

CAVES

The Journal of the Australian Speleological Federation

AUSTRALIA



GHOST BAT: PROSPECTS FOR SURVIVAL

BELOW THE RINGING PLAINS OF WINDSWEPT COOLEMAN

SCOTCHTOWN CAVE MEGAFUNA

No. 195 • DECEMBER 2013

COMING EVENTS

This list covers events of interest to anyone seriously interested in caves and karst. The list is just that: if you want further information the contact details for each event are included in the list for you to contact directly.

A more extensive list was published in the last *ESpeleo*. The relevant websites and details of other international and regional events may be listed on the UIS/IUS website <http://www.uis-speleo.org/> or on the ASF website <http://www.caves.org.au>. For international events, the Chair of International Commission (Nicholas White, nicholaswhite@netspace.net.au) may have extra information. After a very busy 2013 there are a number of activities in 2014. I hope we have time to go caving!

2014

January 4

Sydney ASF Council meeting: Bankstown Grammar School details soon but all clubs need to be aware of this date and send either a delegate or a proxy.

June

Karst without Boundaries: Trebinje (Bosnia & Herzegovina) and Dubrovnik (Croatia). Organised in the framework of the UNESCO-GEF project 'Protection and Sustainable Use of the Dinaric Karst Transboundary Aquifer System (DIKTAS)'. For further information please contact Neno Kukuric: neno.kukuric@un-igrac.org. Characterization and Engineering of Karst Aquifers course and field seminar will be offered parallel to this conference, organized by the University of Belgrade and the Geological Survey of Bosnia & Herzegovina, in the Classical Dinaric Karst. For further information contact Zoran Stevanovic: zstev_2000@yahoo.co.uk.

May 4-7

Yarrangobilly Cave Guides Conference: more details later.

9-11 May

ACKMA AGM: more details later.

August 17-22

International Workshop on Ice Caves (IWIC): Idaho Falls, Idaho, USA. A series of workshops devoted entirely to ice cave research. For details see <http://www.iwic-vi.org/index.html>.

September 29-October 3

Climate Change—the Karst Record 7 (KR7) Melbourne. This international conference at University of Melbourne will showcase the latest research from specialists investigating past climate records from speleothems and cave sediments. Pre and post field trips to karst regions of eastern Australia and northern New Zealand. Workshops on karst hydrology, speleothem petrography, geochronology and geochemistry. Details expected soon.

November 2-8

7th International Show Caves Association (ISCA) Congress: Jenolan. The theme of the Congress will be 'The Challenge of Sustainably Showing Caves in the 21st Century'. Details should be available soon.

2015



June 21-26

Ningaloo Underground 30th ASF Conference: Exmouth, Western Australia. Escape the southern winter (or the northern hemisphere) to enjoy a packed conference program and explore range, reef and gorges with the benefit of local knowledge (always a plus).

Vale Stephen Comino AM

THE FEDERATION and the speleological community as a whole, sadly, have lost a great friend.

He was the de facto environmental defender of Queensland and a man of great energy, principle and intellect. Ubiquitously, he acted for environmental and indigenous groups at great personal cost, including through the darkest years of the Bjelke-Petersen government. He provided the engine room for Central Queensland Speleological Society's efforts to protect the Mount Etna karst over many years. A full obituary is being prepared.

Ross Ellis OAM

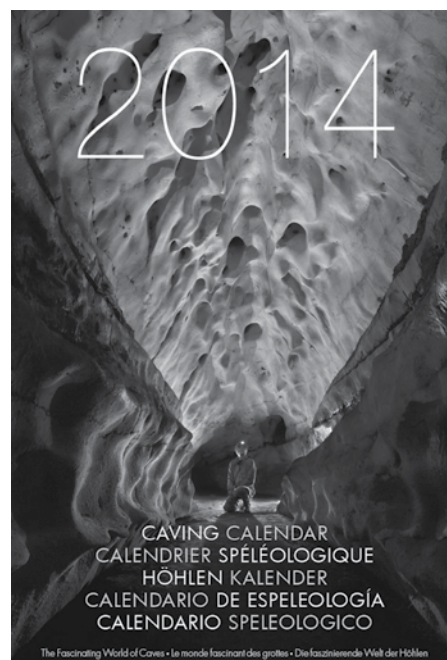
WE ARE delighted to report that in the 2013 Queen's Birthday Honours announcements, Ross Andrew Ellis was awarded a medal of the Order of Australia (OAM), the citation being 'for service to speleology as an author and editor'.

Having joined over 51 years ago, Ross is a life member of Sydney Speleological Society and editor of society publications for many years, including a remarkable stint as editor of the *Journal of SSS* since 1965. He has caved in every state and in USA and New Zealand, has one of Australia's largest cave libraries, and is an avid collector of cave postcards. In 1983 the Federation awarded Ross an ASF Certificate of Merit 'for advancing the standing of speleology through documentation and editing of publications on Australian caves, especially in NSW'. It is wonderful to see that Ross's continuing contributions have been recognised nationally in the Australian honours.

At least seven present and past members of ASF have now been recognised with national honours in the Order of Australia (AM and OAM) for services related to speleology, along with one emergency services medal and several bravery awards.

—John Dunkley

Stunning cave calendar



A NUMBER of the spectacular 2014 calendars are available without having to deal with international money transfers.

This year the donation is to the ASF Karst Conservation Fund. Make a tax-deductible donation of \$30 or more to ASF Karst Conservation Fund and receive a gift calendar for your enjoyment.

Twelve stunning images take you on an enchanting subterranean journey to caves around the world.

The 2013 calendar includes spectacular cave photos from Austria, Brazil, China, France, Haiti, Japan, Laos, New Zealand, Spain, the United States and Wales.

Make your donation soon and don't miss out on this great gift.

Send your cheque to: C/- Grace Matts, ASF Karst Conservation Fund., 176 William St, Bankstown, NSW, 2200.

CAVES AUSTRALIA

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Editor:

Ian Curtis

Email: iancurtis10@hotmail.com

Production and Advertising Manager:

Alan Jackson

Email: alan.jackson@lmrs.com.au

Proofreading:

Susan White

Greg Middleton

Joe Sydney

Jodie Rutledge

ASF: asfinfo@caves.org.au

For all ASF publications:

publications@caves.org.au

Editorial contributions are welcome!

For contributor guidelines, contact the Production Manager.

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ASF

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Cover: Ghost Bat with prey. Photo by Barry Baker.

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Whether caving, cave diving or generally just caving, *Caves Australia* readers are interested in YOUR story. It is only with YOUR contribution that we can produce a quality magazine for all to enjoy. For writing and style guidelines, contact the Editor or Production Manager for further information.

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EDITORIAL

ON THE
PILGRIM
TRAIL

THIS EDITION of *Caves Australia* has been put together by Susan and Alan as Ian has been walking a pilgrim trail in Europe: the trail from Le Puy in central France to Santiago in Western Spain.

He is aiming to collect the Australian record of photos of ornate church doors and gargoyles. Here is a snippet of his adventures.

'On this walk I have been very aware of the stone.

'Le Puy is obviously volcanic and rock cones in the area (puys in French) have churches and monuments perched on them. "Much of the walk since then has been through limestone country.

'As the walk descends towards Figeac and Cajarc every piece of ground is pock-marked with dolines.

'Tourist literature advertises, above all, the Gouffre de Padirac—visited long ago—and the limestone cliffs in the vicinity suggest caves.

'Overhangs and rock shelters beside the track instantly attract attention. The walk over the Pyrenees, too, has dolines beside the trail. Limestone is everywhere in northern Spain.

'The Altamira caves are here and tourist caves are advertised in Leon. This trail would be of interest to all cavers—not to mention those interested in historical and religious sites.'

This issue of *Caves Australia* has a variety of articles:

- Ghost bats at Mt Etna
- Diving at Cooleman with SUSS,
- A north-west Tasmanian cave and its megafauna,
- Risk Management in WA; and last but not least,
- The continuing saga of Dissidence (JF-382).

Enjoy!

*Susan White with email
information from Ian Curtis*

President's Report

WHILE SITTING one evening atop the small coral island named after the herons that live here, I pondered a number of things.

Due west of me the sun was setting over Mt Etna and I tried to comprehend that eons ago the now cavernous limestone there was once part of a similar living reef system.

I remembered in the near past the battle that had been fought long and hard by many to save that limestone and its cavern-dwelling creatures from annihilation by the limestone quarry people.

I recently attended the funeral service of the late Stephen Comino, who had fought for many years alongside Australian cavers to save Mt Etna from destruction.

I also contemplated the impacts and benefits to ASF as we move forward to host the 17th IUS Congress in 2017 at Penrith.

The Federation will host the Congress in July 2017 and will be committed to the planning and delivery of what will become a major developmental point in speleological interest in Australia.

I believe that there will be major benefits for ASF in being able to host the 17th Congress including:

- Exposure of Australian cavers to a wide range of international guests and initiate and sustain links and collaborations;
- The ability to showcase a variety of Australian caves which are the result of a wide combination of geological and geomorphological processes. Our caves are unique and the consequence of interest raised may well lead to establishing new research connections and visitation to Karst areas;
- To expose Australian cavers to the worldwide community of cavers and techniques and share our passion and techniques for science, exploration and conservation into the global perspective;
- To reinforce the skills, values and initiatives that ASF has promoted within this country to the global community; and



■ To unite the speleological community and meet the organisational requirements to host a major conference in Australia

The organisation of the congress should not take us away from the core business of running the Federation and developing links and maintaining conservation management and promoting research and exploration.

Many of us have been involved in organising one or more of our biannual conferences. The requirements to host a larger international congress are probably an order of magnitude greater, but still the units of manpower are the same and rely on organised and dedicated people moving to achieve a common goal.

Dennis Marsh has been appointed to head the team that is being selected from volunteers to be in the organising team.

It will be a sustained effort and many of you will be asked to assist.

Your responses will be greatly appreciated and help to bring into place an event that will be unique for a number of reasons and will be remembered as a positive event in the history of ASF.

I wish you well for the coming season, hope that underground remains your passion and hope to see many of you at the January Council meeting.

Prospects for Survival of the Mt Etna Ghost Bat Population

Nicholas White
ASF Conservation Commission

INTRODUCTION

The ASF Karst Conservation Fund has been supporting research being undertaken by John Augusteyn of the Queensland Parks and Wildlife Service and Professor Jane Hughes of Griffith University.

This innovative project has been trying to estimate the population of ghost bats in the Mt Etna population using GPS technology to understand the foraging range of the ghost bats and to take tissue samples of bats for genetic analysis to estimate the population size. The project was conceived as providing information on which to develop a program to halt the perceived decline in the size of the population.

BACKGROUND

Let us go back a bit for a frame of reference. The ghost bat has always been fascinating, almost a creature of legend. Ghost bats are amongst the largest microbats (*Microchiroptera*). They are carnivorous and adults weigh between 130 and 160 g. Their food consists of birds, bats, small mammals, frogs, geckos and large invertebrates such as beetles, locusts, spiders and centipedes (Churchill 2008). Just as eagles and owls are the large predators of the bird world, ghost bats fill the top-level predator niche of the bat world. The Mt Etna quarry battle started in the 1960s and it was based on saving the caves, their contents and the bats, of which there were at least four cave-dependent species as well as the ghost bat.

I first observed ghost bats at Tunnel Creek Cave in the Western Kimberley. We entered the cave at the downstream entrance and a couple of ghost bats greeted us with a chatter and as we went through the cave the bats retreated to a new vantage point, chattering away, announcing our presence to others. They retreated up a side passage near the roof collapse in the middle of the cave. I have become more familiar with ghost bats since 2005 with the VSA expeditions to Pungalina which found and recognised a new breeding colony there. Totem Pole Cave is the maternity cave



A ghost bat (Macroderma gigas)

but small groups of 2-3 bats are seen in a number of caves spread across 40 kilometers. There are feeding roosts just inside a number of cave entrances.

Caves with fossil evidence of ghost bat colonies are known from Western Australia and the Northern Flinders Ranges. The ghost bat has been disappearing from the southern part of its range in Australia. In

historic times, Jurien Bay Cave, WA, has ceased to be used due to human interference. A colony formerly using a cave in Central Australia has not been present for a number of years (Churchill 2008). The Mt Etna and Cape Hillsborough populations in Queensland have reduced populations, although further north in Queensland the populations appear in good condition. The

PROSPECTS FOR SURVIVAL OF THE MT ETNA GHOST BAT POPULATION

Mt Etna colony was shown to be reproductively isolated from other Northern Australian populations by means of genetic analysis (Worthington-Wilmer *et al.* 1994). This distinction gives the Mt Etna colony a high conservation value now that the population is recognised as distinct with little or no breeding interchange possible with ghost bats further north in Queensland. There is evidence from the fossil record that the Mt Etna caves have had ghost bats present for at least 500,000 years (Hucknull 2000; Martinez 2010).

John Toop was a caver and scientist who worked for Queensland Parks and Wildlife and it is extensions of his work on the Mt Etna ghost bats which form the basis of current research. John Toop's studies showed that the population had declined dramatically from the estimated 450 bats known in the mid-1960s (McKean and Price 1967) to 150 bats in the mid-1980/90s (Hoyle *et al.* 2001, Toop 1985, Toop unpub.). Speaking Tube Cave on Mt Etna was used as an acclimatisation cave for pregnant ghost bats because its temperature exceeded 20°C. Despite court action and protests over the quarrying, the cave was damaged by blasting in November 1988 and again in June 1989. The maternity site for the population is Johannsens Cave on Limestone Ridge. Limestone Ridge is part of the Mt Etna Caves National Park. Johannsens Cave has a gate and seasonal closures to protect the maternity colony. Lower bat numbers have led to the current research that the ASF Karst Conservation Fund has been supporting.

THE MT ETNA GHOST BAT POPULATION AND HABITAT STUDY

This study is titled 'Tracking and Tracing Central Queensland's *Macroderma*—determining the size of the CQ ghost bat population and its key foraging habitat'. The Fitzroy Basin Authority funded the GPS collars, the ASF Karst Conservation Fund funded the laboratory genetic studies and the project was hosted and sponsored within the Queensland Parks and Wildlife Service. This study was based on capturing the bats, microchipping them and taking tissue samples for genetic assessment. The mist net trapping and capture work was supported by a number of the Mt Etna cavers including Noel Sands, Clive Kavanagh and Luke and Nathan Berrill.

Early on it was apparent there were only a few bats. This was despite a search of the known ghost bat caves in the Mt Etna-Limestone Ridge area. A total of 35 individual bats were caught, marked and sampled during the 2011-13 seasons. Tracking has been done using radio transponders glued to the bats' backs. This showed that the bats

ranged several kilometres, some of it to the north across agricultural land and flew very low, which highlighted the risk barbed wire fences might pose to the flying bats. The study plan was to attach GPS collars with a Bluetooth capacity to bats. When the bat flies out of a cave the units collect and store positional flight data. This data is retrieved by downloading it to a laptop computer in proximity to the roosting bat in a cave. Results for the only bat tested so far revealed that it ranged considerably further than was known from the radio tracking data. More such information is needed to understand the foraging habits and range of the bats to fully implement meaningful measures to protect the population.

The genetic analysis was directed at determining the population size and degree of genetic diversity based upon the nucleic acid sequence of the mitochondrial DNA. The ASF Karst Conservation Fund money was used to support this genetic work. This ongoing genetic work suggests that there has been population decline during the last century and a lowering of genetic diversity. The genetic data was analysed using algorithms to predict the population size. These indicate that 30 bats is the upper population estimate for the Mt Etna population. Such a small population is below the conventional 50 needed to prevent inbreeding depression or the 500 needed to maintain evolutionary potential. Ghost bats only live for around 4-5 years, which means that disturbance during the breeding season could have a significant impact on their population size. To reduce human disturbance to the bats the Queensland Parks and Wildlife Service (QPWS) installed locked gates at the entrance to Johannsens Cave in the mid 1980s, and closed roads and recreational areas in the mid 2000s.

FUTURE RESEARCH AND PROSPECTS

This project has only just begun to fulfill its objectives. The genetic analyses need further work before publication. The GPS tracking data from one bat demonstrated the capacity of the units to give detailed information of foraging range. The project was aimed at identifying the foraging areas of the population so that a better appreciation of what interventions might be useful for the population. The Mt Etna ghost bat population is in serious jeopardy given its low numbers, its genetic diversity, climatic factors and perhaps the changes to its habitat from the expanding Rockhampton population.

The proponents are now looking to extend the project through funding from the endangered species component of the

Federal 'Caring for Country' program. The project would study the Mt Etna population and also include the Cape Hillsborough population that has also been in decline. It is intended to include studies of migration levels between populations to better understand the population vulnerability. Threat mitigation activities may be undertaken to protect the populations and this might include fire management measures, pest control and managing site access to avoid roost disturbance. ASF has supported the project application but no grants were made in 2013.

CONCLUSION

The Mt Etna ghost bat population is extremely small, has a narrow genetic base and appears to be reproductively isolated from other ghost bat populations in Northern Queensland. It is important that further research is undertaken to understand some of the critical factors for its continued survival. These may involve further habitat protection in the foraging range, stricter control of access to particular caves and other appropriate measures. ASF has made an important contribution to the present research and should consider further support for research on the ghost bats in Queensland.

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JF-382 Dissidence

The cave that keeps on giving

Alan Jackson
STC

I'VE PUBLISHED two accounts of exploration in this marvelous Tasmanian cave in previous issues of *Caves Australia* (Jackson, 2008 and Jackson 2012a).

Over those two periods of exploration the cave jumped from a minor pothole to a major player in the Junee-Florentine karst area. True to form, Dissidence recently gave us another dose of cave exploration fever.

But first, an aside.

The Canberra branch of the Southern Tasmanian Caverneers has been getting pretty active in the last couple of years, led by the enthusiasm of Mark Euston. Despite numerous attempts by the fickle Tasmanian weather to freeze his appendages off, he keeps coming back (though he doesn't camp out in the rain and snow as often as he used to).

I've been doing my best to keep him entertained with good sporting caving that also ticks off jobs on my list of projects and leads.

One of these projects was to find out just how close Dissidence and Frownland (in Growling Swallet) got, since Frownland was never surveyed (and rarely visited) since its discovery back in the 1980s. In December 2012 Mark came down with Phil Maynard (SUSS) and Laure Gauthiez-Putallaz (French-Swiss caver studying in Canberra) for a four day weekend to follow up some unfinished business in Pendant Pot. I seized the opportunity of a competent team to knock off the Frownland survey. Although we didn't complete the survey, what data we did gather proved both interesting and disappointing (Jackson 2012b). The streamway trended south instead of continuing NW (refer to Figure 2) and did nothing to close the gap between the two caves, but some hydrology theories from the '80s have resurfaced and there is more work to be done in the area.

In early 2013 I started yearning for Dissidence again and we organised a

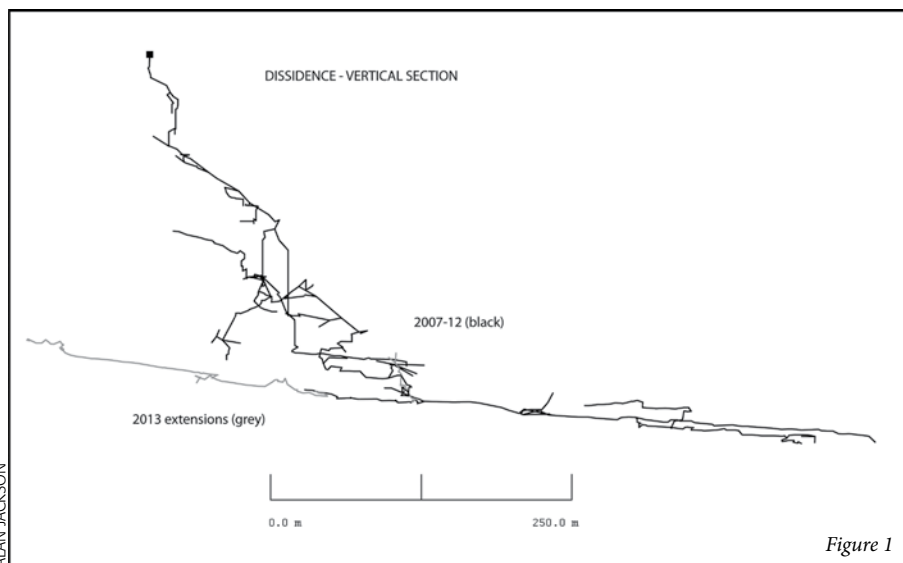


Figure 1

late autumn return to push remaining leads. Knowing the JF in May was going to be unpleasant we made the smart move of renting a house in nearby Maydena rather than camping in the mud and the snow. With the promise of warm showers and electric heaters, a core team of five was lured down: Mark Euston, Andreas Klocker (Austrian of no fixed abode but keeps gravitating back to Tasmania – he's not as stupid as he looks), Andy McKenzie (Dissidence isn't Dissidence without him), and Peter MacNab ('Snablet' – a Pom living in NZ who Andy knows through his Vietnam expeditions).

Day 1: First order of business was to rig the cave, then we split into two to assess two of the leads higher in the cave. Andreas and I finally put to rest the 'undescended 8 m pitch' at -130 m that had been put off since 2008. Once the pitch head was widened it was a short-lived exercise, with the base of the pitch terminating in a 100 mm wide slot taking the stream. The others spent their time assessing the merits of my proposed bolt climb/traverse in the For Everhard series and had come to the conclusion that it was worth the effort.

Day two: Snablet and Andy tackled the traverse while we three others headed

further down to work on the 'old' deepest point at Quiet Desperation (-284 m) and then have a crack at upstream Green Dreams (a low wet point in the upstream extensions pushed at Easter 2012). Mark proved to be thin enough to avoid the need for digging equipment and pushed the squeeze at Quiet Desperation.

It proved to almost connect to the main 2011 streamway extension but was blocked by rockfall, so we moved to Green Dreams. Mark prised a few cobbles out of the streambed and slipped through the wet flattener, returning five minutes later to say that it went for a bit but looked like closing down in rockfall.

With that unenthusiastic analysis Andreas couldn't bring himself to get wet (and potentially wedged) in the flattener, so I headed through to survey what Mark had found.

We saw Andreas four hours later after exploring and surveying over 300 m of delightful stream passage, having found a way through the small bit of rockfall that had initially looked terminal. Much of it was easy walking passage (~3 m high, 2 m wide) but it became progressively lower and lower as the sediments and cobbles that had clearly totally filled the passage at

JF-382 DISSIDENCE — THE CAVE THAT KEEPS ON GIVING

some point in the past started to win the battle.

We left a marked station in a 40 cm high wet crawl and headed back for food. Needless to say, Andreas was pretty cold and miserable; I still can't believe he waited for us.

On our way out we crossed paths with the other two at the usual traffic jam spot of the 42 m pitch. Their epic bolt traverse had achieved its target by climbing up the narrow meander before Smooth Operator pitch to gain ~25 m and then pendulum traversing over to the far side of the chamber to access the alcove and potential fossil passage continuation (the direct route/climb from the chamber floor was very overhanging and deemed not feasible). Unfortunately it wasn't a fossil continuation at all; rather a side-swirl of an inlet passage. At least the lead was ticked off and wouldn't haunt me for the rest of my life.

We had a bit of a rest day on day three. Andreas had a meeting in Hobart he couldn't miss, Mark lazed about the house and we other three had a tourist in the first kilometre or so of Growling Swallet.

Day four saw enthusiasm for Dissidence on the wane. In the end Andy and I headed back in to push the upstream lead from day two, as well as some aid climbs at the start of the 2011 extension (Euphony), while the other three (Andreas skipped work again) opted for a change in scenery, pushing JF-463 Constitution Hole – a find from earlier in 2013 that had wide open pitch leads that no one had bothered to get back to (more on this cave in a future CA, but at the time of writing it is over 2 km long and still going).

Andy and I did a series of aid climbs off Euphony chamber but didn't get anywhere overly interesting. We then soldiered up the stream.

We opted to explore first and survey on the way back, but only if it got a bit bigger and went any significant distance. The low wet stuff proved to be relatively short-lived and about 90 m of new stuff was pushed. We commenced the survey and turned for home at a collapsed inlet (lots of dolerite fill material) where I'm sure two minutes of shifting small rocks would have allowed us to get further but enthusiasm was lacking; you have to leave something to muse over to inspire the next trip.

The other group stumbled into the car-park ten minutes after us with broad grins on their faces, having surveyed a couple of hundred metres of new stuff and with wide open leads in all directions in Constitution Hole.

Day five was a non-event. Andreas and

I returned to the drudgeries of gear cleaning and work while Mark flew back to Canberra for the same. Another of Andy's mates (new to caving) turned up that day and the three of them toured in Growling again before derigging Dissidence on day six.

The rest of the trip was spent cleaning kit and a jolly through Kubla Khan up at Mole Creek to prove that not all Tasmanian caves are muddy, vertical and devoid of decoration.

Dissidence has given once again, with 490 m of new passage explored and surveyed. Nothing exciting in the 'downstream' direction but all good new stuff and empty spaces on the map filled with survey data.

The system didn't get any deeper as a result of our efforts, nor closer to a connection with Growling Swallet, but it is now 3,455 m long. The main upstream extension followed the usual JF passage orientation (NW-SE – along the strike),

and, interestingly, is heading straight for the area of Constitution Hole (though there's a fair gap still). Figures 1 and 2 indicate the extensions in plan and vertical section views.

A detailed final survey was published in *Speleo Spiel* 398.

So, is Dissidence finished this time? No, don't be ridiculous!

The remaining known leads are all grottier and further from home than ever before but they're still leads, and if this cave's exploration history is anything to go by there's always more passage around the corner.

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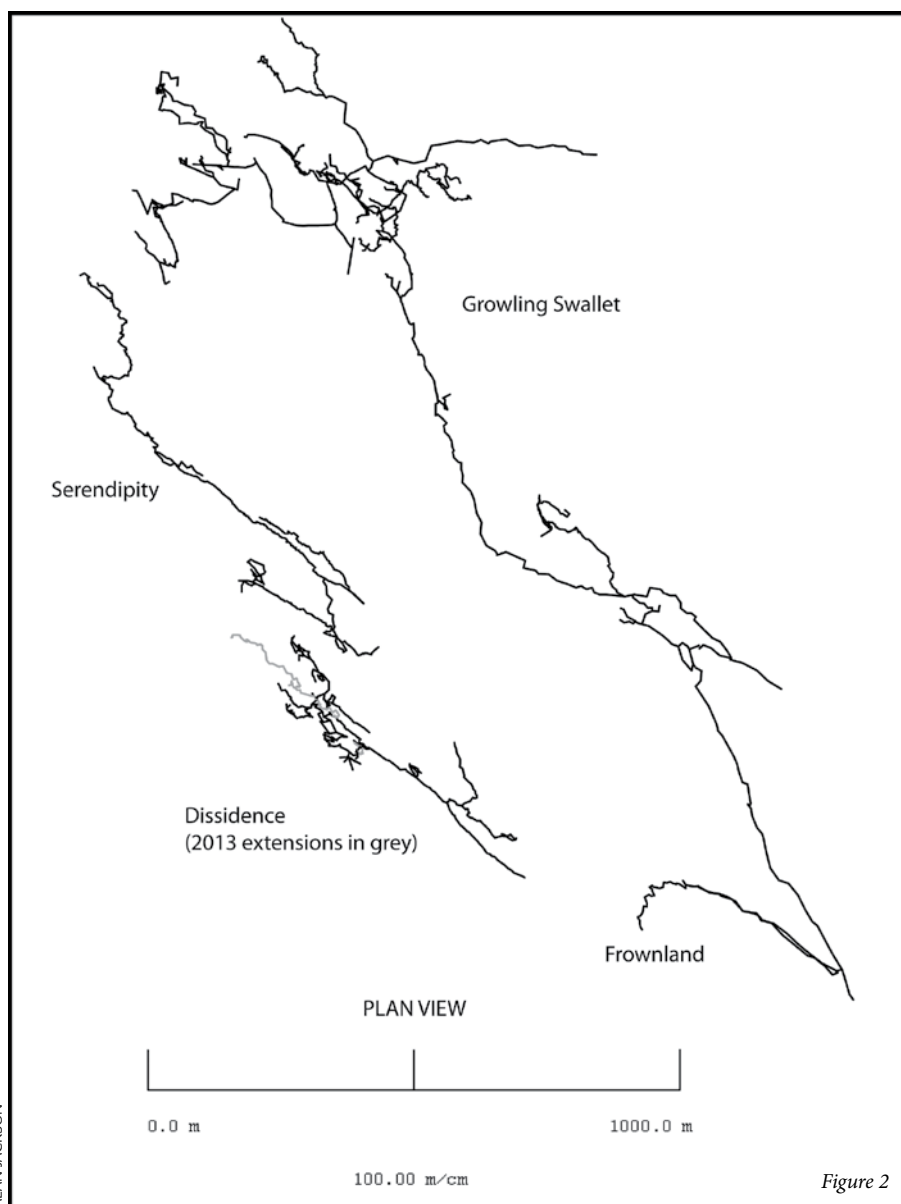


Figure 2

Below the Ringing Plains of Windswept Cooleman

Keir Vaughan-Taylor
SUSS

SUSS TRIPS IN YEARS 2007–2012 AND 2013 AUSTRALIA DAY

People involved: Michael Bates, Katrina Badiola, Nicole and David St Vincent Welch, Ian Cooper, Deborah Johnston, Mark Euston, Andreas Klocker, Bill Lamb, Lauren Harmsworth, Rowena Larkin, Pina Luzzi, Phil Maynard, Rod O'Brien, Megan Pryke, Alan Pryke, Mel Stammell, Denis Stojanovic, Al Warild, Thomas Wilson and the infamous author: Keir Vaughan-Taylor.

Apologies to anyone left out. Special appreciation to NUCC cavers.

NOTE

National Parks do not use apostrophes in place names to indicate the possessive, for example, Nicoles Gorge Walk. This article follows this convention; however, speleologists know the correct usage is Joe Jennings' Walk. Keith's Faint Hole is an exception, because Keith actually fainted and owns his Faint and this is the way the Keith's Faint Hole's name appears on cave maps.

OVERVIEW

This article is adapted from numerous SUSS Cooleman trip reports from 2007 to 2012, culminating in a more explicit description of our seminal trip on the Australia Day Week 2013. Key sites were explored, finally revealing new passages and geological wonders. We have surveyed hundreds of metres of new underwater and streamway passages each trip, thus changing our original theories of the hydrology.

The path and character of the hydrological passages are surprising. Underground rivers thought to be sections of the main river defy expectations, presenting instead as separate river courses. We hope to identify and survey converging tributaries and new rivers sourcing from the array of obscure cave sinks and dolines, many on the edge of the limestone plateau.

Most of our investigations cover areas upstream from the magnificent Blue Waterholes, from which all the water resurges in a yet to be discovered configuration. The



KEIR VAUGHAN-TAYLOR

Phil Maynard, Katrina Badiola and Michael Bates sheltering under a rock from hail

underground rivers are mainly walking size passage formed with a few collapses, suggesting we may be able to penetrate to the Blue Waterholes themselves.

At Blue Waterholes the river percolates out of the ground and then flows on the surface, ambling along beside the hills and gracefully turning away from a highly prospective karst valley into a 60 metre high limestone canyon. It is beautiful limestone countryside where caves play a part in the course of the river, especially around the cascading waterfalls. In this area another series of linked caves, both old and new, behave in unexpected ways. New caves are now recognised to be forming a matrix of waterways leading to Easter Cave. In addition to this, there is huge potential downstream from Easter; however, we have only one lifetime.

The following summary covers our probes into two cave areas. One is in the area of River Cave, Glop and Murray, trying to trace water sources and expand the lines representing underground water on the maps so they join together, thus helping to describe the Cooleman karst landscape. The other fertile exploration has been around Easter Cave, yielding sections of new caves and the puzzling assembly of how the water travels, moves and creates caves in this

magnificent place. Diving at Cooleman has, in my opinion, made it the most significant cave site in New South Wales.

SCHRODINGERS, WHITE FISH AND EASTER CAVE

Downstream from Blue Waterholes, the Easter Cave Efflux is an attractive body of water exiting from the side of a cliff slightly downstream from a series of cascades and waterfalls and carrying far more water than appears at first sight. It is a small cave but is part of a far more complex cave system than we realised in our initial Cooleman visits. From the entrance, Easter visitors need to swim ten metres along the efflux channel to a duck-under, then pull themselves 3–4 m underwater along a stoutly placed rope.

With a diving mask the 3.5 m deep channel can be seen to have a slot in the floor connected in parallel below to a secondary 50 cm diameter phreatic tube. In places, you can descend into the lower tube to find it is home to many white fish. They are apparently trout.

Beyond the entrance free-dive, the stream canyon normally escorts cavers to a small, dry cave area. However, the surface hides the true source of the water flow—an underwater hole in the left wall (looking downstream), only visible with a diving

BELOW THE RINGING PLAINS OF WINDSWEPT COOLEMAN

mask. An unobtrusive dive line is now tied just above the water to a small protrusion and from there to a stouter second tie-off under the water in the floor—the true safety belay.

A smooth passage textured with strong scalloping connects through a smooth tunnel to the lake at the back of the cave. Along the way, a number of white fish make their presence felt, sometimes banging into a diver's face mask.

While not spacious, there is sufficient room to move without restriction. The strong current can be overcome by pulling along the sculpted rock protrusions in the floor. Visibility is generally poor, maybe ten centimetres. Ambient visibility is approximately 15 cm, not a lot but enough to see a wall and find a tie-off. In the strong flow

disturbed silt on the walls or floor is quickly swept away.

Our group, free-diving the entrance sump, made its way to the back room lake. It is not far. I have a second-rate point-and-shoot camera, waterproof to ten metres. I took a few pictures and then surfaced unexpectedly in Back End Lake. This is normally the place last seen by cavers—and the underwater passage continues. I can hardly believe this hasn't been looked at before.

Underwater the passage transforms from a rounded, scalloped tunnel into a structure eroded smooth and vertical, splitting into numerous smooth rifts, each trending to several points of the compass. Everything is smooth because there is a strong, ever-flowing current. In flood these confines would be formidable.

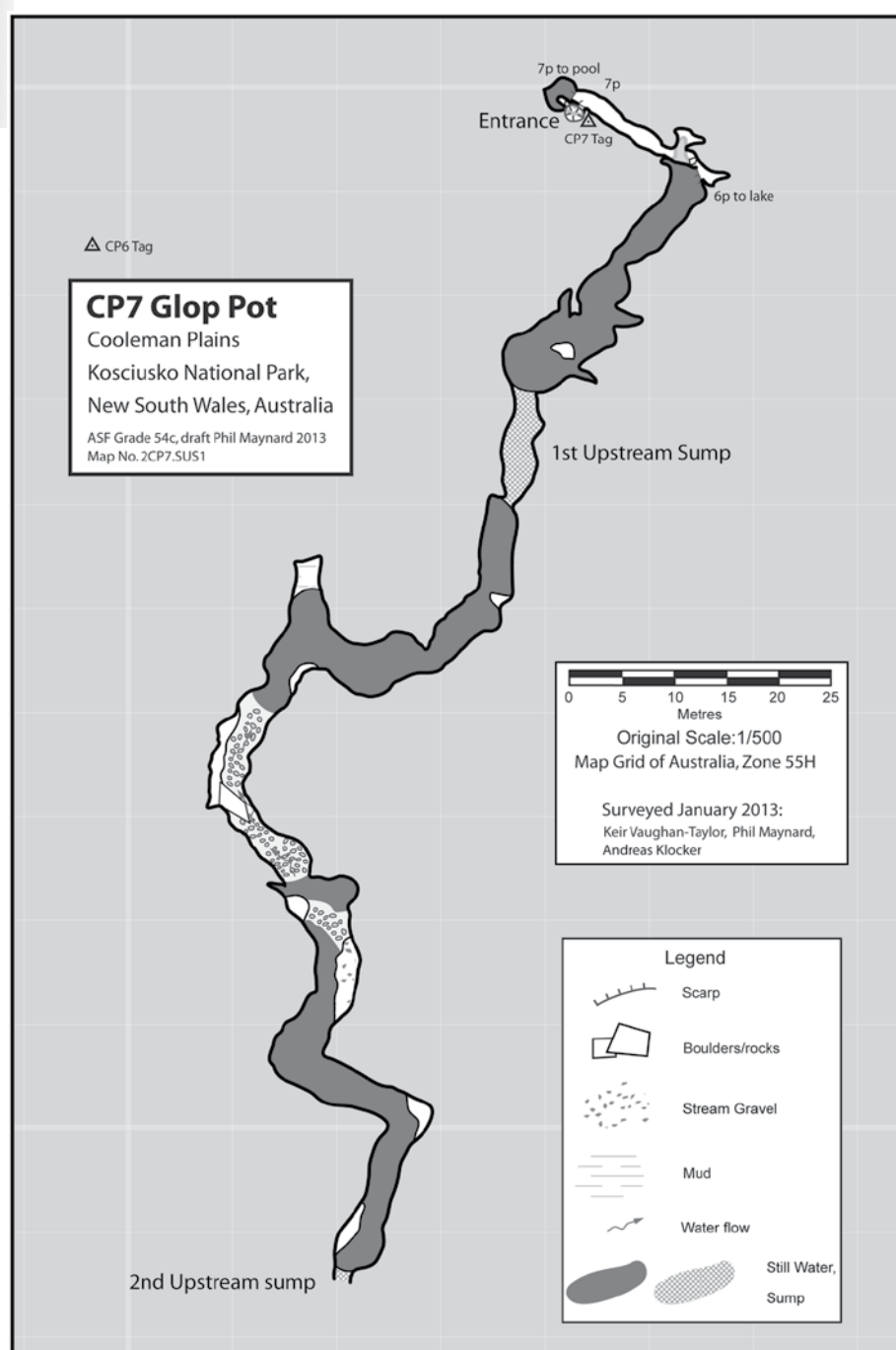
This was only meant to be a quick look-see trip and there was suddenly a significant job ahead. One lead tapered off, ending in a small room, and a couple of others also stopped abruptly. After tying off I returned to the entrance, surprised that we had found such a significant river with so much flow. It was likely to go somewhere new.

It was only a small advance on this trip to Easter. However, walking back to the camp site we were to make a serendipitous find. Someone in the group observed that the volume of water flowing in the river was much less by the time it reached White Fish Cave. We stalked around the cliffside next to a bend in the river where the river volume suddenly decreased. Like a pride of lions, the group was in hunt mode with a definite cave to be found. In the banks of the river a sink was located and a number of small openings. Caves? We would return later to examine this.

White Fish is at the top of the cascades. In normal conditions about half the water in the river plunges out into the waterfalls some 60 m below, ultimately flowing into the distance to meet the Goodradigbee River. It's a great trip to hike to the river junction, marked by a limestone overhang suggesting more limestone caves but it is a long hike to get there. At the waterfall's top half of the river diverts into White Fish Cave, a mini-Tasmanian-style swallet taking water that drops through steep tunnels choked with logs. There are several plunge pools reaching a sump. A swim through a narrow rift connects to dry sections of cave. SUSS has no maps or survey data for Whitefish. Alan and Megan began surveying so that it might be positioned in relation to surveys that we have of nearby caves, and of course Easter Cave, where the water entering White Fish must surely drain back into the river.

At one end is an awkward head-first squeeze that coats you with coarse gravel, presenting an upside-down drop into a room with another sump. It is best to take a tape to help with that drop. The rockpile in the floor hosts largely inaccessible small streams and, on the right, what at first sight seems to be a deep sump. There are small passages leading from the main sump and heading towards the back of the main chamber. Jason, pushing down the sump, was able to raise his hand into the surface of a very small area, which proved too small to follow.

With the sump no longer interesting, Jason squeezed and crawled off into the distance, grunting his way through the rockpile, then disappearing. Uninspired by grovelling, I turned to moving small boulders, hoping to locate the bona fide



PHIL MAYNARD

river that could perhaps just be heard only a short distance into the rocky collapses. Small flows discernibly sighted through the jumble of perched stones were no help in getting to a substantial stream course.

It is amusing that in all the years I have visited, I've never seen these local dry sections being the focus of a dive line through the sump. The short dive may have an in-flow near the start, because in retrospect, 3-4 m into the sump there is a change in temperature, water quality and visibility. The rift leads a little unnervingly through a few log jams to surface in the middle of a large chamber, perhaps 30 m long.

Year 2011

Phil and I retraced the previous Easter Cave dive to the end of the line tie-off at the furthest point of exploration. After trying a number of terminating leads, water flowing from one of the fissures signalled a passage heading upwards. I set another belay at a junction above where Phil was waiting and where more ways to go were apparent. Milkiness in the water makes it difficult to guess which one is the main flow. Finding one possible way, without very much space: a photo of the ongoing realms was later voted to not win a photo award. Nevertheless, my artwork illustrates the nature of the passage and the realm yet to be explored. With guide line securely placed, we have a good exploration point from which to continue next time. It was time to hoick our packs onto our shoulders and trog back up the slippery cascades where we would discover how the others were getting on exploring around the river outside White Fish Cave.

Just upstream from White Fish is a sink at a bend of the river dropping over a small waterfall. The speleological clues seem obvious in retrospect. There is a small waterfall in the river. It meets a limestone outcrop and adjacent to the river are dolines with water. Some very accommodating person has poisoned many of the rose thorn bushes so the banks with the exposed sinks are now more easily found.

Nicole, Dave, Michael and Katrina squeezed into a slot, discovering a significant cave later dubbed Schrodingers. This name provides enormous opportunity for jokes for physicists and chemists, but I suppose it is motivated by my bush walking buddies' ridiculous assertion that the cave doesn't exist until it is explored. For the physicist, the cave exists when first observed. However, the group's philosophers argue it doesn't exist when no-one is there. Care for a chestnut? Of course the assertions only apply to caves. At least we agree on the special place of caves in the universe. For the reader, just go with the

name. When you find a cave you can call it something else. Schrodinger's is a mini cave complex, part of a very interesting set of caves apparently connecting into White Fish. From there we know nothing about its connection to other caves in the area. Alan and Kat spent time surveying the nearby cave, CP92.

The White Fish sump may have an in-flow, but nothing as big as this new capture. The water in this cave somehow finds a path independent of White Fish and possibly escapes again to the river from Easter Cave at the bottom of the waterfall cascades. The volume of water is much greater than that estimated to be flowing in White Fish, and like White Fish there is an interesting and beautiful river passage.

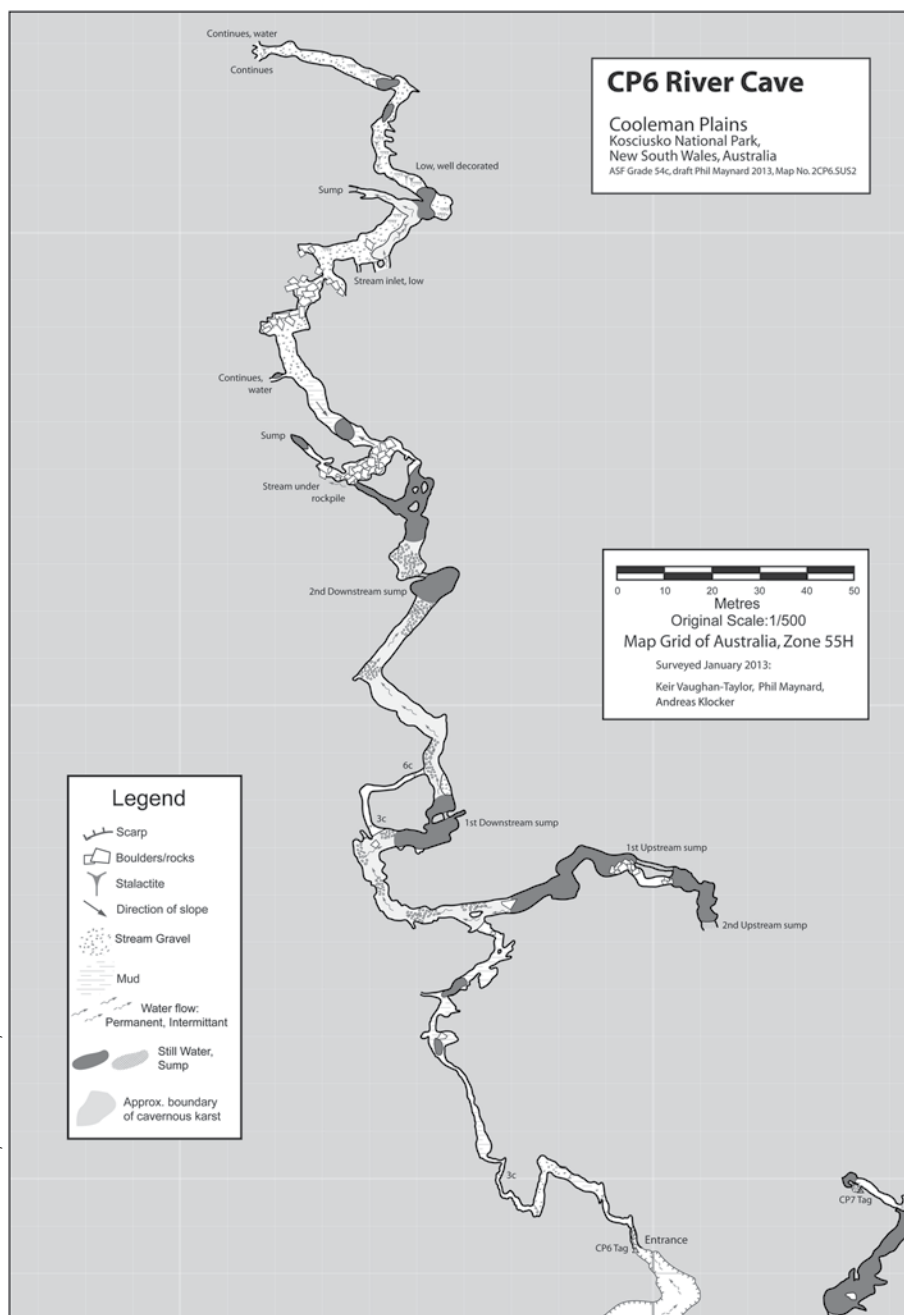
Katrina wanted to borrow a diving mask so she could investigate the onward going sump in Schrodingers. She returned to the

cave and free dived into the sump, making primitive dolphin noises and also a primitive video of the way on, while the group looked on at the mysterious water.

GLOP POT AND RIVER CAVE

This large karst drainage area upstream of Blue Waterholes collects water from the west, south and south-east. There are multiple (number unknown) underground streams and the junctions are also unknown to us.

Glop Pot has a narrow, cave ladder shaft entrance and then a choice of ladder pitches down to water which in one place drops to a twin lake, separated by a low roof. Rod dived the upstream sumps of Glop Pot in our early years, passing a short sump and then another long sump. He reported being unable to find the way on from a final chamber. At the same time, Jason Cockayne



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dived upstream River Cave, reporting considerable passage in which he didn't leave any line. Within cooe of the Glop Pot entrance is the slotted climb down into River Cave's entrance.

Year 2010

Jason and I returned to Glop to follow Rod's orange line, discovering that it spanned hundreds of metres upstream. There is one short sump, followed by 80 m of walking passage, then another sump, maybe 60 m long and surfacing in a pure white marble room. There is nowhere to get out to sit, although there are blades of limestone just below the surface that are equally rest proof, leaving no option but to float in very cold water. There is one exploratory line dropping into a rift and surfacing back in the same chamber. Exploration revealed that there was not a way on. There is a pure white 75 cm wide tube in a side wall from which a stream drops as a small waterfall into the lake room. This flow is not the full water flow. The tube is wedged with many rounded 25 cm white marble stones, around which water flows. Upstream from the White Room is yet to be found.

Jason's upstream lead should make the connection to Glop Pot and so we set out to join the not-too-distant caves. I placed line in and out of various pillars and passages. The last of three air surfaces would become our 'return to' rendezvous point.

With my reel emptied, I returned to an air bell where Jason waited, perched out of the water on a near surface limestone blade, keeping just a little warmer. It was his turn to rig line on from the furthest final tie. Jason connected to my last exploration point and moved off from there, enduring the usual limited visibility. Dropping to 14 metres, a dyke where the river has burst through marked my last tie-off. Jason moved from here up the silt floor where its upward slope made it clear the floor was rising to a surface, but he was almost out of guide line.

He was only just able to surface with his reel at arm's length underwater. His head was just able to broach the surface. He could see a large chamber. Getting cold by now, Jason needed to retain the line to the outside world but he could not properly examine the new chamber. He tied the end of the guide line to a dive weight, then dropped the weight to the bottom at the furthest point and returned.

His later report in our cold rendezvous station was frustratingly tantalising. "Well, is it Glop Pot?" Half-frozen, he chattered, "I d-d-don't know. It looked a bit like the Glop chamber". Back in one of the return air bells it would seem so easy to reload new line in

the reel and push further. The reality is that we are restrained from exploits of bravado by the chill grip of Boreas, the Greek god of cold. The Greeks had a god for everything, although Boreas was really to do with cold wind. No regrets; back at the campsite we drank to our successes. With the entrances of River and Glop caves separated by about 25 m, it seemed to our group inevitable that the fairly large stream in Glop would soon connect to the equally large stream in River Cave.

On each trip to River we walked the grassy plain with our tanks, wetsuits and gear roughly packed and carried on our backs. We noticed spiders nestled in tussocks, amazing creatures we later identified as Musgrave's Alpine wolf spiders. Spirited brumbies grouped in suspicion and eyed us cautiously for a brief time before moving off. River Cave entrance is at the end of a blind valley, possibly once capturing water flow in the valley, geological time ago. Maybe it still flows a little now in intense rain events. All the real water action in this epoch is underground.

At River Cave entrance, kitted, I announced with confidence we would connect Jason's last find to the surface and that this would be Glop Pot. Either it was Glop Pot, or it was Parallel Universe. I took a small waterproof camera, good to 10 m. The maximum depth is 15 m, so I encased the waterproof camera in a watertight container just to make sure it survived the upstream depth pressure. Michael Bates accompanied me as my dive buddy.

The slotted River Cave entrance is a climb down, dropping into low passage. It snakes its way into a squeeze drop and thence along muddy passages, where it soon finds the underground river. It usually takes ten minutes to get organised for a hands and knees crawl up and into the river where it is soon deep enough to swim.

The passage surfaces in two airbells along the way. At the opposite end of the second bell the passage submerges to about 12 m depth. Upon finding the end of the line where Jason last tied off, I connected the guide reel line and set off. Soon after, there is a steep rise in the floor where lake pendants and dykes re-characterise the environment. It is difficult to say for sure because the visibility is always a blurry 25 cm. Following up the floor, we surfaced into a large chamber. This time I had plenty of line and I laid it along the left wall, fixing at two key places and staging one in position for the suspected way on back under water.

This chamber was not Glop Pot. Instead, it is some parallel universe. While similar to Glop's twin chamber, this parallel universe is bigger. The above-water chamber is 25

m long (see sketch) with an enclosed roof. Although there are places on the side where a diver can sit, there is no place where a ladder might access the water from above. The structure of the limestone is similar to the earlier parts of River Cave, with basalt dykes in a fragile stage of decomposition protruding from the walls. Michael and I eddied about trying to find a way on while taking photographs with a flash, spoiling each photograph with a hundred globular blurs. Foggy back-scatter is not a friend of flash photography.

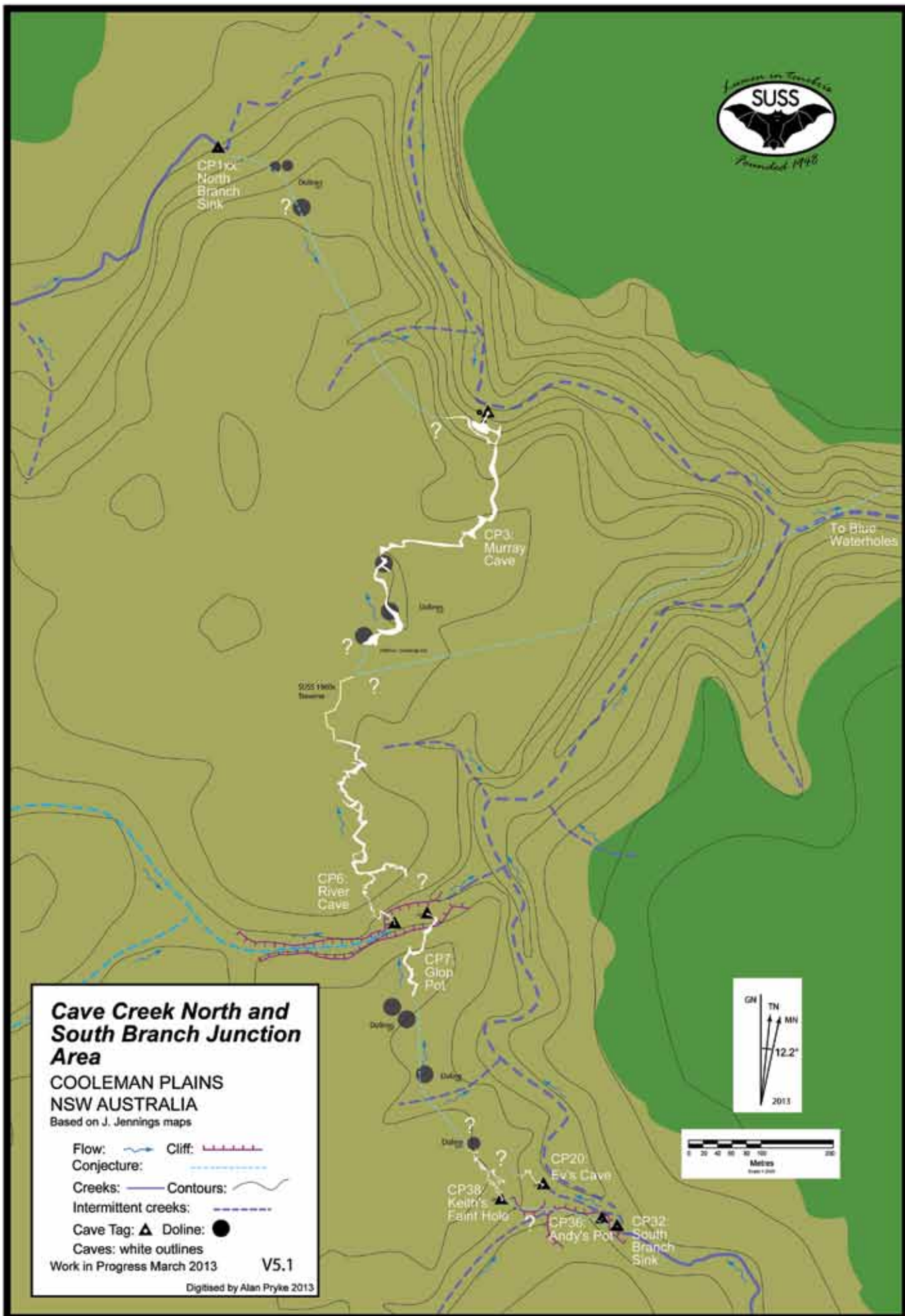
By some lucky reading of the passage we guessed the position of ongoing passage. It descended steeply into an elliptical, smooth phreatic passage, gradually enlarging to 2.5 m with a floor of 1 cm river gravel stones, perhaps laid out 1.5 m wall to wall. As it went deeper, it grew bigger and I ran out of line, so it was time to turn round. In reality we approached our limits because of the cold. The goal for the day had been to get into the mystery chamber and determine if this was a Glop connection or not, and we successfully achieved this goal.

Upstream from Glop's lake, hundreds of metres of walking and wading knee deep in river passage led us to think that this was the main drain. However, it may be that this is a smaller and separate tributary because the water volume flowing across the gravels of the walking sections seems less than that of River Cave. It still seems that there should be a connection. In the poor visibility a stream could join just about anywhere on the path along the placed dive line without having been seen. Parallel Universe and the underwater approaches are estimated to be heading upstream towards the east, making its path in a different direction to any of the other known caves and section of river.

Year 2011

We needed more people to help if we were to put a team of three into River Cave. The idea was to spread the cave-diving expertise through a larger group, ready for later surveying. A NUCC team was going to help but they, of course, wanted to engage in walks and other such activities. There is a lot to do at Cooleman. We carried our diving gear in packs for three persons across the plain to River Cave for a dive, helped by our caving colleagues from NUCC.

Inside the cave at the underground river's edge, we strapped hoses and regulators onto the tanks. We realised there was a missing yoke-to-DIN converter for one of the regulators. It had somehow been left back at camp. I need to replace the yoke valves on the tanks but that is yet another expense. The problem meant no diving that day. After working all week and then





ALAN PRYKE

Mel Stammell exploring Keith's Faint Hole with Alan Pryke



KEIR VAUGHAN-TAYLOR

Glowworm thread features in Glop Pot



KEIR VAUGHAN-TAYLOR

Phil Maynard unpacks disto X on the other side of Glop Pot sump

nine hours coaxing an ailing car to the Blue Waterholes it seemed that little things were not going right. A little recovery time back at camp was advisable to make sure gear is properly organised. Recovery time—I wish.

Emerging from below ground, inclement weather presented as a dramatic series of electrical storms. Sequences of lightning and thunderclaps motivated our retreat to camp but through the valleys rather than across the lightning-struck ridges. Rain bucketed down, forcing us to take shelter under a slight overhanging cliff, which turned out to be hosting the sink into Evs Cave. Recent big floods had blocked the entrance with newly upturned boulders hurled by unimaginable force into the

entrance along with logs and debris, leaving watermarks at least four metres above river bed level. Our stormy weather seemed to be considering a repeat demonstration. Rain eased and then hail. Despite a lot of rain the bed of the river at this time was dry as Kat, Phil and Michael vied for the most comfortable position under a very space-limited boulder. Mel and Alan recognised that smashing white golf balls were a reason to squeeze in and out between the debris, seeking Evs' protective roof and possibly a cave to be found. You just can't keep a good man or woman down. In these conditions a substantial breakthrough was a plan with risks. For me it was good enough that Mel and Alan were able to get in, but for

today that was enough. The storm moved on but other storm cells approaching in a line from the south bid us a hasty retreat to camp along the Joe Jennings' Walk, with the upper plains taking many lightning strikes. That night storms and rain dumped a lot of water into the caves that was to make the next day's dive difficult. By early morning the rains had passed and we had an advantage with our gear already stacked in River Cave. The difficulty was struggling into our wetsuits. I think my suit is shrinking but everyone likes to point at my middle-aged gut and laugh.

Gear was all where it should be; the river level was markedly higher but the dive was not unmanageable. The guide line



Phil Maynard in Downstream River Cave



Keir Vaughan-Taylor in Glop Pot entrance



Walls, basalt blades and river in Parallel Universe



Paul Lewis, Murray Cave Sump in drought; note the wall of fossils

had, in places, collected grasses from flood waters but remained secure and needed only minor maintenance. The temperature of the water was unusually warm, being about 14°C. Phil, Michael and I made our dive through the first three sumps and met in the Parallel Universe Chamber. I eased into the new lead to place new line from the forward tie-off established on our last trip. While I was gone Phil tried out my camera to get some pictures in the cavern of Michael floating about in the black void. Mostly we captured the essence of the black void.

The water was particularly turbid and underwater navigation instrumentation required a left and right hand to feel

a way on and perceive rocky geometry without sight. The stone walls were mostly smooth, without projections, and the floor was gravelly. As we followed the roof of a downward-trending passage it bottomed out, passing under what felt like highly scalloped arch where the river had reached the bottom of a phreatic loop. I attempted to find a rising passage and made my way into a rift that rose into a blind, water-filled aven. I could only tell this from feel and had to reverse along the passage and back into the chamber just downstream of the arch. It had been too soon to try going back up again and it was time to go back. I would try again tomorrow. In the chamber I could not find a place to tie off and was obliged to

return without marking the furthest point of exploration. We all returned to the start of the cave and returned to camp, taking the tanks which needed to be refilled. That was all of them.

While we were diving Mark, Mel, Alan and Kat located Keith's Faint Hole. The initial entrance pitches are tight, taking a number of hours to negotiate. They surveyed the extent of the cave, pushing right to the bottom and documenting its extent for the first time. The bottom of the cave, as can be seen from the photographs, is likely to be one of the main water inlets to the main Coolman River. The hydrological role of the two caves, Keith's Faint Hole and Evs Cave, is that both deliver water to



Michael Bates in Schrodingers Cave prior to river collapse



Glop Pot pitch with diver in the water



Murray Cave sump in drought

the main known caves either in series or as parallel tributaries.

The next day we tried River Cave again. This time Phil and I dived. Michael helped to carry gear. NUCC began the process of packing up to leave. Phil had to leave the next day to go overseas, so this would be our last dive. Alan and Phil were to re-survey River Cave to be consistent with our current survey data and also to later link in surveys of the underwater section that we hope to do in the future.

We retraced the guide line to the lake chamber now known to be Parallel Universe. Phil waited on a mud bank while I set off to push the passage further, with the goal of fixing a line at the furthest point of exploration. The difficulty lay in finding something to tie off onto. The turbidity was much the same as the day before, but this time I followed the floor for clues in the darkness as to where the passage may continue. The railway-shaped tunnel has plenty of room, which I estimate to be 1-2 m wide. With smooth walls all around, finding something to tie guide line to is a

problem. At 14 m depth, near the floor, I found a small vertical projection to tie off. Exploring outwards, I found this point is on the upstream side of the arch. Following the floor I found an upward going canyon along the left wall that ended in a blind aven. The aven was possibly the same one as last time but it is difficult to say. Returning to the tie-off, I disconnected the reel from the fixed line and returned to where Phil was waiting.

The growing length of the dive was requiring more air. I was approaching the full third out of each twin 7-litre tank for the inward journey but also I spent time improving line configuration. Deborah and Rod both used much less air and returned with a bigger surplus. The current smaller tanks will be appropriate for another push trip but if much more line is placed it will be necessary, at least for me, to use larger, heavier tanks and that means greater difficulty backpacking them across the Cooleman Plain.

Alan and Kat returned from surveying CP92 in the Easter Area. New passage

was found and an excellent map has been drafted.

MURRAY CAVE AND CLIFF CAVE

Cliff Cave is an easy, beautiful cave with predominantly walking passage. Although meant to be a simple walk-through passage that terminates, I was interested to visit a back section through a squeeze, since this is apparently an outflow cave. Sure enough, here is another active sump occasionally overflowing in the same way Murray Cave does but with a much bigger and cleaner passage leading to the outside world. The squeeze prior to the sump is a challenge for me. Nevertheless, the sump is calling to us and soon we will have to make the effort. At worst, I can help someone else to do an exploratory dive.

The dry valley outside Murray has some really fine fossils. Usually you can only see crinoid stems but with a little looking, stones in the creek bed can be found containing sections of fairly rare crinoid flower tops. Back in 2007 our whole team visited Murray when a drought had lowered the

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sump so far that the whole team was able to enter what only cave divers can usually get to. We waded through the normally impassable sump, noting thousands of shells embedded in the late Siluro-Devonian limestone.

Murray's vertical slot outflow entrance merges to a passage almost devoid of formation. However, once past the sump, prolific decoration is everywhere, testament to the damage done to the entrance ways. A group of pure white stalagmites hangs in the middle of the passage and right at its root are the names of the early settlers from the late 1800s and then a speleological group, that shall remain nameless, from the 1960s.

Descending a mud ramp brought us to the second sump. It is a triangular passage, normally underwater, but on this trip it was another wading pool. On the other side, the main Cooleman river empties into a pool disappearing somewhere into the wall. A small slot appears to take the water but it's far too small for a person, even Mark. In flood, the river rises up the mud embankment along the passage into the first sump, flowing out of the main Cooleman entrance into the surface river. Towards the back is another short sump, after which the river filters out of a rockpile through which no-one has found a way on. The final room is a big collapse and although there is rock-filled passage on the right, the water comes through rock breakdown straight ahead.

Australia Day Week 23–30 January 2013

This Australia Day week-long trip was one of the most productive of all the trips, resulting in hundreds of metres of surveyed passage. New sections of cave were discovered, surveyed and photographed, helping to piece together the puzzling hydrological relationship in two important cave areas, Easter Area and Glop Pot. All the rivers, both surface and underground, were silted up.

Vivid green algae grow prolifically in the main river as soon as the water emanates from the underground, suggesting a nitrate problem further upstream than just at the camp site. It could be the brumbies, as their population has exploded. A horse will deposit its manure in one place rather than spread it far and wide over the grass it wishes to eat. The trouble is that each horse does the same and dung is piled in hundreds of places along the tracks. I like horses, but there are too many on Cooleman Plain.

You need a couple of days just to prepare for a trip to Cooleman and I left work at the earliest possible minute to get things

done. Phil, our in-house forensic chemist, tested the air from my scuba compressor to make sure it was safe. Oil used in a diving compressor isn't ordinary oil but something highly synthetic that doesn't contaminate air with hydrocarbons. It costs hundreds of dollars for a small container and it was time for a compressor change. The high pressure valves needed to be serviced. I could do the rebuild but I had to pick up parts from an outlet on the other side of Sydney. My diving regulators needed servicing—hundreds of dollars. It may be time to buy new regulators since it's probably cheaper than a service, but ouch—another expense. Oh well, everyone needs a hobby.

I picked up Alan Pryke at Mittagong. His photographic gear had just been stolen from his car so it was up to my point-and-shoot to record any new cave we found.

EASTER CAVE AREA

Full dive kit is heavy to carry, especially when we are in this perfect heatwave weather. Despite the sweat of the day, we would soon experience contrasting cave water, so we needed that wetsuit for which I'd just laid out all that cash. Deborah and I packed all our gear: tanks, weight belts, and several layers of thermals for under the wetsuits.

The gorge is beautiful and the river track climbs and falls on one side of the river over rocky embankments. My shoulders started to get that ache from the weight of my pack and Deborah, carrying the same weight as me, is unfairly young. She made not one note of complaint, in contrast to my bitching about the state of our national politics. Alan will chat about anything and everything. He is a human talk machine, which I mean in a good way, especially when I have to drive back to Sydney.

After White Fish Cave the river cascades over a series of plunge pools and rocky prominences. It could be nasty if you were to fall. With extra caution no such calamity struck, but it was something of an effort. I certainly needed lunch by the time we sat outside the swift currents sweeping into the river from the mouth of Easter Cave. Munching on beef jerky and nuts, I noted that the efflux waters were brown, which did not bode well for our underwater vistas.

We slipped into the river that flows at the bottom of a limestone wall, turned, and surfaced beyond the first short duck under without even turning on our air. Previously placed guide line was abraded and swept out, floating forlornly in turbid waters. Easter's water was seriously silted and uncharacteristically warm. I tied off, once again setting off through a cylindrical underwater passage into the backmost

chamber, with nothing to see at all. In the chamber it was not possible to progress any distance in Easter Cave and I called off the dive, to Deborah's disappointment. She uttered not one word of complaint.

Rather than struggle up the slippery cascades, Alan suggested walking up the valley side to the top and walking around the ridge to White Fish. I think Deborah chose a better path than me, since I sported long rose-bush scratches down my legs, like the motif from *The Matrix*. After stuffing about crossing unforeseen gullies, rock climbs and slippery grass, we regrouped at the entrance of White Fish with me completely stuffed from the effort. I lay in one of the river pools, raising water temperature several degrees. (Honest. I measured it.)

In White Fish it was apparent there had been a significant flood event. White Fish Cave was missing its guide line, swept and tangled in the first sump. Previous line had remained in place for more than 20 years. Normally a simple dive, attempts to lay new line were thwarted by poor visibility and blockages from logs. The small rooms were choked with grasses rent from the hillsides and swept into the underground, and were wedged into log cracks and crevices, waving about like some television hair commercial. Several attempts to pass the sump weakened my resolve, spooked by grassy hands enveloping a previously empty room. White fish were present in numbers, attracted by the light and possibly keen to find a way back to the sunlight. Hard to say, really, since no-one knows what a fish thinks. Fish in Easter can get out any time but choose to live in the dark recesses. Again for the second time, new line could not be laid. There was no water flowing into the entrance of White Fish. The new situation in Schrodingers suggests this may not occur very often from now on.

Schrodingers swallet had changed. Where once a pool formed in the bend of the river and some water penetrated from the back eddy pool of the river into Schrodingers, now the eddy pool is a sandbar over which half the river water flows straight into the cave. Inside the cave, the sump we intended to dive and explore was completely gone, leaving dry passage instead. This was followed into a difficult rock fall with possible leads. Outside on the hill a new shaft has opened, dropping into another section of Schrodingers but was unstable and was not descended.

Alan visited a nearby cave, CP92, discovering new sections and surveying his finds. Maps are delayed because of errors later found in surveying instruments that need to be recalibrated. Nevertheless, these surveys will prove integral with all the other

BELOW THE RINGING PLAINS OF WINDSWEPT COOLEMAN

finds we are making. Rod O'Brien arrived after working at Lake Jindabyne installing large Snowy Mountain Scheme pipe valves. Talk about keen—work all week in some cold deep lake and race to Cooleman for a cold cave or at least a cold beer.

A black snake hurried out of the atrium of my tent on my approach. I decided thereafter to keep the main tent section securely zipped up and to be cautious rummaging in the tent's alcove. That night two mice cavorting in my electrical box scampered up between two fabric sections of the tent and over my head. Perhaps they were what the snake was after.

While Cooleman baked in a Snowy Mountain summer, news came that the rest of Australia was drowning in what many think is the climate change reckoning. Brisbane flooded yet again and Bundaberg also in flood crisis. The sky clouded but potential storms continued on into the north.

The next day was River Cave for Deborah and Rod while the rest of us rigged ladders in Glop Pot. Rowena, arriving about this time, was now part of the group and her help with logistics was greatly appreciated. It was mainly a gear-carrying trip. There was considerable tackle to carry across the plain to River and Glop Pot. The walk is beautiful, with flies made more tolerable for me by continuously swishing my face with a branch from a bush.

Deborah and Rod set out to extend the upstream River Cave dive. Phil, Andreas and I set up the rigging in Glop Pot for a surveying dive the next day. River Cave water visibility was extremely poor. Although the guide line was largely intact, the impact of flooding had dislodged sections and this line needed to be re-fixed. Rod and Deborah managed to safely re-secure line as far as the previous exploration point in very poor conditions. Although the visibility was preventing easy exploration, the temperature at 15°C was much warmer than we were used to at Cooleman. We have experienced temperatures as low as 7°C.

At the furthest point Rod made multiple attempts to find the way on, discovering the same blind passage I had found on previous trips. With persistence, he located a downward progressing passage, extending the distance from the last exploration point perhaps another 15 m. Not very much, but importantly, the main flow passage had been located ready to explore in better conditions on a future day.

Andreas, Phil and I set out the following day to dive Glop Pot. Over two trips we surveyed from the entrance through to the start of the second sump.

The Glop entrance is located about 50 m from the River Cave entrance. Inside are

two 7 m pitches, separated by a crawl tunnel maybe 10 m long and the second pitch looking down upon black water. The sump viewed from the top of the second pitch appears as a single pool but is part of a larger lake chamber separated into two by a swimmable constriction in between.

I was the first diver in the water cognisant that the fixed guide line might not be fixed any more. That was indeed the case. Abraded guide line untidily wrapped round a speleothem was replaced with a more stout orange 3 mm line. I wound the old line up into a ball, stuck it in our pack and set about making forays into the sump with the hope of laying a fresh fixed line. I knew this sump was short, but with zero visibility it took three attempts entering and backing out of the sump to find the way on.

Rowena, free-swimming and keen to make sure no-one was drowning, descended the ladders and finned her way around the figure-eight chambers, accompanying the scuba-equipped Phil. Rowena was, I think, assessing whether this trip was a goer or not. If not, there would be some slightly less than exuberant de-rigging of ladders. I was sure, knowing this sump from a previous trip with Jason, that a way could be found. At least there were no bloody logs and wavy grass. The final trick to getting through was feeling along the river gravels which indicated a main water flow. The gravel surrendered to a frothing silt bank, but to one side a scalloped rock surface completed the directions into the next air chamber. Although I had the perception that I was spiralling to the left, it was actually a straight line.

The guide line was intact on the other side but traced another circuitous route back through underwater fissures, an older path not at all congenial compared to the new blind luck navigation. Andreas removed all this old line, leaving only the new in place. We were easily able to run a survey tape measure through the sump in a straight line, estimating the length, depth and angle. With this reasonably reliable estimate of the sump extent we can connect the survey of the outer cave to the stream way passage within.

Last time I visited Upstream Glop the floor was gravel with a trickle of running water. The gravel was now gone and the passage filled with knee-deep water all the way to the next sump. The flood had removed all the gravel, possibly lowering the sump and enabling the current civilised route into the next chamber.

We went to the furthest planned survey point at the start of the second sump from where we surveyed back toward the entrance. The line in the second sump was

also gone. This second sump is ~60 m long, and in this visibility it was too ambitious to try on this day. I want to get an electronic compass in a waterproof housing to survey this one. That would have to wait until a later trip. Phil and Andreas surveyed while I struggled, trying to get my point-and-shoot to take a half-decent picture.

Many of the photographs taken are poor because of water on the lens, cavern fog and my incompetence. Nevertheless, enough pictures have worked well to give a representation of what is beyond.

RIVER CAVE

Visiting River Cave first in 1967, SUSS was unable to progress far upstream or downstream because of the underground river sumping.

Australia's long drought from 1963 to 1968 destroyed half of Australia's wheat crops, caused the death of 20 million sheep and brought catastrophic loss of farm income. SUSS, returning to River Cave in 1968, set out its usual mad plan, this time to float the river using a raft. They '...found the river was non-existent. It had dried up, leaving only occasional pools and puddles.' We know of this trip from a draft of a letter in the SUSS library that was sent to Joe Jennings in 1969 at the behest of SUSS member, the late Glen Hunt. Associated with the letter is a guesstimate map of the river passage from this trip. The survey bearings were recorded using a Silva compass and distances guessed. Distance estimates totalled more than 1000 ft (or about 300 m) of river passage, but beyond that downstream sump whatever passage existed has not been visited since that time.

I had seen the downstream River Cave sump on one occasion in high water where there was a substantial whirlpool drawing in every hapless object that was sucked into its grip. On previous trips to Cooleman I had not been enthusiastic about a downstream dive. Pushing against the current at Jenolan's Lower River teaches a lesson of caution about diving downstream in a cavalier fashion without sufficient regard for the important return journey. There was so much to explore at Cooleman that downstream River was to me a distraction, although I knew of the 1968 SUSS letter and was intrigued. However, on this occasion the water was low, there was no whirlpool and curiosity is a powerful motivator.

Using a three-litre cylinder Deborah and Rod, with some difficulty, located a slot in the downstream lake. It was a canny piece of work by Rod to locate the position in the lake where the outflow might possibly be. The intrepid pair slotted themselves through a letterbox hole in the side of the

lake, thus re-finding for the first time the cave described by our early SUSS explorers. On the other side, streamway passage similar to the River Cave we all know continues as a river/lake section, entering into small, domed lake-rooms with similarly domed alcoves on each side.

It is evident that the description and map by the 1968 team greatly understates the size and beauty of these passages. There are two connections to a rock-collapse chamber through alcoves on the right side and again on the left along a triangular, water-filled passage that finishes with a climb over jammed river stones. Here there is a climb up to a large chamber of breakdown rocks. After the climb Deborah and Rod found their way into the chamber on the far side to an abandoned river passage containing a shallow pool. They found a second large chamber where the way on appeared to be a long crawl. Deborah, not a fan of crawls in her super-expensive dry suit, chose with Rod to turn round. They were the first to see the 1968 passage since then and the first to see the cave with its characteristic rivers because in 1968 it was all dry.

Rod and Deborah had to leave to go back to Sydney. The next day Phil, Andreas and I went to survey what they had found and see if we could push exploration further. We replaced the orange guide line through the second sump with less visible green polypropylene, fixing the outside end just below the water surface; unnoticeable, unless it is known there is a way on. Surveying through the sump and to the other side we surveyed and mapped our way along the route found by our companions the day before.

There are two connections from the river to the first large chamber, one through an alcove to the right side and another wading along a triangular passage on the left. At the far end of the left passage is a climb over loose, jammed stones and rocks into an upper collapse chamber. A horizontal basalt layer projects out of the limestone in the tunnel and at one point, although small, a delicate insect wing encased in a web casing stood on a piece of basalt. The web material is similar to a glowworm but I have no idea what encased the winged insect in this sealed off environment.

At the last chamber explored by Rod and Deborah, we knew from the map there was a way but it was not obvious. Formed from collapses around the junction of several intersecting streams, a breakdown

chamber seemed to end in all compass directions. The crawl that dissuaded Rod and Deborah from further exploration led nowhere. Andreas scrambled about in the rock breakdown, finding a small squeeze on the opposite side of the cavern from where we imagined the river course might be. Andreas' squeeze dropped back to a stream in a stand up passage often decorated with formation. The stream possessed less water than we experienced in the first passages and so is likely to be another water feed into the river system.

Another small incoming stream joined the main walk-along passage. Somewhere we had lost the main river, but this was brilliant, illustrating that the Cooleman hydrology is made up of many inlets and streams. Unlike the rockfall chambers, the streamway tunnels are well decorated with yellow stalactites, shawls and straws. Stream water percolated across river gravels under many formations and then into a lake with a left-hand bend in the river and a coarse sandbar fully exposed in this low water, referenced in the 1968 map. The ongoing tunnel, exquisitely decorated, finally ended at a small diveable sump and a passage to the left labelled on the 1968 map as 'unexplored left hand branch'. Exploring this, we found a serpentine tunnel with one simple squeeze that terminates after 20 m in another possibly diveable sump.

We surveyed and sketched the cave up to this exploration place (see the map drafts). The 1968 map shows that the sump was dry; it shows a crawlway passage and considerable further passage. The rest of the known cave was estimated at that time to be a number of long survey lengths, totalling more than another 100 m of passage.

CODA

To date we have not surveyed upstream River other than a few rough bearings. The River Cave—Glop map roughly indicates their end points trying to hold hands. The problem is that there is at least 250 m of dive line going upstream in River and still no connection to Glop. If these rivers are separate that is fantastic, because we will have another river of equal size, but I do not yet accept that.

Rod and Deborah's last upstream dive ended in a descending passage, the final tie-off a hammer buried in the gravel. In my opinion, this passage will surface in Glop, but where? We have circled the perimeter of Glop Lake, feeling along the walls try-

ing to find a passage onwards, but to date have found nothing. There is, however, a clue. Finishing a dive in Glop Lake requires climbing a caving ladder to the top of a 7 m pitch. Exiting from Glop, I snagged the buckle of my weight belt and flipped it open. The belt plunged into the lake, watched from a short distance by a floating Phil, waiting his turn for the ladder. He immediately dived after the belt, managing to find it on a clean limestone ledge. This ledge in the middle of the pool may have been a ledge inside our sought-after upstream passage.

My prediction is: the Upstream River dive will continue to descend past the belaying hammer, but then turn up and arise, possibly next to Andy Spate's caving ladder, lost since his adventures with Joe Jennings. The area map shows the old SUSS eyeball survey from the 1969 drought. It is still a distance from the Murray connection, so we need to finish our survey to give a better position. It seems likely that we will connect to the other side of the Murray rockpile and then we will need simultaneous trips into Murray and Downstream River armed with loud voices. No problem there and it will be fun. Glop, in the upstream direction, we think, will connect to Evs or Keith's Faint Hole. Glop's second sump is missing its dive line from the flood and so here we go again. Glop's White Room may connect from Evs or Keith's, so there is no lack of things to do.

Murray Cave is the last we saw of the underground river on its way to Blue Waterholes, and what a find it would be should it connect to the main drain downstream from here. I would have expected the river to trend more to the east but River Cave, Glop and Murray's river section is going not toward Blue Waterholes but instead to the north. In the main entrance section of Murray is a tunnel aptly called the Evil Twin.

Tight, it ends in a sump too small to dive. However, a SUSS trip in 2007 during a severe drought found the sump gone. The Evil Twin Extension crawls towards the north through a series of rockpiles and seems to go on and on.

Found in the last few hours of a trip, it was explored as far as time would allow and not surveyed. The Evil Twin may find its way to North Branch sink, which has recently been exhumed in a flood or alternatively, it could reconnect with our river downstream from Murray and thence to Blue Waterholes.

Scotchtown Cave North-west Tasmania

The discovery of Tasmania's first cave with an assemblage of megafauna

John Wylie
SRCC

ABSTRACT

Within the extensive Smithton dolomite deposits of north-western Tasmania a small area of limestone exists at Scotchtown, some 4.8 km south of Smithton. Through quarrying in March 1942, an infilled cave was exposed that provided the first assemblage of Pleistocene megafauna from a cave in Tasmania.

The feature became known as Scotchtown Cave. It has recently re-emerged as a site of interest because of the discovery of the same type of giant kangaroo remains at Mt Cripps between 2000 and 2005, by members of the Savage River Caving Club (SRCC) (Gray 2000, 2005).

INTRODUCTION

The property on the Lower Scotchtown Road on which the cave was found, was owned at the time by Ray Ollington. In 1942 the quarry was operated by Mr F. Archer to provide lime for the paper mill at Burnie (Brown 1989) as the lime being provided by Fenton's operation at Pulbeena had proved chemically unsuitable for the paper mill's operations (Gulline 1959, Pink and Ebdon 1988).

The working of this limestone quarry resulted in the exposure of a rich deposit of fragmented bones within an infilled cave. Fortunately Mr Archer recognised the potential significance of the bone deposits and ensured that a quantity of the bones



View of the hill where the quarry and limekiln were operating, circa 1942.

was forwarded to the greatly appreciative Queen Victoria Museum (QVM) in Launceston for initial identification (Anon. 1942a, Scott 1942a).

Another first for Tasmania was the discovery within the Scotchtown Cave deposits of bones of *Thylacoleo carnifex*, the "pouched lion" (Anon. 1942a). No remains of extinct giant marsupials such as *Diprotodon*, *Nototherium* and *Thylacoleo* had been previously found in either bone cave breccias or the older alluvial beds in Tasma-

nia (Johnston 1888). It is also interesting to note that the northern part of Tasmania is the only part of the state that had yielded megafaunal remains (Gill *et al.* 1962).

PHYSIOGRAPHY

The physiographic features of Tasmania's north-west are amazingly diverse, with low coastal plains, large inland swamps, and a range of mound springs (Rockcliff and Sheldon 2011).

Since the 1940s, these inland swamps

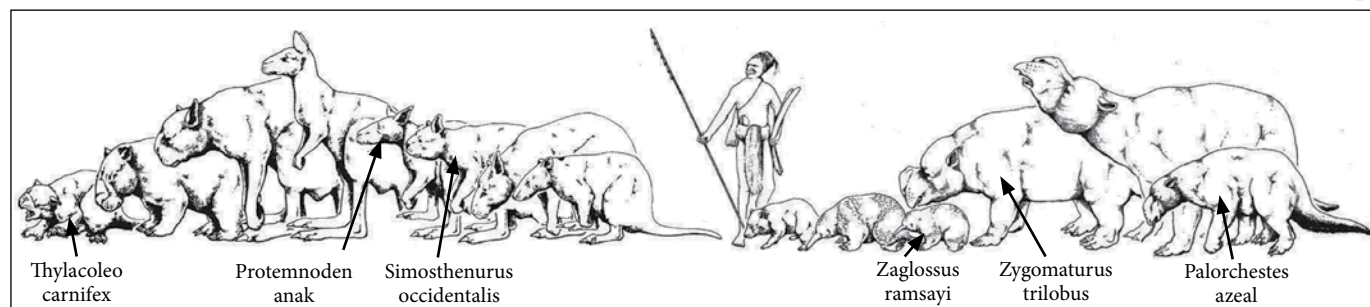


Figure 1: Size comparison of species found at Scotchtown Cave. Reprinted from White and Lampert 1987



The site of Scotchtown Quarry (2004)

CRAIG REID



The limekiln that operated on the south side of the hill at Scotchtown (2004)

CRAIG REID



The site of Scotchtown Quarry (2004)

CRAIG REID



The quarry site with Dean Ollington standing approximately where Scotchtown Cave was discovered (2012)

JOHN WYLIE

have been drained for agricultural purposes leaving only remnant forest with dense heath plains and tea-tree swamps around the fringes. This is like the surrounds of Montagu Caves (Heap 1996a, 1996b). To the south are a series of coastal hills, with eucalypts interspersed with some rainforest species, grading to temperate rainforest and low scrub.

GEOLOGY

There is little mention prior to 1934 of limestone or dolomite in the area. The first mention of lime being obtained was from shell deposits on Hunter Island in 1827 (Meston 1958) and Strzelecki, in 1840, noted the carbonated waters from mineral springs (Stephens 1912).

A newspaper article mentions lime being provided to the VDL Company orchards from the limestone deposits at Scotchtown (Anon. 1917). Fortunately Craig Reid of QVM visited and documented the Scotchtown quarry in 2004, as the present owner has back-filled and levelled off the quarry and limekiln.

This isolated dark grey oolitic limestone outcrop is a member in the Precambrian to Cambrian Smithton Dolomite (Noldart 1966, Brown 1989) and is one of three differing limestone deposits in the Smithton area (Nye 1931, Gulline 1959). A govern-

ment geologist reported that other cracks and caverns, although small, occur in the dolomite in the Smithton area (Thomas 1944).

Recent geological work suggests a middle to upper Ediacarian age (Calver 1996). He detailed the Neoproterozoic geology of the Smithton Synclinorium and how this limestone outcrop did not get changed into dolomite (Calver 1998).

Dolomite, $\text{CaCO}_3 \cdot \text{MgCO}_3$ is less soluble in natural waters than calcite, so it generally hosts fewer caves.

The dolomite karst and the small isolated outcrops of oolitic limestone (Longman and Matthews 1961) in the north-west area have not produced caves of dimensions most speleologists would like, with fewer than 25 caves being documented to date in an area within the Smithton dolomite basin



The Scotchtown limestone outcrop on the Duck River

JOHN WYLIE

SCOTCHTOWN CAVE: DISCOVERY



Scotchtown Quarry: excavating megafauna bones from Scotchtown Cave infill, circa 1942



Queen Victoria Museum staff dig out megafauna deposits in Scotchtown Quarry, circa 1942



Painstaking work: QVM staff digging out bone deposits from cave infill, circa 1942



Bone deposit in cave infills of Scotchtown Quarry.



Bone deposit in cave infills of Scotchtown Quarry.



QVM director Eric Scott and his wife Freda examine a large bone dug from the Scotchtown Cave infills

of some 700 sq km (Baillie 1989). However, a number of caves in the Smithton area have provided some of the best assemblages of megafauna (Colhoun 1989, Murray and Goede 1977; Kiernan 1988).

THE TASMANIAN MEGAFUNA RECORD

Caves are generally stable environments, and when vertical holes develop, these act as natural traps and pitfalls, resulting in animals being trapped and their skeletons then being preserved, leading eventually to greater understanding of megafauna morphology (Hope 2004).

The 1942 Scotchtown Cave discovery was the first Tasmanian cave to provide an assemblage of megafauna, with numerous new species identified by QVM staff (Gill and Banks 1956).

The distribution of the Tasmanian devil and thylacine in SE Australia in the Quaternary was written up in 1953 (Gill 1953), with three plates showing the upper and lower jaw bones of *Sarcophilus laniarius* (now *harrisii*) and *Thylacinus cynocephalus* (thylacine), which had come from Scotch-

town Cave.

These were the first published photographs of some of the bone material collected from Scotchtown Cave.

A list of some of the species identified at Scotchtown Cave, with approximate weights, includes:

- *Zygomaturus trilobus*—a rhino-like marsupial. Weight: approx 500 kg.
- *Palorchestes azael*—a marsupial similar to a ground-sloth. Weight: approx 500 kg.
- *Metasthenurus newtonae*—a large, short-faced kangaroo that browsed like an antelope. Weight: approx 150 kg.
- *Simosthenurus occidentalis*—a smaller short-faced kangaroo. Weight: 100-130 kg.
- *Protemnodon anak*—a long-faced, long-necked kangaroo, like a long-necked browsing antelope. Weight: approx 120 kg.
- *Thylacoleo carnifex*—a leopard-like marsupial 'lion'. Weight: approx 70-100 kg.
- *Megalibgwilia* sp—a monotreme (egg-laying mammal) similar in shape and size to the long-beaked echidna of New Guinea. Weight: approx 10 kg.

Figure 1 illustrates the species identified at Scotchtown Cave. Similar fauna

was found at Mt Cripps; a mandible (lower jawbone) was discovered by members of SRCC in Charcoal Cave (CP118) and identified by Chris Tassall and Craig Reid at QVM, Launceston, in February 2005 as probably being from a *Simosthenurus*, the short-faced kangaroo (Gray 2005).

QVM has recently sorted the skeletal collections from Scotchtown Cave and Mowbray Swamp, where possible, into family groups (Filmer-Samkey 2008). The fauna includes currently threatened or endangered, e.g. the spotted quoll (*Dasyurus maculatus*) and extinct species e.g. the kangaroo family Sthenurinae (Macropodoidea: Diprotodontia). This collection continues to be referenced internationally.

SCOTCHTOWN CAVE: SOME HISTORY

The Scotchtown Cave in-fill exposed by quarrying had dimensions estimated at about 7.6 m x 4.5 m (Anon. 1942a). It created great interest, particularly when added to other megafauna found in Mowbray Swamp in 1910 (Noetling 1911) and the surrounding district (Scott 1915).

With the assistance of the Circular Head Council, the discoverer of the bones, Frank Archer, forwarded some by train to QVM in Launceston (Manning 1942).

The QVM quickly responded and a number of people visited the site on 13 March 1942 to collect for three days (Scott's field diary).

A second trip resulted in further bones being collected and further information about the bone deposits was published in the local paper, the *Circular Head Chronicle*, on Friday 13 March, 1942.

This was during World War II and the content of newspapers at the time was very much on the war. It was so great it made headlines in the local paper at the time. Similarly, the director of the Australian Museum, Dr Walkom, sent a newspaper cutting from Sydney newspaper, *The Sun*, (Walkom 1942, Scott 1942b) to the director of QVM, noting the discovery of a megafauna site and seeking details (Scott 1942c).

Once news of the discovery was printed in the local Smithton paper, under the title 'Marsupial Cemetery' (Anon 1942a, 1942b, 1942c), people in the area became interested, resulting in a number visiting the quarry and collecting pieces from the quarry workings.

This resulted in correspondence between QVM and local people, as the pieces taken may have further assisted QVM to identify additional fossil species and QVM was keen to see or even obtain additional pieces for the QVM collection.

The director of QVM contacted the

head teacher at Irishtown State School, Mr J. Leslie Knibbs, about a pupil's father collecting bones from the quarry and seeking information as to how he could contact the father so he could view the bones (Scott 1942d).

A person who had collected additional bone material from the quarry, a Mr T. Bercheree of Irishtown, was also contacted. Scott visited Mr Bercheree and was able to borrow the material collected (Scott 1942e).

A second trip was organised by QVM on which far more material was found, including a Tasmanian tiger and Tasmanian devil which were far larger than extant specimens (Scott 1942f).

News of the discovery filtered further into society and numerous papers around the country noted the event (Anon. 1942d, Anon. 1942e, Anon. 1942f, Anon. 1942g, Anon. 1942h). In 1947 an article appeared in a Launceston paper including for the first time a photo of two people examining the bones (Anon. 1947). This was most likely because World War II was over.

All the excitement of the megafauna discovery at Smithton eventually waned and the next detailed report on the Scotchtown Cave megafauna did not appear until 1956 (Gill and Banks 1956), some 14 years after the collecting of the bones.

Fortunately QVM took photos of the quarry and the position the megafauna was found in. This was the first time these photos were published.

Edmund Gill compared the Tasmanian tiger jaw with other specimens collected on mainland Australia in 1953 (Gill 1953) and followed with a joint paper in 1956 (Gill and Banks 1956). A decade later Scotchtown Cave was highlighted in a Tasmanian science textbook and some national science curriculum materials (Fish and Yaxley 1966, 1972) because of the megafauna remains.

The cave was incorrectly reported as being in dolomite and many others have made this incorrect statement in subsequent years. Little else has been written on the collection.

There will hopefully be a modern review soon by QVM.

THE SIGNIFICANCE OF THE SCOTCHTOWN CAVE DEPOSITS

Various megafauna species subsequently found around Australia have been compared with the Scotchtown Cave material, highlighting the importance of this collection (Flannery 1980, Smith 1982, Griffiths *et al.* 1991). The megafauna of Scotchtown Cave will always be significant, as it was Tasmania's first megafauna cave site, and continues to be referred to in a broad range



L-R Jodie Rutledge, Craig Reid and Jill Bennett looking at the Scotchtown megafauna collection at QVM



Bones from the Scotchtown collection, QVM



More bones from the Scotchtown collection, QVM

of publications, like *Paleobiology* (Megirian *et al.* 2010) and *Quaternary Science Reviews* (Gillespie *et al.* 2012).

A review of the extinct kangaroo family Sthenurinae (Macropodoidea: Diprotodontia) of southern and eastern Australia showed that species diversity has more than doubled since a previous review some 30 years earlier. This latest review includes reference to the Scotchtown Cave material housed in the QVM (Prideaux 2004).

The ongoing debate on the causes of the megafaunal extinction is a contentious field of research and as there has been no agreement between the scientists in the fields of archaeology and palaeontology, (e.g. Gillespie *et al.* 2012, Cosgrove *et al.* 2010) scientists will probably be debating this for a long time to come. Other sites add to this complexity. For example, in the 1970s an excellent deposit of megafauna was discovered in dolomite caves at Montagu (Murray and Goede 1977, Murray 1978).

The latest Tasmanian discoveries of megafauna at Mt Cripps 2000-2005 (Gray 2000, 2005) by members of the Savage River Caving Club will hopefully inspire others to systematically explore and study karst areas, document all they find, notify the relevant experts and organise field trips to record and possibly explain these finds, just as SRCC has.

In the meantime cavers will keep looking carefully for material of interest that will always be of value, whether past or present, for the scientists to discuss and debate!

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More from the QMV collection

for Jill, Jodie and I to view the Scotchtown Cave material at the Museum.

Thanks to Greg Middleton for taking me to the QVMAG and going through their records to find the inward and outward correspondence referred to in this article.

This article would not have been possible without the input of numerous Circular Head residents, who provided history, photos, guidance to the old quarry site and contact details of others.

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All in a Day's Caving

Ross Anderson
CLinc

IN LATE June, along with four other Western Australian cavers, I went caving to a vertical cave in the south-west of the state.

It was a club trip, permits applied for in advance and a good day planned. On the morning of the trip I went to the Parks and Wildlife office to pick up the permits and keys for the caves, only to be told that we couldn't do those caves.

There was something funny going on here, but more about that another time. Anyway, standing at the counter with cavers waiting down the road, a decision had to be made: which caves to go to?

WHAT WE HAD PLANNED

Tight Entrance Cave (vertical entrance) and Kudjal Yolgah Cave (handline only required). TE is, as its name suggests, a tight entrance, about 7 m down a solution tube. To have adequate safety gear for this cave I had brought a 40 m rope and a 45 ft ladder with sundry rigging gear and pulleys, etc. (i.e. enough rope to do the pitch three times and enough ladder to do the pitch twice—so in essence, we could have had all five participants on separate suspension systems on the pitch at the same time).

WHAT WE ENDED UP WITH

Arumvale Pipe Cave, a vertical entrance cave of approximately 25 m depth. Takeoff is from a platform installed by the land manager with good rigging points over a 'simple' 90° edge. With a little maths you can figure that the ladder wasn't long enough to do the full pitch, so we needed some SRT as well.

WHO WAS ON THE TRIP

The names of the guilty have been deleted and only the innocent remain.

- (C1) Competent vertical trip leader, rope access technician;
- (C2) Competent trip leader, mountaineer/climber with limited SRT;
- (C3) Competent caver, mountaineer/climber with limited SRT;



ROSS ANDERSON

Heading over the edge and abseiling into Arumvale Pipe

- (C4) Competent caver with limited abseil/ladder experience and almost no SRT; and
- (C5) Novice caver with five previous trips and no SRT or ladder experience.

THE TRIP IN

C2 and C3 did the initial rig of the cave.

C1 took the novice off elsewhere to practise abseiling on a slope where the basics of controlling and locking a Petzl stop descender could be taught and understood without risk.

Rigging of the cave was checked, adjustments made, and C2 and C3 entered the cave on single rope without belay as it was not deemed necessary. After they had entered the cave all excess rope on the cave floor was drawn up and the rope reresecured with a releasable hitch at the anchor.

C4 abseiled with a bottom belay.

The novice abseiled with a bottom belay and a top belay attached for about half the pitch as the rope tail was not long enough to belay the whole pitch and the greatest risk of incident was at the top edge of the pitch.

After the others had entered the cave, C1 rigged an inline 3:1 haul system onto the mainline, so that when the group exited the

cave, the mainline could be converted to a haul system at a moment's notice.

The ladder was then lowered into the cave, and, of course, was about 11 m short.

Did I mention that at the lower end of the abseil, just after the end of the ladder, there was a restriction that can be quite taxing for novice SRT practitioners? I have now, because this is about when I realised the cave was a little more challenging than intended.

So, anyway, off we went caving — a beautiful cave, lovely pretties, great streamway, enjoyed by all. Time to leave.

Now comes the fun part.

We have a mixed group of cavers; all but one have been caving for a number of years with a mixed skill set and a mixed bag of gear.

WHAT WE NEEDED TO ACHIEVE

We had to get each participant about 7 metres up a rope on SRT to a ladder and then each could climb out with just a chest attachment, i.e., self-belaying whilst on a ladder.

C2 and C3 wore climbing harnesses with mechanical up-gear for the chest and sufficient gear to SRT the 7 metres and self-belay out.

C4 and the novice were set up with

ALL IN A DAY'S CAVING

complete mechanical up-gear so they could 'frog' to the ladder and then climb out on a self-belay.

C2 and C3 exited efficiently as planned and were at the top to assist should either C4 or the novice experience difficulties.

C1 stayed at the bottom as he was the only person able to get C4 and the novice on to the rope and up and away.

C4 was exiting through the restriction using more energy than a practised SRT person would. She got through the restriction and was about 2 m up the ladder when she declared that she was stuffed and couldn't go on.

WHAT ARE OUR OPTIONS?

C1 to do a one-on-one pickoff from below, going up if necessary; possible, ready to be undertaken.

C1 to do a one on one pickoff from below; going down, then a haul the whole way out for C4.

C1 to climb past C4 to exit the cave and to initiate an assisted exit from above.

All of these options were doable but not as efficient as a top-assisted exit:

C2 and C3 to release the anchor and lower C4 to bottom of pitch and then initiate a haul out.

C2 and C3 to rig a haul system and assist C4 to exit.

Option 5 was the automatic choice of all concerned.

C2 rigged an access line to the edge of the platform, lowered the rope tail to C4 and progressively helped her to exit the cave. Once C4 was halfway up the pitch he converted the rope tail to a 2:1 haul system to assist C4 from the cave. C2 had to use the rope tail because our backup rope was tied to the restricted entry cave sign halfway down the pitch due to some inconsiderate passer-by. If not, the backup rope would have been used. During the assisted exit, C4 was always attached to the rope via a chest ascender and was able to climb the ladder. Effectively, C2 and C3 took part of the load and made it easier for C4 to climb out.

The novice exited without difficulty but with much cursing from C4.

DISCUSSION AND OUTCOMES

Were we adequately prepared for the cave? Both yes and no. We had enough gear for everyone to get out safely without harm but it was not ideal—a second rescue-dedicated rope would have been nice and a longer ladder would have negated all the issues. We had ample hardware and rigging gear.

A couple of participants were short on experience.

C1 organised the entry and exit of the cave so that C2 and C3 were always leading, and he could concentrate on C4 and the novice. This worked very well given the way we had to set up gear and provide tuition.

The inline haul system that C1 rigged just prior to his entry was not discussed with C2 or C3 (it was assumed it would be familiar to them), hence during the assisted exit this system was not used.

Was C4 ever at significant risk? No. As soon as she indicated she was having difficulty C1, C2 and C3 were in position to quickly assist with either lift or lower. At all times she was able to 'stand' on a ledge or the ladder and had voice contact above and below.

WHAT ARE THE LEARNING OUTCOMES?

- Always take more gear than you think you may need;
- prepare for a rescue;
- discuss your rescue plan with others;
- know your group, plan who does what first—if C1, C2 and C3 were at the bottom of the cave and C4 went up first, bottom assistance/rescue would have been necessary, which would have been harder than a top assist;
- be prepared to re-evaluate your plans if the situation changes and ensure you can still adequately cover all eventualities; and
- Ensure that first aid and medical supplies are available—in our case the car, with a first aid kit, was 20 m away.



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