrass the person concerned by mentioning his name. ('A Karst Odyssey'. ACKMA Journal 34 – March 1999).*

Ahh – the good old days! But let us not dwell.



*A view through the Arch at Arch Cave*

## HISTORY

While obviously known to aboriginal groups for thousand of years, the first recorded European visit to Borenore was John Henderson (no relation, as far as I know...) in 1830. Major Thomas Mitchell visited the caves during his Third Expedition in 1836. An interesting association with Borenore is that of Frank Rusconi, the Italian stonemason of (mostly) Gundagai – famous for the *Dog on the Tuckerbox* and *Rusconi's Marble Masterpiece* (See ACKMA Journal 81 – December 2010). Borenore was the source of much of his marble. Like many Australian karst (particularly marble) areas it possessed quarrying operations for some years. Its 'glory' days were over the first half of the 20th Century, but mining did not completely cease until 1994.



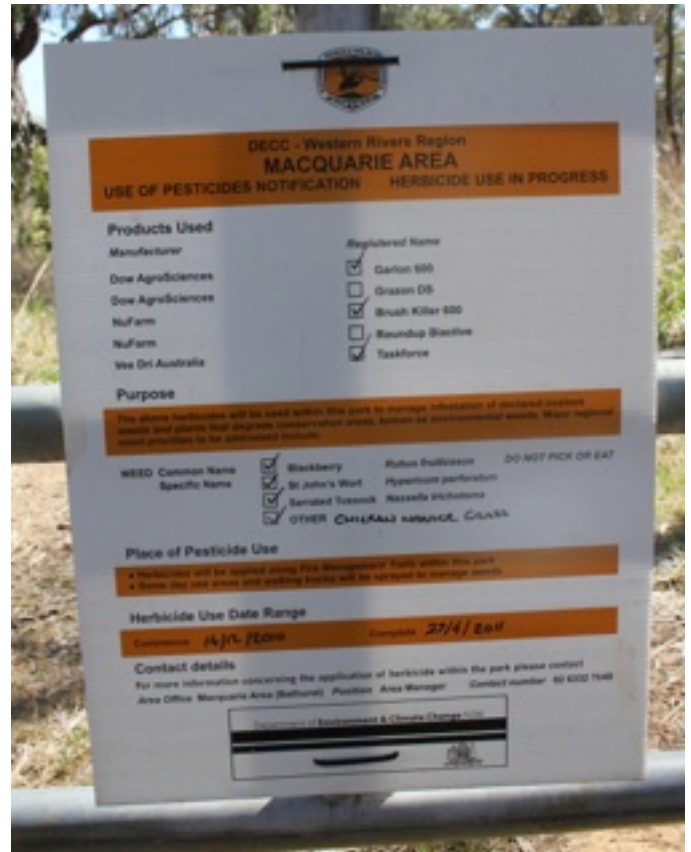
Above: Boree Creek entering Arch Cave  
Below: A view of the creek section in Arch Cave



The Borenore Karst Conservation Reserve was initially dedicated as a *Reserve for Public Recreation* in 1959. The area was managed, together with a further 32 other small parcels of land, by the Canobolas Regional Parklands Trust. In 1997, Borenore Caves was included in the lands controlled by the Jenolan Caves Reserve Trust (JCRT), and as noted above was managed by Mick Chalker from Wombeyan (Wombeyan and Abercrombie were then under the JCRT).

When the JCRT was 'effectively dissolved' in 2006, management of the Jenolan, Abercrombie, Wombeyan

and Borenore karsts reverted to the NSW National Parks & Wildlife Service (NPWS); with only the Jenolan Show Caves themselves remaining under the rump JCRT. This is the current situation. The Borenore Karst Conservation Reserve is registered as a natural heritage site on the Register of the National Estate.



Signage denoting the spraying of feral plants at Borenore

## GEOLOGY

The Borenore karst is partly-metamorphosed Silurian marble (approx. 500 million years old) which outcrops along Boree Creek, irregularly, over about five kilometres. It is totally surrounded by igneous rock that flowed from volcanic eruptions at nearby Mount Canobolas. At this time, or possibly earlier, the limestone metamorphosed into marble. Several small (now-abandoned) marble quarries are spread throughout the area.

Boree Creek runs through the best known cave in the Reserve – Arch Cave – at the East end. Tunnel Creek runs through Tunnel Cave at the Reserve's west end, which itself feeds into Boree Creek. A number of springs continually flow into Boree Creek.

The water from these springs is of high quality and is an important source of water in maintaining the general health of Boree Creek and the Reserve itself. There are about forty tagged caves in the Reserve, mostly small. The other cave of relative significance is Verandah Cave, which is located near the western boundary of the Reserve above Tunnel Cave, and is effectively an undercut cliff.



*Interpretive signage at Borenore*

## MANAGEMENT

There is an excellent Management Plan on Borenore, written under the JCRT and gazetted in April 2001 – a PDF of it is on the Internet.\* Obviously, under the *rule of thumb* 'ten year rule' is it due for an update and it will be interesting to see if and when the NPWS get this done.

That said, I must say I was extremely impressed with the current Borenore management on my recent visit. I spend a couple of hours or so there. One arrives at a small car park, adjacent to which is excellent interpretive signage. A short 100m walk, transiting a small bridge over Boree Creek, brings you to Arch Cave. All one needs is a light source and decent footwear.

There is a circuitous route through the upper (dark) section of the cave, down to its considerable Arch (not in the Abercrombie Caves league, but impressive nonetheless!), and again through cave along the creek inflow. There are many daylight holes. The dark cave section contains mostly dry bulbous speleothems (no surprise given the great airflow through the cave). While, not unexpected, there has been historical damage and some graffiti in the cave, it is far from obvious. The creek section is particularly pleasant to walk through. The whole traverse is as easy as touring a self-guided show cave which, of course, from the Borenore perspective it effectively is.

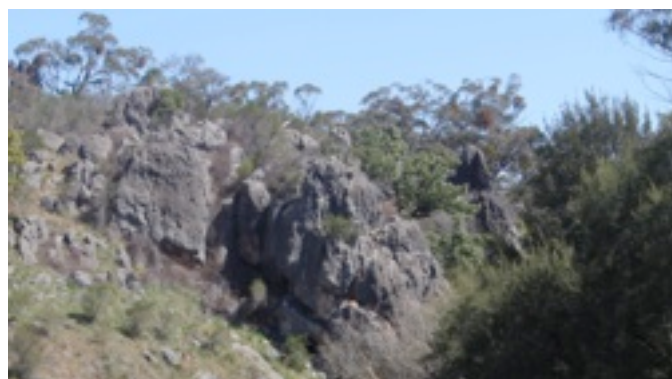
After visiting Arch Cave, I undertook the long walk around Boree Creek to Tunnel Cave. The traverse took about 45 minutes (one way), and I moved at a goodly clip! While there is excellent track signage along the route, Tunnel Cave itself is not indicated, and I had to rely on my memory of over a decade ago to find the entrance. The long trek (1½+ hours return...) and lack of direct signage is, of course, a (wise!) management decision. Clearly, the aim is for casual tourists to visit robust Arch Cave...

Tunnel Cave is used as a roosting site by the vulnerable Common Bent-winged Bat (*Miniopterus schreibersii*), and is closed from May to September. The long trek to Tunnel, undoubtedly, is undertaken by relatively few, which suits management objectives just fine. Given that Tunnel was still officially closed upon my visit, I only delved briefly into the entrance area.

Tunnel Cave is at the base of a large bluff on the southern side of the creek. As you approach you can see

several entrances, with the true cave entrance being the lowest portal. While it is possible to look down into the start of the Tunnel Cave from the upper chamber (I did), the lower entrance is the practical one that should be used. Transiting the cave you can get wet, so I was more than happy to not progress past the entrance on this occasion in any case, as I was not geared up. The creek has eroded a deep channel in the first part of the tunnel. The cave then opens up into a large chamber followed by a long passage, again often filled with water, but you can normally get around it and keep dry, as I recall.

All the usual speleothems are represented in the cave, although most of it is 'dry'. Obviously, there is plenty of guano. Near the end of the cave there is another large pool. There is a sink hole at the end, offering an easy climb out. One does need to be/should be geared up, but the traverse of the cave is relatively easy.



*Above: The entrance to Tunnel Cave  
Below: A close up view of the Tunnel Cave entrance.*



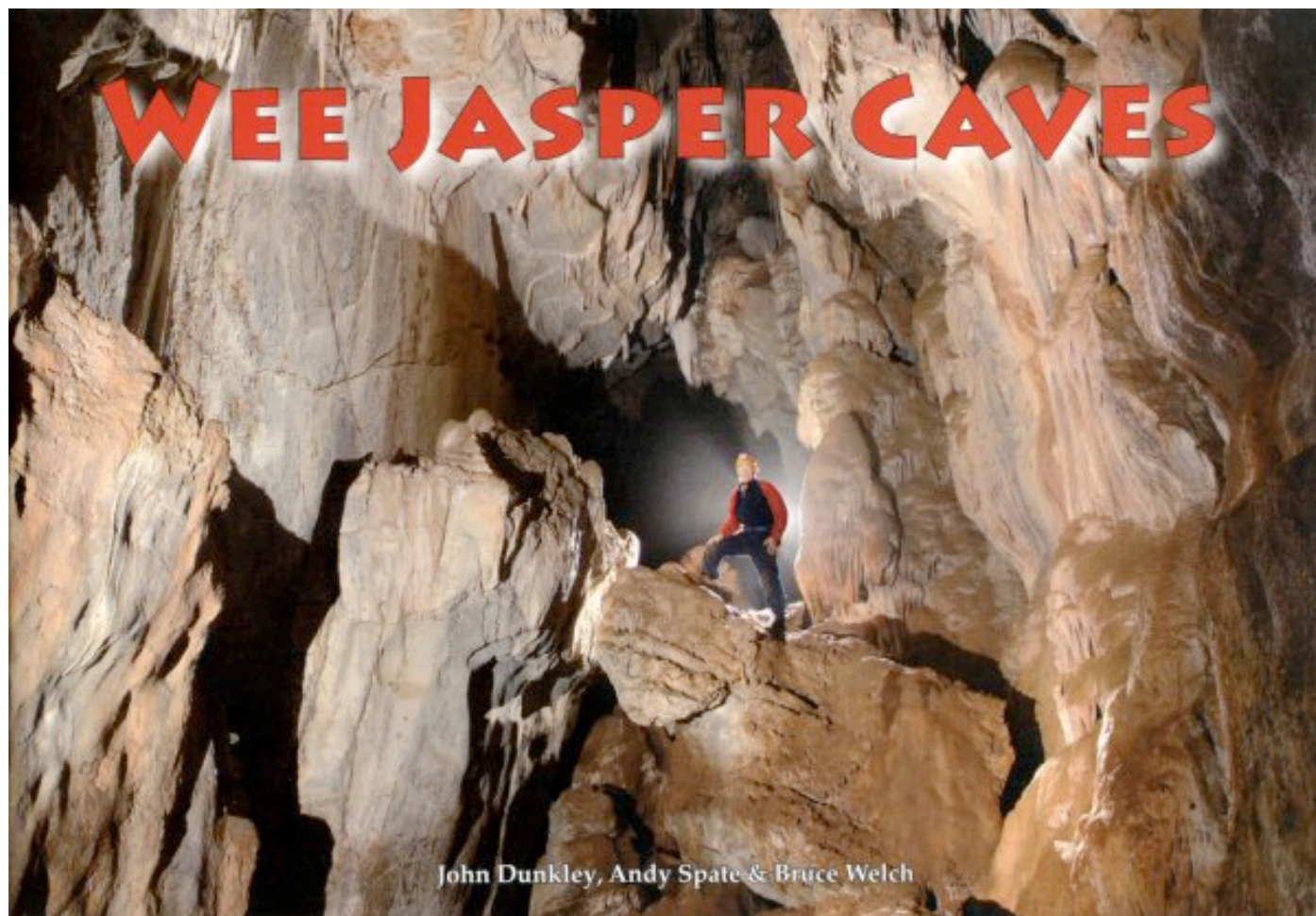
Probably the greatest management issue in the Reserve is feral flora, with blackberries being the worst offender. I remember, from my first visit to Borenore many, many years ago that blackberries were indeed rampant – as I recall Mick Chalker's visits to Borenore from Wombeyan were often about blackberry spraying. I am delighted to say the NPWS is clearly on the case – I did not see a living blackberry anywhere in the park (although plenty of the deceased variety) – bravo!

So, if you happen to be in the Orange area, half a day – or more – at Borenore is well worth it. It is a most pleasant, and very well managed, karst area.

\*See: <http://www.environment.nsw.gov.au/resources/parks/pomfinalborenore.pdf>

## WEE JASPER CAVES

Reviewed by Ken Grimes



### **Wee Jasper Caves**

by John Dunkley, Andy Spate & Bruce Welch.

Published by the Australian Speleological Federation. 2010.

\$14-95 plus \$3-50 postage – send payment to John Dunkley, 5 Coleman Street, Pearce ACT 2607. Or contact [jrdunkley@gmail.com](mailto:jrdunkley@gmail.com)

This 64 page booklet provides an excellent summary of the caves, karst and geology of the limestones at Wee Jasper, NSW. The text covers a broad array of topics in considerable detail and the two-column landscape format allows a versatile layout of supporting maps, photos and diagrams (e.g. a panorama of the main chamber of Careys Cave is spread over two pages, as are several of the cave maps). There are some excellent photos – both historic and modern (the latter mainly by Alan Pryke and Geoff Kell).

A 7-page history section starts with Aborigines and covers the early settlers and later developments and individuals such as A.J. Shearsby, a local pharmacist-geologist-photographer. There are many delightful extracts from contemporary newspapers dating from 1832 to 1921, and an additional two pages in the later section on Careys Cave reproduces part of an account of a visit in 1919.

Three pages on the geology describe the Devonian limestones and their structure, but there seems to be some confusion between "dip" and "strike" in the text and a figure caption – apart from a NW-plunging syncline at the southern end of the valley, the beds mainly dip west and strike NNW, parallel to the valley. A few dip symbols on the map would have clarified this. A further three pages describe the fossils: both the Devonian fossils in the limestone, which include excellently-preserved primitive fish, and the bone fossils in the cave sediments.

Biology is restricted to short notes on the cave bats and the limestone vegetation. References to other more-detailed sources would have helped here.

The rest of the book deals with the caves, which have considerable diversity. It starts with Careys tourist cave. This describes the cave in general and the

features within it, which include extensive rock sculpturing by slow moving phreatic waters. It also mentions the various activities available to visitors, including underground workshops. The two-page cave map by HSC is impressive, but confusing in spite of the colour and bedrock shading. I suspect part of the confusion is because there are several areas in the middle of the map which have missed out on the shading used to indicate bedrock.

The Wild Caves section starts with a page of warnings, access details (i.e. "contact the Wee Jasper Reserves Trust"), mention of ethics and minimal impact caving, and a suggestion that would-be cavers should join a caving club. It then works through the three major wild cave systems of the area: Dip, Punchbowl-Signature, and Dogleg Caves, and also describes the Devils Punchbowls (surface dolines). The caves are described in detail: their history of exploration, descriptions of their form and contents (sediments, speleothems, fossils), followed by a discussion of the genesis and hydrology. This is all assisted by some magnificent photos, mostly by Alan Pryke, and the excellent Jennings maps, which are separated into multiple levels with numerous profiles and cross-sections. The Punchbowl-Signature map set takes up 9 pages in all. Although prepared in the 1960s, these maps are still outstanding object lessons in the art of systematic cave mapping.

The three cave systems are quite different in character. Dip Cave is a classic example of structurally-controlled

phreatic passages following the strike of the steep-dipping beds, although the extensive collapse modifications make the details difficult to see.

Punchbowl-Signature Cave is a complex multi-level system which is in strong contrast to the Dip Cave as structural control is much less obvious. The four levels represent a series of still-stands as the water level dropped and the numerous flat ceilings mark the upper limit of solution beneath each of the old watertables. Meandering passages and wall notches indicate strongly flowing streams immediately beneath these watertables (i.e. epiphreatic). Contrasting with this are tall narrow passages which indicate vadose incision of those streamways as the watertable dropped from one level to the next.

Dogleg Cave is an active, and commonly flooded, meandering stream passage representing the present and lowest level of the Punchbowl drainage system, though there is no connection between them.

The final two-page spread is a diagrammatic map of the Wee Jasper valley showing the location of features and campgrounds, but not the wild caves.

In all this an excellent publication, and sets the standards for future efforts. Strangely, it is not mentioned in the Publications page of the ASF web site!



*Dip Cave, Wee Jasper. Photos: Andy Spate*

## STRANGER IN THE FOREST

By Eric Hansen

Reviewed by Cathie Plowman

This is not a book about caves. Set mostly in 1982 it is an account of the author's desire to walk across Borneo, his efforts to turn this desire into reality and then his several months spent walking through the forests of Sarawak and Kalimantan with the company and hospitality of the Penan.

While the caves are not mentioned, the long walk does come close to Mulu. Regardless of caves or not, many ACKMA members who have been to Mulu will be interested in reading this experience of the forest and the people who live in and with it.

As a child, Eric Hansen is captivated by jungle movies and Kipling's *Jungle Book*. Several decades later he travels to Singapore via a stopover in Kuching. Like many tourists today, his few days there include a river trip and longhouse visit and Hansen senses that he has 'come home' to the place of his childhood longing. Six years later he returns to walk in the forest, but logging and barges have already removed the forest of his previous visit.

Despite the romantic beginnings of *Jungle Book* and a quest to walk across an unknown land, this is not an easy journey. Making contacts with locals, learning local bartering systems, finding guides, learning the language and where to start the journey seem insignificant when compared to interrogation by people fearful that this unaccompanied white stranger in their forest is an evil spirit.

The book is also a gutsy tale of determination in often extreme physical discomfort and a quest to pursue the urge to immerse himself in the rainforest. After two months of walking, Hansen safely completes his planned journey. But as he travels away from the hardships of the forest, he realises that his true journey is incomplete and does an about turn to embark on a far more challenging walk across Borneo via remote forest and isolated people.

The book is illustrated with some beautiful black-and-white portraits of Penan in the rainforest. There is an extensive bibliography but I found the maps hard to figure out in relation to the text. (Likewise the author found his maps irrelevant to way-finding in the forest.)

The book concludes with a photo of nomadic Penan standing with their spears on a logging road. Certainly roads like this have intruded much more since Eric Hansen concluded his long walk and the forest and the Penan lifestyle, which the reader gleans from the book, have greatly changed since then too.

*Stranger in the Forest: on foot across Borneo*

By Eric Hansen

Vintage Departures, 2000

Published by the Friends of Naracoorte Caves 2004

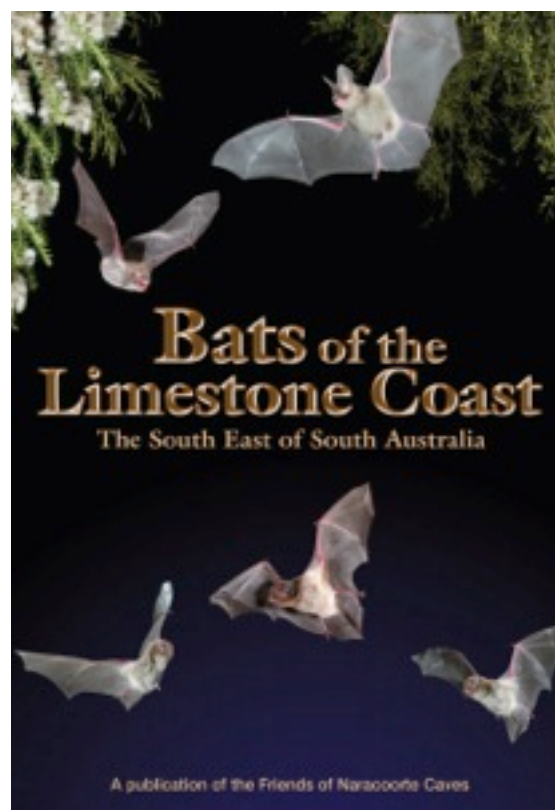
## BATS OF THE LIMESTONE COAST

By Terry Reardon and Steve Bourne

Reviewed by Sasa Kennedy

Whilst only a slender volume this booklet contains a wealth of useful information about bat classification, diversity, behaviour, habitats, diet and life cycle. Beginning with these general topics it then goes on to introduce the bats of the Limestone Coast. For these local species identification pointers, size and weight, distribution, behaviour, diet and conservation status are outlined. The booklet concludes with an excellent section on bat conservation, including threats, how to help and what to do if you find an injured bat.

The book is clearly and concisely written and includes excellent photos and distribution maps of all species local to the Naracoorte region. It is a great introduction to micro-bats in particular. Its usefulness is not limited to residents of the Limestone Coast. The general information is relevant to all bat species and many of the local species can be found in other karst areas of Australia. It is a very useful resource for guides wishing to understand and explain the role of bats in the ecosystem as part of their cave interpretation and could also prove useful when trying to identify bats that are brought in injured to visitor centres, bearing in mind that not all Australian bats are included. In short, like a microbat, it is a little gem.



# LOVESONG of the DARK

Geoff Kell

'Twas young Farquharson from Bowning who hit the Tumut scene  
He was working for the Parkies - he was sensitive – and green  
He hung out with the boys a lot and drank a lot of beer  
But life on the domestic scene was somewhat short on cheer

Then one day to an office he delivered a report  
And he spied a fair young maiden and thought: "Strike me, she's a sort!"  
From that day on with any slight excuse he'd drop on in  
And he'd dream:" 'er name's Alana", as he grinned a silly grin

He took a while to ask her out but when at last he spoke  
He asked her to the pictures – he was a sentimental bloke.  
And as his feelings bloomed into that gooey, soppy kind  
He thought: "Jeez, I'd better marry her, or she might change her mind."

Now Alana was a Catlick and sought to do it right  
Whilst Adam was a Buddhist, with not a wat in sight.  
She wanted a traditional (with whiskey and a priest)  
He wanted something simpler (with whiskey and a feast).

Of course his darling's wishes would be honoured and obeyed  
But what would work for him? "I know, let's do it in a cave!"  
(That's where a Buddhist always goes if he has to meditate,  
And for sure would make the insides of his darling palpitate).

At last the fateful day arrived: the church, the priest, the pub  
Then they went to celebrate with the best of Chinese grub  
Two days elapsed then out of bed they sprang: "Oh, not again!  
We have to get to Careys Cave and do it all in zen!"

\*\*\*\*\*  
The setting was romantic, with candles and a harp  
In a chamber near the bride prepared with a mirror, on a tarp  
The wedding group looked slightly strange, or so a witness says:  
"Would you believe the men wore skirts, the celebrant a fez!"

But then the magic spread around, the harpist wove his spell  
And the bride soon made her entrance behind her flower girls  
Followed by handmaidens, all keen to do their job  
They stepped up to the dais and faced the waiting mob

The music stopped, a tranquil hush descended over all  
The words began: the promises to heed each other's call,  
They were obviously desperate to regain their marriage bed  
'Cos they'd jump in with a "WE DO!!" before each vow was fully read

Then each friend lighting that beside, the candle flame went round  
This chain of light a symbol of support to which they're bound  
The two, now one, receive the flame: the final wick is fed  
A few words more, a katag wrapped around them, they are wed.

The happy party leaves to celebrate with joy in store  
The candle flames extinguished, the darkness reigns once more  
This ancient timeless space has seen young happiness again  
And lent an atmosphere of mystery to the fleeting lives of men.

## Coming Events

2011: Oct 25-26, Nov. 25-26	<b>Centre for Gippsland Studies. Churchill, Vict (Workshop and Conference)</b>
2011: Oct 30-Nov 1	Global Geotourism Conference, Oman
<b>. . . and Looking Ahead:</b>	
2012: May	<b>ACKMA Annual General Meeting, Wee Jasper, New South Wales</b>
2012: Aug 5-10	International Geological Congress, Brisbane
2012: Sept 6-15	World Conservation Conference. Jeju Island, South Korea
2013: May	<b>ACKMA 20<sup>th</sup> Conference, Waitomo Caves, NZ</b>
2013: 21-28 July	International Congress of Speleology, Brno, Czech Republic

# GREAT NEWS! CAPE RANGE INSCRIBED on the WORLD HERITAGE LIST

Andy Spate



*View south from Charles Knife Road, Cape Range. Photo: Kirsty Dixon*

The 'Brief Description' on the UNESCO World Heritage List reads as follows:

The 604,500 hectare marine and terrestrial property of Ningaloo Coast, on the remote western coast of Australia, includes one of the longest near-shore reefs in the world. On land the site features an extensive karst system and network of underground caves and water courses. Annual gatherings of whale sharks occur at Ningaloo Coast, which is home to numerous marine species, among them a wealth of sea turtles. The terrestrial part of the site features subterranean water bodies with a substantial network of caves, conduits, and groundwater streams. They support a variety of rare species that contribute to the exceptional biodiversity of the marine and terrestrial site.

Hamilton-Smith, Kevin Kiernan and I stated in our Executive Summary of a report to the Western Australian Department of Environmental Protection (Hamilton-Smith et al 1998):

*... our review reinforces the argument that the Cape Range peninsula is a highly important site with a range of unique values. We would not usually use the term "unique" at all and do not do so lightly. We suggest that the archaeological, geomorphic and subterranean faunal attributes and setting of the peninsula amongst the fringing coral reefs render this area as well worthy of international (and national) recognition through nomination, and ultimately listing, Cape Range peninsula as a site of World Heritage significance. We point to the area as one of particular interest and importance for scientific research which is really only in its infancy in this area.*

Of course this does not adequately describe the 'outstanding universal values' of the site. In 1998, Ecology Journal No. 83 - June 2011

Others say:

*Cape Range is one of the great geological set-pieces of the State...* (Carter, 1987, p108)

*...it ranks more and more as a world class subterranean fauna.* (Main, 1993, p 243)

*...the area ranks as unique and scientifically as world class.* (Main, 1993, p246)

To back up some of these statements I have provided some background information below.

### **Climate**

Cape Range has also had a most interesting climatic history having originally been a rainforest during the Miocene (Humphreys, 1993, Wyrwoll et al. 1993). The environment is now decidedly an arid to semi-arid tropical environment except in the odd years when cyclones exert their influence. Some rainfall also arrives with the passing of minor fronts. Evaporation exceeds rainfall by a factor of ten to fifteen. The current dry climatic conditions would appear to have operated for over 170,000 years after even more arid conditions pertained before that time.



*View south from Charles Knife Road, Cape Range. Photo: Kirsty Dixon*

### **Geology**

The carbonate geology of Cape Range is based on the middle Miocene (24-25 million years BP) Cape Range Group that is made up of three limestone units deposited in differing marine environments. Most of the karst phenomena is found within the Tulki Limestone. There are also much younger Pleistocene to Holocene age limestone units hosting karst features. The fringing Ningaloo Reef is a current carbonate deposition site.

Structurally, the limestones are tectonically complex in an asymmetric anticline. The number and age range of karst-hosting carbonate units and the structurally unusual, for Australia, tectonically altered Tertiary limestones give the site its geological significance from a karst viewpoint.



*Clints, grikes and karren above Charles Knife Road, Cape Range. Photo: Kirsty Dixon*

### **Geomorphology**

The asymmetric anticline has produced steeper slopes on the eastern flank dissected by a few deep gorges. The western flank has a denser, but not deeply incised drainage pattern. Significant alluvial fans occur on both sides of the peninsula but are larger to the east. There is only one permanent surface watercourse – Yardie Creek.

Uplift of the Cape Range peninsula has produced a series of wave-cut marine terraces of probable pre-Pliocene age. Some of these terraces are overlain by ancient dune fields.

The relatively great relief, enhanced in the past by lower sea levels, provides the opportunity for significant karst development. However this must be balanced against the aridity of the present climate. Hamilton-Smith et al (1998) discuss this issue at length and describe a variety of karst forms including caves, gorges, dolines, springs and karren. All of these point to a long period of landscape development probably initiated in more favourable climatic regimes than those pertaining today. Nearly 850 karst features, mainly caves, have been identified at Cape Range, largely through the sterling efforts of Darren Brooks.

The close proximity of the fringing Ningaloo Reef has a close geomorphic and hydrologic relationship with the terrestrial and subterranean parts of Cape Range Peninsula.

## Hydrology

The hydrology is complex with periodic fluvial systems and with vadose and phreatic elements. The details of the karst drainage systems are unknown. Cape Range is underlain by a Ghyben-Herzberg groundwater system with a freshwater lens floating on saltwater. This has considerable implications for cave development and their cave-dependant fauna. Tidal influences in the caves and phreatic zone are a very rare phenomenon in an Australian context.

The ongoing extraction of groundwater to supply the town of Exmouth, tourist and defence facilities has implications for the Ghyben-Herberg system and raises concerns for the highly significant subterranean aquatic fauna. The immense Gorgon gas development on nearby Barrow Island will have further impact on water supply as a substantial influx of residents is expected in Exmouth. The issue of water supply versus the underground environment was internationally recognized when the Karst Waters Institute placed Cape Range on its 2000/2001 list of the top ten Endangered Karst Ecosystems worldwide (karstwatersinstitute.org). This was as a result of a joint nomination by ACKMA and the Australian Speleological Federation Inc.

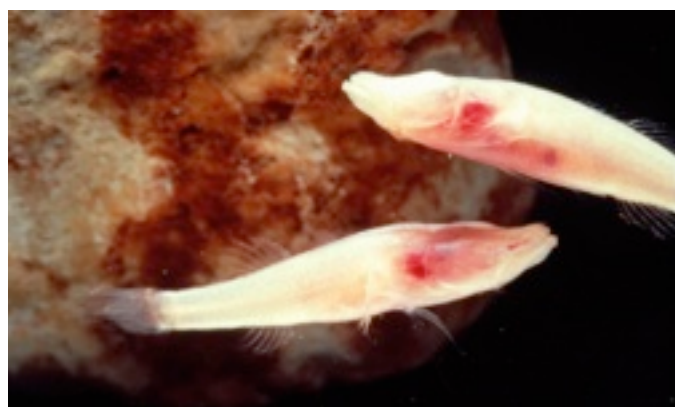


Owl roost (6C4), Cape Range. Photo: Kirsty Dixon

## Biology (abridged from Humphreys 2008)

The World Heritage significance is enhanced by the inclusion of many higher order taxa found nowhere else in Australia or even the southern hemisphere and by the close affinity of some of the aquatic taxa with other subterranean species on either side of the North Atlantic. This imparts an international flavour to the world heritage significance of the fauna as the three sites Bundera Cenote at Cape Range, the Blue Holes in the Bahamas and a marine lava cave in the Canary Islands hold the key to the history of the disjunct cave faunas in the area of the former Tethys Sea (Humphreys 1994)

The biological diversity at the surface is not particularly attributable to the karst, but to the geomorphological diversity and the overlap of three bioclimatic regions (southern, tropical and arid). The biological significance of the region largely attributable to karst lies in the subterranean fauna. The more humid caves contain a rich subterranean fauna largely comprising a relictual rainforest fauna with both tropical and temperate elements. This fauna, along with the anchialine and freshwater fauna, continues below a deep covering of Pliocene and Pleistocene dunes at the southern and northern end of the range. The fauna is regionally diverse both within the range and distinct from that of the coastal plain, the latter having some taxa in common with Barrow Island.



*Stygobiont fish - Blind Cave Gudgeon Milyerina veritas.*  
Photo: Douglas Elford, Western Australian Museum

Beneath the lower slopes and the coastal plain, the anchialine and freshwater fringes of the range support a diverse stygobiontic community, rarely accessible, that of the eastern shore having at least one taxon indistinguishable electrophoretically from one on Barrow Island. The caves contain Australasia's only known obligate vertebrate cave fauna, the Blind Cave Eel (*Ophisternon candidum*) and the Blind Gudgeon (*Milyeringa veritas*). The diversity of anchialine fauna reaches its peak in Bundera Sinkhole, because of the deeper access it provides (33 m). In addition it is the only known site in the southern hemisphere for several higher taxa (class, order levels).

It is important to consider the karst in its entirety (including its relationship with the Ningaloo Reef), because it is the juxtaposition of diverse terrestrial, freshwater and anchialine habitats on Cape Range that contributes to the unusual concentration of subterranean animals, and the higher taxonomic composition make it possibly the phylogenetically most biodiverse site globally. A significant amount of this diversity lies outside current and projected conservation estate, including the WHA boundaries.

The subterranean fauna provides evidence of local and global geological processes and of climate change. The composition of the fauna indicates that the area was previously covered by rainforest (both temperate and tropical) and thus provides evidence for the retreat of rainforest as the climate became more arid. Remipede-type anchialine fauna provides strong evidence of former connection with Tethys Sea. Evidence for the isolation of taxa formerly of marine origin resulting from the uplift of the anticline (Melitidae). The biotic characteristics of Cape Range subterranean fauna are largely relictual from past climates (rainforest cover) and geographical position (on shores of Tethys), rather than related to the specific karst type. The surface flora is diverse because it is an overlap zone of northern, southern and arid zone floras, and topography supports microclimatic relicts (e.g. *Livistonia alfredii*), rather than the fact that it is karst.



*Stygobiont fish - Blind Cave Gudgeon Lasionectes exleyi. Photo: Douglas Elford, Western Australian Museum*

### Scenic values

Although the underground scenery is not particularly spectacular there is some use of the caves for adventure tourism. Webb and Brooks (1995) reviewed the caves in regard to their tourism potential. They recommended several would be suitable for adventure, ecotourism and advanced SRT training. They also made recommendations about training and management. Owl Roost Cave does receive some adventure tourism.

However, the surface scenery is spectacular and relatively heavily used given the remote location. Ningaloo Reef, which must be regarded as part of the karst system, is a very significant attraction with its whale sharks, corals and a huge diversity of other marine life.

### Human factors

Although Morse (1993) and Hamilton-Smith et al (1998) have commented on the significance of the area to Aboriginal people there is undoubtedly more to be learnt about the archaeology and anthropology of the area. Both the west and east coasts would have been resource-rich areas although the lack of freshwater may have limited the use in some areas. Springs and other karst features may have provided water points.

The area is a popular tourist destination for its landscape, significant fringing reef and coastal waters. There are a number of defence facilities in the area. Tourism, urbanisation and other developments have and will continue to compromise the karst and its dependent biota (Hamilton-Smith et al 1998, Spate et al 1998). Hopefully World Heritage status will lead to enhanced planning and management of the reef and karst.



*Yardie Creek Gorge, Cape Range. Photo: Department of Environment and Conservation*

## Research and reporting

Although bedrock geology, gross geomorphology, groundwater hydrology and biospeleological aspects have all received considerable research inputs and the caves are relatively well documented there is much that remains unknown about the karst biology, geomorphology and hydrology. The area offers many opportunities for studies of long-term climate change on geomorphic processes and for terrestrial and subterranean biology.

## Comparable sites

There are no similar Tertiary orogenic karst sites in Australia although many of the world's caves are found in such systems. Hamilton-Smith et al (1998) state:

*What is significant about the lithological systems at Cape Range as far as karst geoheritage is concerned? Relatively few Australian karsts are formed in limestones of comparable age to the Cape Range Group. Most of the karsts in the eastern states have formed in much older, crystalline limestones. The only other significant karsts formed in Miocene limestones apart from Cape Range are the Nullarbor karst and some karsts in the Murray Valley of South Australia - there are a few very much more minor examples*

*only, such as those in the Wynyard and Redpa areas in Tasmania. Oligocene limestones also host karsts in SE South Australia and along the Glenelg River, Victoria. (page 11)*

and they go on to say:

*There may be no comparable karst setting elsewhere in the world. (page 15)*

## Concluding remarks

The listing of the Ningaloo Coast brings the number of Australian World Heritage properties to 19 – about half have karst or pseudokarst attributes. (I may be stretching this a bit by including the Mount Hypipamee crater in the Wet Tropics of Queensland World Heritage property!) However, the Ningaloo Coast nomination and subsequent inscription relied very heavily, and properly, on the geomorphic and subterranean fauna values.

The nomination was for an area of 708,350 hectares. Lobbying by local community led IUCN to recommend to the World Heritage meeting in July this year that the area be reduced by about 15% to 604,500 hectares as can be seen on the accompanying map. The 15% included some leased grazing lands as well some unallocated Crown lands. It may be possible to include these lands in the future – a much easier process than the nomination procedure!

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