Journal of the

Australasian Cave and Karst Management Association

ACKMA Journal No. 113 December 2018 Australia Post—Print Post Approved: PP381624/02050. ISSN 1835-5374 Published Quarterly

The ACKMA Journal

Official Publication of the Australasian Cave and Karst Management Association Incorporated.

Published quarterly in March, June, September and December.

The opinions expressed in the ACKMA Journal are those of the individual authors and not necessarily those of ACKMA Inc or its officers.

EDITOR: Tim Moore

SUB EDITORS: Tony Culberg, Andy Spate

Photos taken by the authors or editor unless otherwise acknowledged.

PRINTER: Hansen Print, Smith Street, Naracoorte, South Australia 5271.

Ph: +61 8 8762 3699

ACKMA Inc is cross-affiliated or otherwise associated with:

Australian Speleological Federation, New Zealand Speleological Society, Australasian Bat Society, The WCPA Working Group on Cave and Karst Protection, Guiding Organisations Australia, Bat Conservation International, American Cave Conservation Association, International Show Caves Association, Cave Diving Association of Australia, The Malaysian Karst Society, The Jenolan Caves Historical & Preservation Society and the USA National Speleological Society Cave Conservation and Management Section

LIFE MEMBERS of ACKMA Inc

Steve Bourne*, Michael Chalker*, Peter Chandler*, Brian Clark*, Alan Costigan, Grant Gartrell*, Kent Henderson*, Ernst Holland*, Greg Martin*, Chester Shaw*, Dave Smith*, Andy Spate*, Dianne Vavryn*, Rauleigh Webb*, Kevan Wilde*, David Williams*

(*previously elected as Fellows)

FELLOWS of ACKMA Inc

John Ash, Peter Bell, Dale Calnin, Deborah Carden, Arthur Clarke, Ken Grimes, Ian Houshold, Julia James, Neil Kell, Kevin Kiernan, Lana Little, Robyn McBeath, Cathie Plowman, Dennis Rebbechi, Barry Richard, John Watson, Nicholas White, Anne Wood, Phil Wood

ACKMA PRESIDENTS

Ernst Holland 1987-91, Andy Spate 1991-95, Michael Chalker 1995-97, Greg Martin 1997-99, Brian Clark 1999-2001, Peter Dimond 2001-02, Peter Chandler 2002 -03, Robyn McBeath 2003-05, Steve Bourne 2005-11, Peter Chandler 2011-13, Dan Cove 2013-16, Dale Calnin 2016-2018, Andy Spate 2018-

FRONT COVER: Hang Soon Dong (starts page 5)

PHOTO: Steve Bourne

IN THIS ISSUE

Editorial

This edition kicks off with the second instalment of Steve Bourne's description of his trip to the caves of Vietnam and Laos. His description is vivid and, particularly, his photographs are spectacular. In the March edition next year, his caving journey will continue after he crosses the border into Laos.

There is, then, a tribute to a long standing and active ACKMA committee member, Ann Augusteyn.

In "Around the show caves", we have some articles from familiar places. Interestingly, we also have a contribution from the Cutta Cutta Caves in the Northern Territory.

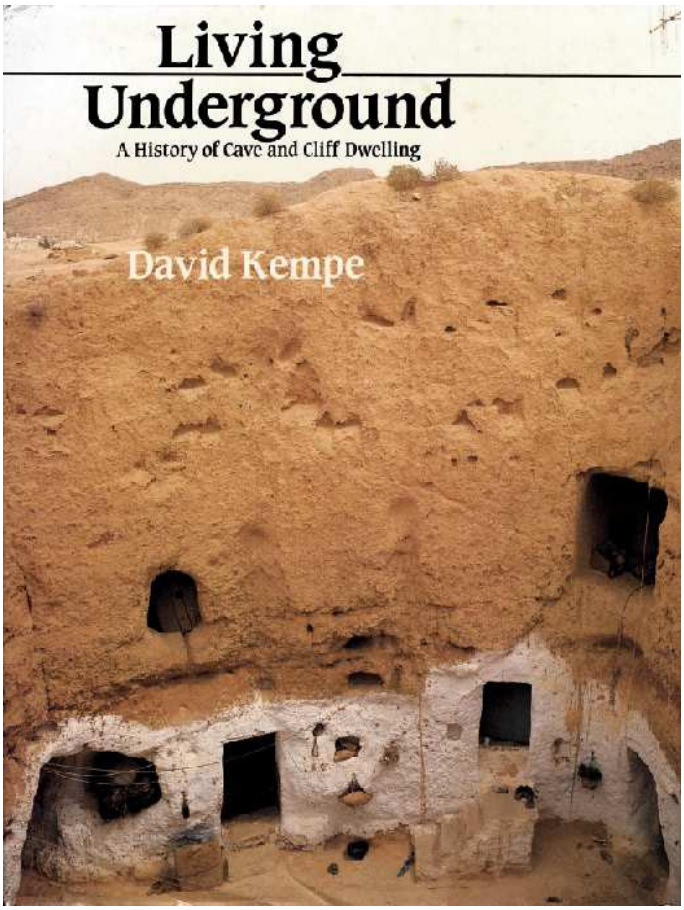
Our "Mystery shopper" article in this edition is unusual in two respects. First, it is written by a younger contributor than I have recollected from my past reading of this journal over more than 20 years. It has been written by a young person who visited the show caves of Tasmania during the October School holidays. During those holidays, visits were undertaken to each of the four show caves in that state. This gives rise to a longer article than in the first two "Mystery shopper" contributions in past journals. The reflections on the three northern caves are entirely positive, while our reviewer found a visit to Hastings Caves a little disappointing for the reasons outlined in this review. In addition to comments about the guiding experienced, the reviewer's parent noticed what appeared to be a safety lapse which could have potential adverse consequences if not rectified.

We also have two pieces from John Brush on lava caves. The shorter of the two informs us of additional protection that has been provided to the lava caves and lava field at Harmans Valley in Victoria while his longer contribution, together with its fascinating suite of accompanying photographs, provides a comprehensive tourist guide for potential visitors to the lava cave fields of Northern California.

We also have a short piece from Professor Andy Baker on the impacts of drought on groundwater recharge and the consequential changes that arise to impact on Wellington Caves.

In the September edition, I noted that the Association had offered to provide a contribution to the costs of interpretive signage for the Moa Bone Point Cave and Moncks Cave near Christchurch. I indicated that I expected that an article dealing with the history of the caves, and their circumstances after the devastating Christchurch earthquake in 2011, could be expected in this edition of the Journal. Unfortunately, multifaceted negotiations need to be completed before the interpretive signage text can be finalised and the signs erected. As a consequence, publication of a story on the significance of these caves and on the installation of the proposed interpretive signage must be postponed to a later edition of this Journal.

I have included material concerning an advertisement that appeared in the newsletter of the US National Caves Association. The advertisement was for a house for sale in Arkansas. I am unaware of any Australian equivalents (the underground homes in the opal fields of Cooper Pedy in South Australia and White Cliffs in New South Wales pale in comparison!). Since my teenage years - a very, very long time ago - I have been fascinated by the adaptation of caves or cave-like spaces for human occupation (whether as dwellings or for some other human use purpose). One of my favourite cave related books is entitled *Living Underground*, authored by David Kempe – a volume first published in 1988. When I am short of contributions in a future journal (an event which I hope does not eventuate), I may well inflict a review of this volume on my readers!



Finally, but a matter of significance in the life of the Association, Nicholas McIntyre has been busy in his role as the convener of our 2019 Guides' School and Annual General Meeting – both to be held at Naracoorte in South Australia in May next year. The Guides' School will be conducted over three days commencing on Wednesday 15 May and will be followed by the ACKMA Annual General Meeting over the following weekend (with the formalities taking place on the Saturday morning). The centre pages of this edition set out information about both the Guides' School and the AGM weekend together with a registration form. A further, separate copy of this material will also be circulated, by email, in late January 2019.

President's Report

Some not so good news …

Our thoughts go out to the Augusteyn family and the staff at Capricorn Caves. The passing of the charismatic Ann has been a terrible shock to all ACKMA people and beyond. Ann, and Ken before her, did a fantastic job of converting a run-down operation into a world-renowned show cave operation. As I have stated on several occasions in various circumstances, I regard Capricorn Caves as the best managed show cave operation in Australia and New Zealand.

I have already conveyed ACKMA's condolences to John, Helen, Robert and their families and to Capricorn Caves staff – and I am more them happy to repeat those sentiments here.

Many older members will remember Kevin Kiernan as a founder member of ACKMA and a contributor to cave and karst science and management. Unfortunately, I bring you the bad news that Kevin's son, Adrian, died recently in a kayaking accident on the Humla Karnili River in Nepal. Adrian was an experienced raft guide and competitive kayaker. He was an Australian freestyle champion and had kayaked in many countries. Adrian was recognised around the world as can be seen from the many tributes on Kevin's Facebook page.

Again, ACKMA's sympathies go out to Kevin and his family.

On a brighter note – I think I have now re-established contact with Life Member Alan Costigan – long ago manager of Buchan Caves. More on that front shortly.

Also, another first (or maybe a second) – we have a contribution from Cutta Cutta Caves in the Northern Territory. Great to hear from them. We all, and especially our esteemed editor, Tim, want something from all Australian and New Zealand show caves in every issue – and from you Hein as well!

Recently, John Brush and I met with Jodie Anderson and Geoff Melbourne at Jenolan, to discuss the 2020 ACKMA Conference. Scott Melton has produced a great draft for 2020 – "2020 – Vision for Cave & Karst Management". Jodie, Scott and Geoff will be building on this for a great Jenolan conference.

After Jenolan, I went on to Wellington to meet with Michelle Tonkins and Ian Eddison to talk about various management issues and the possibility of the 2021 AGM and Guides' School – all looks good at this stage. Great to have these meetings fixed in advance.

Then to Canberra where John and I had dinner with Nick McIntyre and Chaka Chirozva from Naracoorte (and palaeontologist Professor John Long) discussing next May's Guides' School and AGM. All looks well.

Then my car blew up – sobs. Lucky to be alive but all well now.

One of the sights awaiting you at Naracoorte in May 2019

The fossil bed (and friend) in Victoria Fossil Cave

Hang Son Doong

Part 2 of Steve Bourne's caving adventures in Vietnam and Laos

(all photos by Steve)

After the show caves and three warm up trips with Oxalis as tour operator, it was at last the date for the Son Doong expedition. There is no doubt Son Doong has an aura about it in the local village and among visitors to Phong Nha. Several visitors I spoke to were excited to meet someone visiting the cave and I exchanged emails with them to provide some pictures from my trip.

It is very widely promoted as "the largest cave in the world". One would initially think that the largest cave in the world would be a relatively easy task to determine. But then is it cave chamber, passage, volume, length… and so on? My understanding is that Son Doong has the largest cave volume of any cave in the world, something like 38M m3. The Miao Room in China is the largest chamber by volume and Sarawak Chamber in Mulu National Park, Sarawak, the largest chamber by surface area.

Measuring and determining what is the largest cave/ chamber/passage is keeping a few dedicated researchers very busy and very accurate scanning technology can provide high quality data. Then it just comes down to definition of a cave and what is in or out.

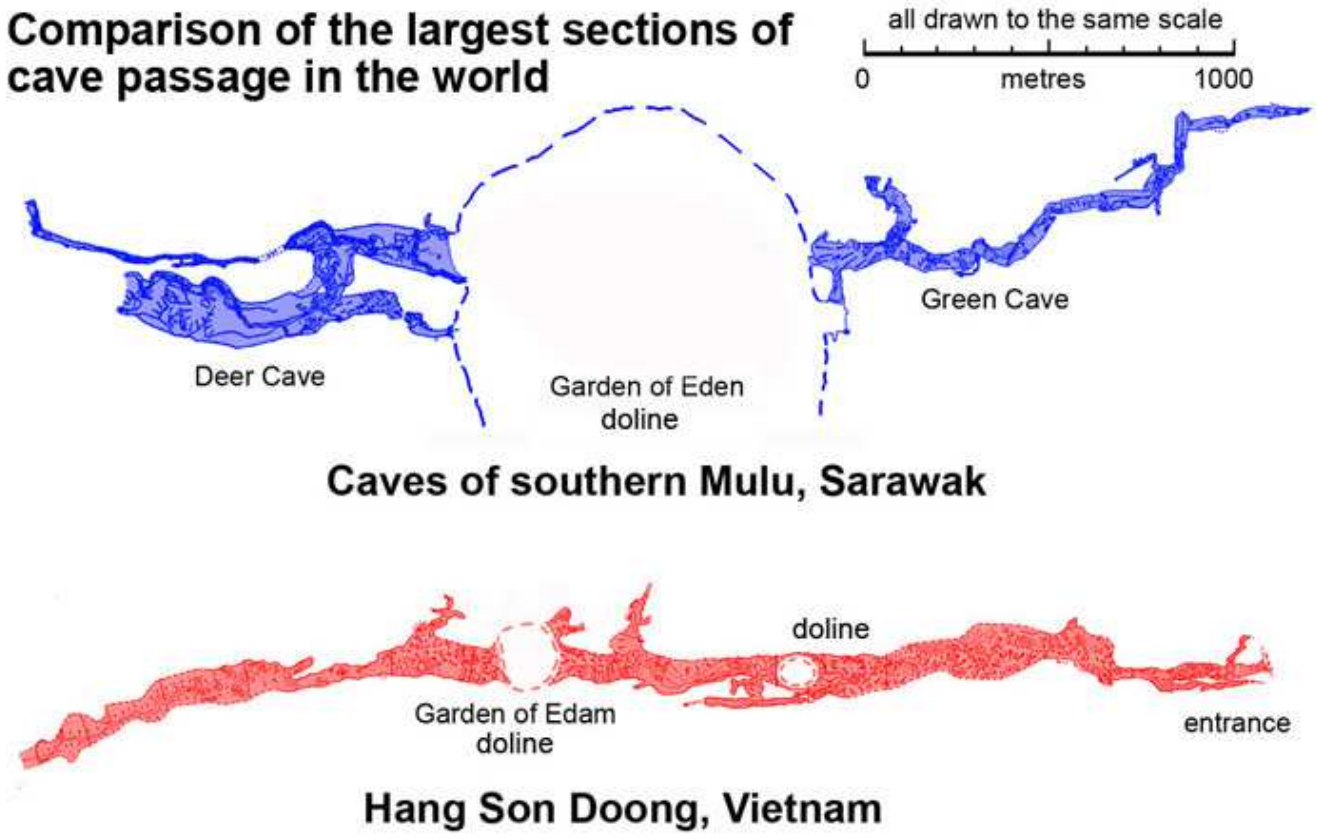
For example, Son Doong has enormous daylight dolines with jungle, are they part of the cave?

I recall the area between Deer Cave and Green Cave at Mulu, which is essentially a collapsed cave creating a "doline" that is so vast it does not look or feel like part of a cave. Having previously been to both Deer Cave and Sarawak Chamber, I looked forward to Son Doong, to see for myself.

Augusto, Lobo, Ezio, Lilia and I attended the compulsory briefing the afternoon prior to the commencement of the tour. Oxalis has a strict rule that if you fail to attend the briefing, you are not allowed on the tour. The briefing was delivered by Josh, a young member of the British Cave Research Association (BCRA). One condition of the permit for Oxalis to operate tours in Son Doong is that they must have a BCRA representative on the tour.

Other members who join the expeditions include Howard Limbert and his wife Deb, and other cavers who were part of the firstexploration and mapping.

Josh was good company on the tour, but the skill level of staff which are BCRA trained seemed to make the position redundant. Maybe a case of doing a job too well and not being required anymore?



Comparison between Deer Cave, Malaysia and Son Doong Vietnam, sourced from the web (SB)

Our accommodation for the evening prior to the tour (included in the expedition fee) was at Ho Khan's Homestay. Ho Khan has legendary status in the village as the discoverer of Son Doong in 1990. Over 15 years elapsed before he found the cave again with Howard Limbert.

Lobo, Steve, Ho Khanh and Augusto at the Home Stay

The expedition porters packed all of the equipment and supplies at Ho Khans' from early in the morning.

The support crew was astounding- 1 guide, 1 BCRA guide, 5 safety assistants, 25 porters and 2 chefs. An additional 2 safety assistants joined us for the cave exit.

Our group comprised my 4 Brazilian friends, 4 Vietnamese and another Australian Peter Bayliss, who was originally from Western Australia but now lives and works in Laos.

As with other trips, we had a range of caving experience. Two of the Vietnamese were on their first ever caving trip. They had plenty of jungle hiking experience which is how they were allowed to pass the entrance criteria. They did a good job through the cave.

Day 1 is nearly all above ground. It is a relatively easy 10km or so trek to the first camp site. Along the way, we stopped for lunch at Son Doong village. The village has just 9 families and 45 persons, with a huge imbalance of young girls who will leave the village looking for partners. The village would seem to have reached a point where it will not function for much longer. Despite being quite remote, the village was equipped with solar panels and good battery storage, generating far more electricity than they can ever use.

The trek features many river crossings so feet become wet early in the trip. They remain wet for the next 2 days, with some respite on Day 3 but were wet again on the fourth day.

Excitement rose when we set eyes on the entrance of Hang En from maybe a kilometre away. As we trekked closer, it grew bigger and bigger. Instead of climbing through the larger entrance, we accessed a smaller entrance to the right, and then climbed the rock pile for views of our campsite. This was a serious "wow" factor.

The view of the camp site in Hang En

Access to the campsite was gained via a raft across the river, although it was flowing so slowly it was virtually a lake.

Now we came to appreciate the support staff seriously. The porters had reached the site ahead of us and set up our tents, mattresses and sleeping bags, with names of expedition members on each tent. Toilet facilities were set up, with all waste collected in plastic bag lined buckets with rice husks added. All waste is removed from the cave.

The chefs had established their kitchen and "dining room" and begun preparing the evening meal.

We had some free time before dinner so I spent about 30 minutes swimming in the lake/river. So much for caving for days without a wash, I was super clean!

Our chefs provided an excellent meal and, as we were to discover, it improved every night. After dinner, we spent some time taking photos, placing lights inside tents to give colour. I really appreciated Lobo's knowledge on photographing large cave chambers plus the large number of flash bulbs he had brought with him. We took some trial shots to get camera settings correct for the tent light and dining table lights, and then arranged porters and other cavers to set off multiple flashes. We managed a very nice result.

View of the Hang En camp site at night (above)

On Day 2, I awoke early to a muted light coming through the enormous entrance to Hang En. What a way to start a day. The chefs were busy preparing breakfast - more of a morning banquet. As an early riser, this was frustrating for me as breakfast was at 8.00 am with the caving to start at 9. I was ready by about 6.30!

Hang En is the third largest cave in the world according to our Vietnamese guide (they have Deer Cave in Mulu at number 2). The exit to the cave is simply jaw dropping - an enormous cave entrance with a sandy floor with the jungle creeping in on all sides and up the cave walls. We were through the cave in quick time and then, following the river (which was at a very low level) onwards towards Son Doong.

Exit to Hang En (below)

Along the way, we learnt why Son Doong remained "lost" for so many years after Ho Khan discovered it. A limestone wall adjacent to the river had fallen and blocked the river and the original path he took to the entrance.

We left the river and climbed a steep path towards our lunch site, conveniently close to the Son Doong entrance. It took a few minutes to realise the strong breeze shaking the vegetation was actually coming from the cave. I took some video later when we descended into the entrance and it looks like footage of a minor hurricane, such was the strength of the wind blowing through the trees and the associated noise.

We were kitted with harnesses for the climb in by the safety assistants and checked by Josh. Then, one at a time, we climbed down the 80m of knotted ropes to the safety of the cave floor. The ropes are cleverly placed and you clip on to each section as you make you way down. The first part of the cave is a blur, I was in the largest cave in the world!

Dzung and Josh were brilliant at showing us good photo opportunities, but Lobo and I (and maybe others) were a little frustrated at not being able to look around to find our own shots. The group is kept to a strict path and there is little deviation from this - which is a good thing.

We crossed the river in the cave and spent some time photographing this.

A river crossing in the cave (above)

"Hand of Dog". The guide on the back formation is several hundred metres from the camera (below right)

Not long after, we saw the first glimpse of light from accurately named "Doline 1" - though it was quite some time before we reached it. At a point we could line up, with a safety assistant on a nearby formation and another hundreds of metres in the distance on a formation called "Hand of Dog", we traversed along an enormous passage.

As we walked towards the entrance, another "wow" moment as the camp site came into view. We took a side passage to look at fossils in the rocks and take a swim – a fantastic way to finish off a day's caving.

Another gourmet dining experience and lots of storytelling. Most of us were off to bed early and I spent some time speaking with Peter, the other Aussie in the group. With the early night, I woke up at a ridiculously early hour which gave me a chance to photograph the first rays of light through the doline.

Day 3 was a dry day - so for those who had carried (or had the porters carry) an extra pair of shoes, it was also a day of dry feet. I soldiered on with the same footwear, knowing I would be wet again the following day.

Early morning at Doline 1 with porters preparing for the day

In a trip of highlights, this was a special day. We split into 2 groups to photograph the "James Bond" hole and another scene.

The "James Bond" hole

We then had the opportunity to photograph one of the truly iconic Son Doong images - that of people on a very large stalagmite within the daylight zone of Doline 2. When I look at the collection of images from this site, I noted that the promotional shots are taken with a very wide angle lens making the cave appear larger than it is (which is still really big!!).

My Brazilian friends posing at one of Son Doong's iconic photo spots

Progressing further, we could view back up into the doline as the sunbeams made an appearance. I have been in Vietnam for 9 days but had not seen the sun till now! However, at the appropriate time, the clouds parted and the doline was lit with an incredible shaft of light. I took dozens of photos at this point (as did everyone else in the group). Among many fine images, my favourite was a reflection of the doline in a shallow pool.

Once the sunbeam show finished, we ventured back into the darkness and viewed some cave formations of unbelievable size - stalagmites up to 80m in height. The passage was enormous, but the feeling when we approached the next doline, filled with jungle, was certainly one of awe and amazement. Our guide, Dzung, made it very clear before we entered the doline that we were not to walk on the vegetation and that we were to strictly stick to the defined path. This appears to have been well adhered to as beyond the defined path the vegetation appeared pristine.

Classic Son Doong sun beam

I learnt a new term here, when Josh informed us the vegetation exhibits *phenotypic plasticity*.

This term describes where vegetation (in this case) exhibits different growth patterns inside the cave from the same vegetation outside the cave. Inside the cave, the plants are deciduous, a response to the reduced sunlight and nutrient levels, compared to their evergreen forms in the jungle above.

Hard to believe this is actually inside a cave!

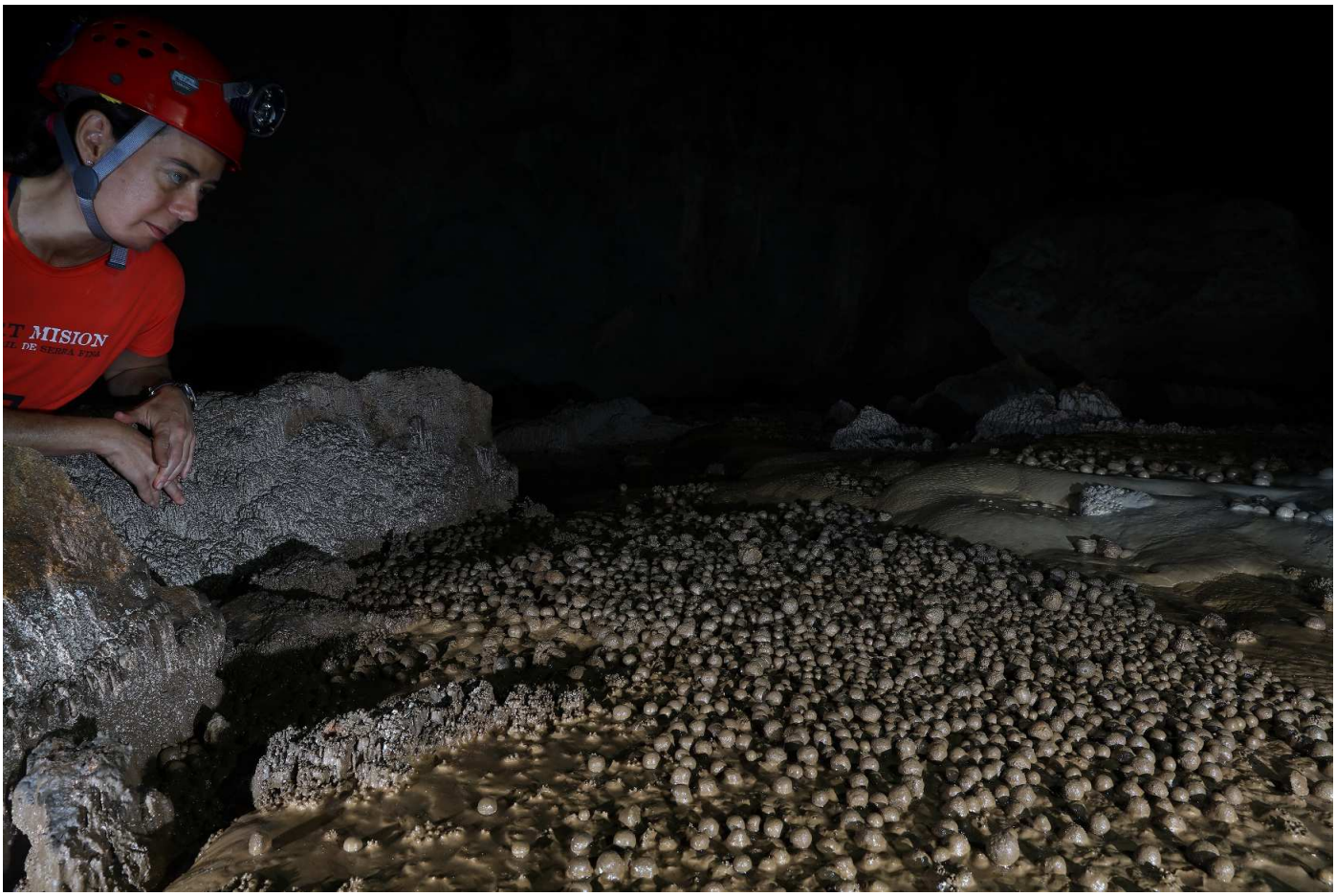
One of the Brazilians, Ezio, had brought a laser range finder with him to check the measurements of the cave. Dzung would explain a passage was 150m high so Ezio would check. After a few cases of over statement of passage dimensions, Dzung would ask Ezio to measure for him. The floor of the doline to the edge of the cave was about 200m, the limit of Ezio's equipment. That's a really big hole!!!

An amazing site descending to our night 3 camp site

We were allowed a generous amount of time to photograph the jungle doline before descending to the camp site. After a brief rest, we went towards the cave exit to enable us to view the cave and take our photos so we could move more quickly through this section on our way out on Day 4.

We found the centipede endemic to the cave and a few other invertebrates.

The fields of cave pearls were amazing. I had run out of battery so photographed the pearls the following day. An important lesson in Son Doong is the need to take plenty of batteries and cards for your camera.



Cave pearls

The third night banquet exceeded the previous 2 nights as the chefs strived to outdo each other. Two additional safety staff joined us to assist with the climb out and kindly brought some cans of beer for us. Just when I thought the catering couldn't get any better, it did!

I awoke on Day 4 to the sounds of birds flying around the doline - lying in bed, looking up out of the cave from around 400m away, what an experience!

While we were packing up, I took a close look around the camp site to see how much waste was being left and impact on the cave. I picked up a cigarette butt, some small pieces of paper and plastic. When the porters saw what I was doing, they became quite agitated and Josh suggested that I not worry about it as the porters would clean up.

I photographed butts on the floor outside their tents and later recommended that each porter should carry a suitable container to place their butts in rather than put them out on the cave floor. It is easy to suggest they shouldn't smoke on the trip, but smoking is so much a part of their culture, I doubt you would get any porters. They only smoked at the camp sites which are near the cave entrances and dolines. The only person I saw smoking in the cave's dark zone was the park ranger who came along to make sure protocols were being followed!

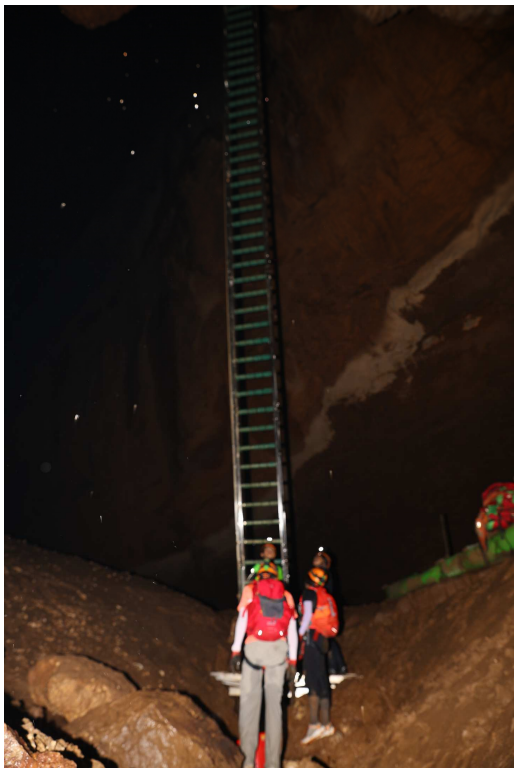
A downside. Porters smoke at the camp sites and butts are left by tents. Most are collected in the clean-up but I did find butts from previous trips

After everyone was packed, we set off for the cave exit. When the passage has water, the group uses rafts to reach the Great Wall of Vietnam, an imposing wall of flowstone. It was dry so our group trudged around 500m along a narrow muddy trench to reach the climb out. The wall was fully rigged when we arrived, with the safety assistants in place. One at a time, we climbed the 30m fixed ladder; before switching to knotted ropes and climbing the near vertical wall. The flowstone has plenty of footholds and you are safely harnessed and expertly guided by the assistants across each section of wall.

While we enjoyed our lunch, the porters climbed the wall, each carrying large and heavy loads. I am sure all of us admired their strength and agility throughout the trip.

It is a short and easy walk from the top of the Great Wall to the relatively small cave exit. From there it was a few kilometres walking back to the waiting bus.

Part of the way along the walk out, we joined a familiar path - the exit path from the Hang Va cave trip from a week earlier. I have searched for (but can't find) a map showing the relative locations of the caves, which I imagine is deliberate to avoid having people trying to find their way to Son Doong themselves. Apparently this has happened a couple of times but with so many people at camp sites at the cave entrance and groups moving through daily, the chances of someone finding the cave and sneaking in would seem unlikely.



The fixed ladder at the Great Wall of Vietnam

Each group is treated to a final banquet dinner at the Home Stay to celebrate the trip. We had a great meal and celebratory drinks and were presented with medals for "conquering" Son Doong Cave. After dinner, Peter and I did the Australian thing and stayed at the bar by the pool until staff decided it was time for them to go to bed and the Australians could please themselves what they did.

One aspect I did not like was that we were constantly reminded and encouraged to provide tips for the staff and porters. Each visitor was given an envelope to facilitate tipping and you feel very obliged to do so, which I did. We were told that the visitor season lasts only 8-9 months and guides and porters need additional funds for the off season. In my feedback form, I suggested that the wages paid should allow for the seasonality and not rely on guests tipping for staff to have off season money to get by. A little extra on the $4,000 tour price would not make much difference.

$4,000 is a lot of money to pay for a cave tour, but when you consider what is provided for this, it actually feels like value for money. The tour fee covers accommodation and meals the evening before and after the tour; absolutely everything during the tour; high end equipment; plus 30 support staff for the trip. How much would a cave tour in Australia or New Zealand cost with 30 support staff for 4 days?

I was most impressed with the Oxalis enterprise. The guides were well trained; spoke good English; and provided a balance of adventure and interpretation on each tour. There is a focus on protecting the cave resource. Their attention to safety, without being in your face about it, was excellent. They employ large numbers of locals and have established the Oxalis Foundation to support local villagers. This contrasts sharply with the way Phong Nha Cave is shown and not looked after. Paradise Cave is still in very good condition but the huge numbers of people every day and large lights on for hours a day will no doubt have an impact over time.

To be continued in March 2019

-o0O0o–

Only in the US? Unfortunately, it has sold!

House For Sale - A Living Cave $2,750,000

If your not getting enough time in your cave during the day, how about living in one? Or maybe you're looking for a nice, cool retirement home? Well here you go... A single family home for sale in Parthenon AR for **$2,750,000** with 4 bedrooms and 4 full baths. This **5,572 square foot** home was **built in 1989** on a lot size of **256.90 Acre(s)**.

RARE opportunity to own the unique Beckham Creek Cave Lodge. 4BR/4BA nearly 6000sf lodge built inside a living cave on 256.9 acre m/l. Recently renovated, indoor waterfall, lodge is fed by an under-the-floor spring originating from deep within the heart of the cave, geothermal heating system, extra maintenance barn & apartment with horse stables, helicopter landing pad, small spring-fed lake originating from the spring inside the cave which creates a waterfall to this lake, back-lit bluff line drive, short drive to the Little Buffalo River and all the local attractions. See for more details and photos by checking out the realtor's website: https://www.weichert.com/72043326/

Vale Ann Augusteyn

By Jordan Wheeler

Ann Augusteyn was born in Halesworth, a small town in England, to Leslie and Marjorie Copping. Her life was simple, growing up in a country town during the post-war era. Throughout her childhood she showed great sporting prowess and represented her county in hockey and tennis. Ann was also a very diligent student and achieved academic excellence through hard work and dedication, a trait that continued throughout her life. She obtained a Bachelor of Arts degree in History and completed a Certificate in Education before commencing a new life abroad where she met the love of her life, Ken. Together they worked, Ann as a teacher and Ken as a foreman on a gas plant, and travelled extensively throughout Canada and Europe - followed, eventually, by marrying in England in 1971 before moving to Australia in 1973. Ann was the very proud mother of 3 children, John, Robert and Helen and grandmother to Katie, Jade, Jake, Riley and Elise.

In June 1988, an article appeared in the Courier Mail that Batman was selling his caves in Rockhampton. This was the year Brisbane hosted the World Expo and the people of Queensland were looking for new adventures. The advertorial caught the attention of a young Augusteyn family. Ann, a high school history teacher and her husband Ken, now a plumber, seeking a new challenge - packed their whole world up into a car and drove north for Rockhampton to take over the only privately-owned show caves on freehold land in Australia. Ann and Ken knew nothing about tourism and even less about caves, but they had energy, determination and, with Ken's skill set across all trades, they had what it took to make a mark on the industry.

Ann (left) with Capricorn staff at the 2013 ACKMA Conference at Waitomo

The local community was initially apprehensive that someone "from the city" had bought the caves and wondered what the future was for Olsen's Caves. That did not deter Ann and her family. They were determined to execute a plan to make the caves a premier tourist attraction. Ken began working on the infrastructure of the property while Ann took on everything else. She did the marketing, ticket sales, cleaning and to top that off was the sole tour guide.

Ann and Andy Spate at the 2011 ACKMA Conference Ulverstone (John Brush)

For the next 20 years, they focussed on the development of the property. Their business plan was to generate enough income to reinvest in maintenance, new facilities, conservation and sharing the natural wonder with the world.

These achievements had made Ken and Ann very proud, however nothing more so than making Capricorn Caves wheelchair accessible. In 1992, carrying in 6 tonnes of timber and 3 tonnes of steel, they worked to minimise impact on the caves and maximise views for visitors, becoming the most accessible cave in Australia.

Ken's health declined after years of hard work and, in March 2008, he was pushed up the ramp that he had constructed to attend his son John's wedding in the Cathedral Cave. Ten days later, he passed away leaving behind a remarkable legacy and a tourist operation completely in Ann's hands.

From this point, Ann never took a backward step - she became a community leader and well respected within the local tourism industry, developing Capricorn Caves into, not only a leading show cave, but also one of the leading tourist attractions in the country.

The driving force behind why Capricorn Caves became such a successful operation under Ann's guidance was the culture of family that she built. The staff of the Capricorn Caves have been extremely privileged over the years to have travelled across Australia and internationally with Ann, as part of Savannah Guide Schools and ACKMA conferences.

Ann (third from right) and the Capricorn team at the 2018 ACKMA Conference at Margaret River

This was when Ann truly came to life. The morning of a trip away with staff her excitement could be likened to that of a giddy school girl. She would hug everyone, dance and have a smile from ear to ear. Often on these days she forgot to eat breakfast out of excitement. She took these times to get to know really know staff (and often find out more than they meant her too…) but she loved the stories.

Ann also loved a party. A glass (or bottle) of red, good company and a dance floor. She was always first on the dance floor and last to leave, happy dancing away by herself if no-one joined her. Her energy for life was contagious and it was impossible to spend time with her without catching her enthusiasm.

Ann attended her first ACKMA conference in 1993 and hosted her first in 1998. She was a major part of the organisation ever since. Ann volunteered her time to sit on the committee in various positions over the years (including unofficial conference photographer) and continued as a committee member until her passing. She has been recognised for her personal contribution to cave conservation and tourism as a **Fellow of ACKMA.**

If you asked Ann what legacy she would've like to leave behind, there would be no mention of her ability to build a business from the ground up. No mention of a mother of 3 who worked 24/7 for decades in an industry of which she initially knew nothing. No mention of becoming one of the most respected women, not in the industry, but in the entire region. It wouldn't be money earned or awards or recognition. Ann's legacy is in the caves.

Under Ann's watch, the Capricorn Caves, which had 4 visitors on the day she took over, has become a location where people travel from around the world to appreciate.

Overseeing the scientific research, of what has become an internationally significant fossil site, will allow education to occur for so many future generations. Wheelchair access means no-one will ever need to miss the opportunity to take in the beauty of the Cathedral Cave again. Ann's legacy is not in what she has done for herself but what she has provided for future generations, long after we are all gone.

2019 CAVE GUIDES' SCHOOL

Wednesday 15 May – Friday 17 May 2019 (Programme on page 20)

followed by

ACKMA AGM

Saturday 18 May – Sunday 19 May 2019 (Programme on page 21)

VENUE

Naracoorte Caves National Park – World Heritage Site

Looking forward to seeing you at these 'not to be missed events'!!

You are invited to join us for an exciting and informative 2019 Cave Guides' School at the Naracoorte Caves National Park South Australia. The Cave Guides' School will focus on further developing skills and capacities for cave guides and build upon previous training that has been delivered in conjunction with ACKMA.

This program is tailored to development needs identified in guide surveys conducted by ACKMA and centres on the role of a guide as a story teller whilst remaining true to the facts!! It also aims to improve technical knowledge on Australian cave systems & management, interpretation delivery and audience engagement.

Key note speakers will include local palaeontologist and 2018 SA Unsung Hero in Science Communication Award recipient Dr Liz Reed along with well-known ACKMA members Andy Spate, John Brush, Steve Bourne and current researchers at the site. A highlight of the program will be the 'Interpretation Master Class' led by Michael Mills, Creative Director, heapsGood Productions (see bio below).

2019 is a significant anniversary year for the Naracoorte Caves National Park as it marks 50 years since the discovery of fossil remains in Victoria Fossil Cave and 25 years since inscription onto the World Heritage Register. Please join us for a range of tutorial, familiarisations, networking and practical learning sessions. The Guides' School will be followed by the ACKMA Annual General Meeting.

An outline of the Master Class is included below:

Interpretation Master Class

Thursday 16 May and Friday 17 May

"*Developing the Art of Storytelling and Interpretation*"

Led by Michael Mills, Creative Director, heapsGood Productions

Michael is an award-winning science communicator who uses stories and drama to connect his audiences to science. In 2014, he was awarded the Unsung Hero in Science Communication Award in South Australia.

This one-and a half-day master class has been specifically developed to help guides better understand the role and importance of story and of storytelling. It will help you create and present better stories, characters, and drama to interpret the cave environment, adding to your repertoire of guiding skills.

There will be time to practise skills and gain confidence so that you can develop these methods into your cave tours.

Are your cave tours generally the same commentary and perhaps the same material or jokes? Do you feel 'stuck' for fresh ideas for your cave interpretation? You'll leave this workshop with new skills and ideas about how to integrate these into your cave presentations and an even greater appreciation of the wonder of the caves where you work.

If you think you're not a storyteller or drama person, think again. Come along and learn and try some new approaches. You will come away with new tools to use and add into your existing role. Your tours will take a bold and creative leap, as you learn how to tell a better story, and help your visitors to better connect to the caves.

Nick McIntyre
Convenor

REGISTRATION

Please send completed registration forms to **ACKMA Treasurer, PO Box 122, LINDISFARNE, Tasmania 7015**.

After your form and payment have been reconciled, the form will be sent to Nick.

Tony Culberg
Treasurer

SCHEDULE OF FEES

Guides' School

And

ACKMA AGM weekend

Registration Form – Schedule of Fees Payable (payable per person)			
Registration 3rd Cave Guides' School	Registration includes lunches, morning teas, dinner, and nibbles at listed events from 15-17 May Book and pay early to receive early bird registration rate.	**Early Bird Registration prior to 1 April 2019** $265.00 **Registration after 1 April 2019** $285.00	
Transport 3 days Guides' School	If requiring transport/collection in mornings & drop in evenings from town to venue (10km from centre of Naracoorte to the Caves).	$25.00	
Registration ACKMA AGM	Registration includes lunches, morning teas, dinner & finger food at listed events 18 & 19 May along with transfers to other activities from Naracoorte Caves.	$255.00	**does not include daily pick up from town to site. Could be provided at additional cost if sufficient numbers require.
Welcome Event pre-ACKMA AGM	If arriving on Friday 17 May from 5pm – 7:30pm onwards please join us at the Guides' School Wrap Up/ACKMA Welcome Event. Complimentary drink on arrival & finger food provided.	$30.00	** For Guides' School attendees this is already included in your registration.

Registration Form

Cave Guides' School 15 – 17 May 2019

ACKMA AGM Weekend 18 – 19 May 2019

Title: Mr/Mrs/Miss/Dr_____ Name:_____

Address: _____

Organisation: _____ Affiliation/Current Role:_____

Email Address:_____

Mobile Ph Number: _____ Business Hours Phone: _____

Dietary Requirements: _____

Payment for Attendance at (please circle):	**Guide School Early Bird**	**$265.00**
	Guide School non Early Bird	**$285.00**
	Transport:	**$ 25.00**
	ACKMA Welcome Event	**$ 30.00**
	ACKMA AGM	**$255.00**

Payment Amount (check per schedule of fees) TOTAL: _$_____

Payment Method:

For AU & NZ member's direct credits/EFT are preferred.

Direct Payment EFT – Name: ACKMA Inc

Account: 10257455

BSB: 065156

To help us track and identify payments please reference your direct payment with NC519 followed by your surname. Email the registration to the ACKMA email address noting the payment advice reference used on the form.

Cheques are to be made payable to ACKMA.

Please forward your payment along with the registration form to ACKMA Inc, PO Box 122 Lindisfarne TASMANIA 7015, Australia.

Email enquiries to: conference registrations@ackma.org

ACCOMMODATION OPTIONS

Accommodation Providers	All accommodation to be booked directly with the providers.	
Naracoorte Caves National Park Wirreanda Bunkhouse	Accommodates up to 49 people in shared dormitory style accommodation (4 bunks-8 beds per room) with shared amenity block & kitchen facilities. $23.00 per person/ night. Need to bring own bedding/towels – or these may be supplied at additional cost per person. +61 08 87601204	$23.00 per person/night
Naracoorte Caves National Park Campground	Naracoorte Caves National Park campground & caravan park– powered sites $31.00, unpowered sites $29.00. For up to four people per site.	$29-31.00
The Avenue Inn	Motel accommodation with restaurant approx. 10km from the Caves. Mention the Guiding School or ACKMA AGM for discount to listed room rate. 17 Fourth Ave, Naracoorte 1300 283 683	$109-159.00
William Macintosh Motor Lodge	Motel accommodation with restaurant approx 17km from the Caves. Mention the Guiding School or ACKMA AGM for a discount to listed room rate. 20 Stewart Terrace, Naracoorte +61 08 8762 1644	$115-158.00
Naracoorte Hotel Motel	Hotel with bistro and motel rooms in centre of town. Mention the Guiding School or ACKMA AGM for a discount to listed room rate. Approx 13km from the Caves. 73 Ormerod Street, Naracoorte South	$99 – 115.00
Country Roads Motor Inn Naracoorte	Motel accommodation approx. 13 kms from the Caves. Mention the Guiding School or ACKMA AGM for a discount to listed room rate. +61 08 8762 3900	$128 – 158.00
Big 4 Naracoorte Holiday Park	Caravan, camping and unit accommodation approx. 15 kms from the Caves. Mention the Guiding School or ACKMA AGM for a discount to the listed rates. +61 08 622128	$100-155.00 cabins $30-35 for camp & caravan sites
Cave Park Cabins	Cave Park Cabins have two cabins within 2km of the Naracoorte Caves. These two bedroom cabins sleep up to five. Mention the Guiding School or ACKMA AGM for a discount to the listed rates. 0428 799 373	$100-150.00
Naracoorte Cottages	B&B style accommodation with six self-contained B&B houses and within 12 km of the Caves. This accommodation ranges from 2 bedrooms and 1 bathroom up to 5 bedrooms and 3 bathrooms. For groups for a multi-night stay, an indicative tariff is $60 including GST per adult per night (including full breakfast provisions for each day of the stay). 0408 810 645	Contact provider

GUIDES' SCHOOL PROGRAMME

Guides' School - Day 1. Wednesday 15 May		
Theme: Guide as storyteller & science communicator		
8:45AM		Registration Desk opens
9:00am		Arrival, welcome & introductions
9:45am	Tutorial	Caves of Australia - a technical overview of our different systems & how they came to be – Andy Spate
10:30am	Morning Tea	
11:00am	Tutorial	Cave and karst systems management & maintenance of natural values and visitor management principles – Steve Bourne
11:30am	Tutorial	OHS SA Visitor Safety Framework & Emergency Response Preparedness – Department of Environment & Water
12:00	Lunch	
1:00pm	In-Cave Tutorial - Alexandra Cave	Dating techniques & science communication – Adelaide University Research Team
2:15pm	In-Cave Tutorial - Victoria Fossil Cave	Managing our valuable World Heritage assets – Dr Liz Reed
3:45pm	In-Cave Tutorial - Stick Tomato Cave	Cave cleaning and maintenance methods Pros & Con – John Brush
4:30pm	Familiarisation & Networking Caves Café	Introduction to Wrattonbully Wine Region - glass of Wrattonbully Wine on arrival followed by Happy Hour drink specials with locally produced nibbles provided.
6:00- 8pm	Caves Café	Dinner

Guides' School - Day 2. Thursday 16 May		
Theme: Guide as Storyteller and Science Communicator		
8:45am		Master Class Registrations
9:00 am	Interpretation Master Class—Michael Mills	
10:00am	Morning Tea	
10:30am	Interpretation Master Class	
12:00pm	Lunch	
1pm	Interpretation Master Class	
3:00pm	Afternoon Tea	
3:30pm	Interpretation Master Class	
6:00 - 8pm	Caves Café	Dinner

Guides' School - Day 3. Friday 17 May		
Theme: Guide as Storyteller and Science Communicator		
9:00am	Interpretation Master Class—Michael Mills	
10:00am	Morning Tea	
10:30am	Interpretation Master Class	
1pm	Lunch	
1:45pm	Familiarisation World Heritage or Adventure Caving Experience	Activity • Behind the Scenes World Heritage Tour • Starburst/Stick Tomato Adventure Caving
4:00pm		Transfer to evening venue
4:20pm	Naracoorte Venue	Presentation – Guest Speaker
4:50pm		Panel Session & Wrap Up
5:30pm	Naracoorte Venue	Welcome: Arrival of ACKMA AGM attendees. Complimentary drink provided on arrival along with finger food

ACKM Annual General Meeting—weekend programme

ACKMA AGM – Day 1. – Saturday 18 May		
08:45	Naracoorte Caves – Wirreanda Camp Kitchen	Registration for AGM
9:00am		Arrival & Welcome
9:15am		Report on ACKMA Guides' School & discussion
10am	Morning Tea	
10:30am	Naracoorte Caves – Wirreanda Camp Kitchen	ACKMA Committee Meeting – non attending members will be provided with other interesting familiarisation options including Bat Observation Centre; introduction to new accessible tourism initiatives.
12:00	Lunch	
1:00pm	Familiarisation – Wonambi & Victoria Fossil Cave	View recently completed capital works at Naracoorte Caves & Victoria Fossil Cave tour
3:00pm	Afternoon Tea	
3:30pm	Naracoorte Caves – Wirreanda Camp Kitchen	ACKMA AGM – non attending members will be provided with other local visitor options.
5:30pm	Naracoorte Venue	Transfer to evening venue
6:00pm	Naracoorte Venue	ACKMA Dinner – purchase own drinks **No BYO!!**

ACKMA AGM – Day 2. – Sunday 19 May		
9:00am	Naracoorte Caves Laboratory	Arrival & administrative matters, Discussion on any previous day events
9:30am	Presentation Naracoorte Caves Laboratory & Blanche Cave	Research programs at the Naracoorte Caves – Dr Liz Reed & Adelaide University Team
10:30am		Morning Tea
11:00am	Naracoorte Caves Laboratory	Post AGM Committee Meeting
12:30	Caves Cafe	Lunch
1:30pm	Naracoorte Caves Laboratory	Wrap up of ACKMA AGM
2pm		Afternoon Activities • Adventure Caving Starburst or • Behind the Scenes World Heritage Tour • Group Photos
5-6:30pm	Schultz Cave	Conclusion Event in Schultz Cave Wrattonbully (wine tasting in cave) & finger foods.

Harmans Valley lava flow receives permanent protection

John Brush

UIS Commission on Volcanic Caves

The iconic landscape vista of the Harmans Valley lava flow (near Hamilton in western Victoria) will be permanently protected following a recent decision by the Victorian Minister for Planning.

The vehicle for protection, which was gazetted on 18 October 2018, was an amendment (Amendment C36) to the Southern Grampians Planning Scheme to include a Significant Landscape Overlay (SLO) over those parts of the flow that lie on privately-owned land within the Southern Grampians Shire.

As noted in the ACKMA Journal No 110 in March 2018, the area had been afforded interim protection under a temporary SLO that was due to expire on 31 October this year.

The Harmans Valley lava flow is about 20 kilometres long. It originated at the Mt Napier volcano and flowed across the landscape in a pre-existing valley. At about 40,000 years old, the flow is one of the most recent in Australia. It is widely regarded as having one of the most intact and significant collections of young volcanic features in Australia and for being the best local example of a lava flow constrained by a valley.

Mt Napier and the upper section of the flow, which contain the renowned Byaduk lava caves, were already protected as they are within the Mt Napier State Park. However, most of the flow lies beyond the park boundaries where it had almost no protection until the interim SLO was applied in October 2016. Prior to that date, parts of the flow were significantly damaged in 2004 and again in 2015-16 by 'rock-crushing', an operation that pulverises and smooths the rock surface to make it more suitable for grazing, and by small-scale quarrying activities over a period of many years.

A view of the Harman Valley lava flow with Mount Napier beyond (John Brush)

The intent of the permanent SLO is to protect the landscape character of the flow as well as its surface features. It will also protect several small caves that occur outside the boundaries of the Mt Napier State Park.

The process of introducing permanent protection of the flow commenced with a call for public submissions in October 2017. Of the 74 submissions made, most supported permanent protection. The Victorian Government then established a Planning Panel which, in March 2018, convened a 2 day public hearing in Hamilton at which those who had made submissions were invited to speak. I spoke on behalf of ACKMA and the UIS Commission on Volcanic Caves. Following the public hearing, the Planning Panel reported to Council and recommended permanent protection of the flow in a manner that addressed some of the concerns of landowners. The key recommendations, including changes to the proposed Amendment C36, were agreed by Council on 18 July 2018 and then submitted to the Victorian Department of Environment, Land, Water and Planning. On 5 October 2018, the Planning Minister formally approved Amendment C36 to the Southern Grampians Planning Scheme. This came into effect following tabling of the Amendment in Parliament and Gazettal on 18 October 2018.

The lower reaches of the Harmans Valley lava flow, within the Glenelg and Moyne Shires, are not covered by Amendment C36 and thus remain exposed to potential damage.

The "Mystery shopper" goes to Tasmania

Introduction

During my October school holidays, my father and I went to Tasmania to visit my uncle and aunt. As part of our travels, we visited each of the four tourist cave locations on the island. My father said that the price I had to pay for my holiday was to agree to write a mystery shopper article (with his assistance) for this Journal. I agreed to do so and this is it!

I have visited a number of tourist caves with my family and friends in Australia and overseas (including doing some mild adventure caving at Jenolan). I really enjoy going into the caves and hearing the explanation from the guides about their formation and the various hydrological, geological and other influences that have created the shapes and colours. I am also glad, for the most part, that the guides have, since I first visited a cave when I was about 10, mostly stopped suggesting that particular formations looked like Yoda or a wedding cake or something else.

Gunns Plains cave

We started, after our arrival in Launceston, by driving to Gunns Plains Cave.

Gunns Plains Cave was very interesting. Our guide was very well informed for a privately run cave. I was also glad that we had a small group so that the guide could focus on the individual people and their questions.

The cave was formed by a stream running along it inside its containing hill. The stream still runs through the centre of the cave. The cave was home to cave lobsters - even though we did not see them, there was a photo at the cave entrance.

The cave also sloped with the angle of the hill. You could see how the outside hillside would appear from the path we followed up the slope in the cave. The cave had been discovered when a sinkhole collapsed. The area was filled with similar sinkholes. The cave also continued beyond where you could walk to on the formed pathway. We were told that, to continue, you would need to crawl on your stomach for a long distance.

The formations in this cave were stunning and our guide described them comprehensively. He knew all the scientific words and a lot about how caves were formed. There were multiple colours in the cave and the guide knew how to explain how all of them came into being. The cave had some exceptionally beautiful formations and a few of them differed from those I had seen before in other caves.

This cave especially stood out to me because of the helictites. This was the only cave of the four that we visited that had these. They were very beautiful, unique, and added something different to this cave for me.

Helictites at Gunns Plains Cave (above)

Shawls lit to show translucence (below)

Travelling to Mole Creek

We then travelled the back roads across country from the Gunns Plains Cave Reserve to Mole Creek where we stayed the night. On the way, just after crossing the Mersey River, we stopped and walked through the bush to the entrance to Croesus Cave, a cave which my father had visited with my twin sisters about 30 years ago and visited again with my mother about twenty years ago. We had tried to walk to Croesus Cave during a family visit to Tasmania a few years ago but had only got about halfway there when my third sister, only a few years older than me, trod on a beehive in the foliage of a tree which had fallen across the track. On that occasion, we had hastily gone back to our parked car to remove the bee stings and the many remaining bees in her clothes.

Although dad had explained to me why it was a gated cave to protect it, I was still disappointed that I couldn't go inside with him. Perhaps sometime in the future?

The Mole Creek caves

This was my second visit to the caves at Mole Creek. The new Visitors Centre was impressive compared to what I remembered from my family's earlier visit.

Marakoopa Cave

On the morning of our second day in Tasmania, we visited Marakoopa Cave. We went on the "Underground Rivers and Glow-worms Tour". We were in quite a large group, 20 or so, so there needed to be a bit of bunching up to hear what was being described by our guide. However, the tour was informative and there was very little description based on giving human world descriptions of any of the formations.

Marakoopa Cave was a beautiful cave, full of interesting formations and colours. We had a reasonable guide who knew most of the relevant information.

The problem with this cave, however, was the group size. Too many people were allowed in the group which prevented any individual attention and made it difficult to hear. The cave also had some dark colouring from bushfires. The formations were going grey and even black in some areas. Although this was damaging to the cave, it was not as bad as some of the effects that had occurred as consequence of people touching formations. At least the smoke damage was natural.

Rim pools in Marakoopa Cave

King Solomons Cave

The tours at Marrakoopa Cave are timed so that it is possible to drive the nearly eleven kilometres to King Solomons Cave in time for a subsequent tour of this cave. At King Solomon's Cave, we again had quite a large group with about sixty percent of them having been on our earlier tour at Marrakoopa. King Solomons Cave was the stand out one of those that I visited.

I have deliberately chosen not to name most of the guides because I do not wish to embarrass them. However, our guide at King Solomon's cave, Aaron, warrants special mention for a number of reasons. These were:

- He did an amazing job. He knew every detail that he should and more!
- He did not try to sugar-coat anything about future impacts of climate change on caves such as this one;
- He told us the proper scientific names of the formations and how the colours formed from the different minerals in the water as the formations grew;
- He didn't give human identifying names to any of the formations; and
- It felt like he actually cared about how the caves were managed.

This was the only cave where we saw any cave life. At the entrance to the cave, there was a cave spider. The guide explained that this spider was pregnant, which meant that it was much larger than usual. Seeing her (and the guide's explanation of this and of the cave overall) set this cave above the others that we visited.

A very, very long straw in King Solomons Cave!

This cave still had damage but was not always as obvious as the other caves. Also, there were bones of animals that had fallen into the cave and died. This cave definitely had the most fauna related features.

However, this mesmerising cave was also rather cramped with our party (although certainly not as much as at Marrakoopa).

Hastings Caves

We drove the hundred kilometres or so from where we were staying in Hobart to Hastings Caves to the south down the Huon Valley. Although we made the trip especially to visit Hastings Caves, on our return journey, we diverted to visit the Tahune Forest Air Walk, some 26 km into the forests to the west of Geeveston.

All of those going on our scheduled tour through Newdegate Cave assembled outside the cave entrance. I was surprised at how many people there were for our scheduled tour given the distance that Hastings Caves are away from the main centres of population. We had such a large group that we had to be split up into two separate parties, each of about 20 people. The two groups went through the cave starting about a minute or so apart under the instructions of our separate guides. This was part of the problem with this cave.
In the end, however, it was the guide's description of the cave that did the most damage to enjoying its features. There were still good and beautiful formations that were as dazzling as in all the other locations. The lighting, which seemed to have been renewed as LED lighting, was also well arranged for displaying the formations, including, as the guide demonstrated, the translucence of formations.

Our guide, however, did not do anything to contribute significantly to the tour. She did not talk about how anything in the cave was formed and she also compared a large number of the formations to real-world items. There was no description of how the caves were coloured and the impact of the sediment that had been washed into the cave or any description of the impact of bushfire smoke. There was still a wide range of beautiful and different formations. There was also a part of a stalactite that had broken off and enabled us to see the original straw formation from which it had evolved. My only regret is that it would have been a much richer experience if the guide had explained it better.

One of the missing stair tread safety strips

As a matter of visitor management and safety, my father noticed that the edges of three of the paved steps in the major chamber at the foot of the entrance staircase were missing part of their non-slip trim. One of the three steps from which this element of the safety feature was missing can be seen on the photograph . This, dad told me, might reflect an inadequate attitude to ongoing maintenance. Although we didn't see anybody slip, nonetheless, it showed a hazard which should have been noticed and fixed.

Overall conclusion

Although all four caves that we visited had different visual and guiding experiences for me, each of them showed me differing aspects of the beauty that can be created by the activity of water flowing underground through limestone geology.

Around the show caves

Cutta Cutta Caves

Cutta Cutta Caves are a unique tropical cave system situated with an open woodland landscape in the Katherine Region of the Northern Territory. Cutta Cutta Caves are a warm cave system with the temperature and humidity inside the varying in between wet and dry season.

The cave ecosystem is intrinsically linked with surrounding landscape with several monsoon vineforest plant species including fig tree species (notably the rare Hairy-Fruited Banyan Fig (*Ficus virens var. dasycarpa*)) tapping into the caves with their root systems, relying on the humid air inside for moisture. The rocky outcrops of the karst landscape also offer fire protection to the plant species that grow within them and offer a sanctuary for animals such as the Common Tree Snake, Red and Black Flying Foxes, Figbirds and the Common Koel.

The inside of the Cutta Cutta Caves i also home to a variety of animals. While not frequently spotted by tourists, six bat species have been recorded in the cave, including two vulnerable species, the Ghost Bat and the Orange Leaf-nosed Bat, which are both at risk of becoming endangered. It is also common for snakes to be spotted in the cave with Brown Tree Snakes and Olive Pythons seen regularly during tours.

Dry season visitors to Cutta Cutta Caves

The caves are accessible by participating in a guided tour. An elevated walkway was built in the cave in the late 1980s to prevent further erosion and reduce the impact of tourism on the cave's fragile ecosystem. Cutta Cutta Cave is lit using a variety of lighting, including LEDs, and is powered by a solar panel grid. During the tour, visitors see a variety of cave formations, including stalactites, stalagmites, flow stones, shawls, straws and the cave is also home to spectacular calcite crystals which make many of the formations inside the cave glisten under torchlight.

Nitmiluk Tours works in conjunction with the Northern Territory Parks and Wildlife Service to help maintain and promote the important ecological and recreational assets within the Cutta Cutta Caves Nature Park.

Capricorn Caves has done it again!

The Queensland Tourism Award gold winner for the best tourist attraction goes to Capricorn Caves.

We are humbled to receive this award in loving memory of Ann Augusteyn who worked tirelessly on this submission before her recent passing.

It was a massive team effort and each and every team member played an important role, thank you.

This one is for you, Ann!

Margaret River

The Margaret River Busselton Tourism Association team has had great results in removing weeds across the Margaret River Caves Precinct. There was, however, a sizeable number spread out along wall of the doline thatwere just out of reach. So after a few phone calls and emails a plan was created .....

On Sunday 28 October 2018, the State Emergency Service, West Australian Speleological Group and Cavers Leeuwin joined forces in helping to remove arum lilies from the walls of the doline at Lake Cave, by abseiling the sides of the doline.

It was a great day with over 35 active participants joining in - so many, in fact, that a group from Cavers Leeuwin ventured off to Brides Cave to undertake the same task. All the weeds that were visible were removed with enough daylight for a couple of mock rescues.

All in all, the day was a great success, with thanks to all those involved - it will be an event we look forward to repeating.

Wellington Caves

I love a sunburnt country,
…….,
…….,
Of droughts and flooding rains,
(Dorothea Mackellar)
The Central West of NSW went from floods in the spring of 2016 to drought in just 2 years!

In 2016, the series of heavy rain events flooded towns such as Canowindra, Forbes, Dubbo and Wellington. At Wellington Caves, Gaden Cave which is often dry with a woodland above, became quite wet and it was not uncommon during that period to see frogs in the chambers. The Fossil and Phosphate Tour had a major mud slip which blocked the entry Adit, requiring a bobcat and several days labour to stabilise the area. Cathedral Cave had the 'Well' rise and completely flood the lower chamber. This flooding in the lower level of Cathedral Cave was for 9 days and even when the water subsided it remained off limits for a few weeks before the floor was safe enough for tours to visit again.

Fast track two years and the central west of NSW, in fact all of NSW, was in drought!

In September 2018, NSW was declared to be in drought. Wellington certainly was very dry and our Cathedral Cave 'Well' was a mere puddle in the shadows and not registering on the 5+m depth gauge. Our region then had above average rainfall for October 2018 and barren sheep paddocks quickly changed to tall grass. The region technically remained in drought but visually appeared to be lush. The 'Well' depth gauge rose to 1.8m.

UNSW has been conducting hydrological studies at Wellington Caves under the leadership of Prof Andy Baker. Drip monitors in Cathedral Cave have been strategically placed below speleothems, just under the surface at the upper chambers as well as just above the water table in a lower passage above the 'Well'.

This study has become part of an international hydrological study and Friedberg University in Germany have also assisted in adding soil moisture probes in open grassland and in woodland on Wellington Caves Reserve.

Wellington Caves Reserve now has:

- A weather station
- Drip data loggers under speleothems in Cathedral Cave
- Bore holes to access data from the ground water

This combines a very thorough analysis of the rain and its effect on soil moisture, through the limestone of Wellington Caves to the ground water and its changes to and from the Bell River. In fact, numerous papers are now being produced and Wellington Caves are being showcased around the world in these scientific circles.

Andy Baker also recently facilitated recent visits by Lucia Ojeda, who is an expert on cave climates, working on her PhD at Nerja Cave in Spain, and Wuhui Duan, a past climate/speleothem scientist from China.

Andreas Hartmann of Friedberg University also works alongside Andy Baker and together they were instrumental in planning the recent addition of soil moisture probes. Andreas is also the guest host for the American Geophysical Union Instagram page. Check out this link:

https://blogs.agu.org/waterunderground/2018/10/08/groundwater-and-drought/

UNSW also secured agricultural land for the base of a hydrological study beside the Macquarie River in Wellington and it has around 50 bore holes which enables the study in groundwater.

On Father's Day, 2 September 2018, Wellington Caves team member Tara Grasnick and her father, John Grasnick, took a walk behind their property on the Bell River a few kilometres downstream from the caves. The Bell River had become an intermittent stream way. There is limestone here on either side of the Bell River and no doubt water remained in the karst but at very low levels.

See also the companion article on the next page

-oOOOo-

You have now gone past the pages for the Guides' School and the ACKMA Annual General Meeting in Naracoorte in May 2019.

Have you remembered to fill in your registration form yet??

Wellington, NSW, April 2018. There has been no rainfall recharge of the groundwater here for 16 months (and counting). How do we know?

Groundwater and drought

Professor Andy Baker

Drought is in the news here in New South Wales, Australia. But how are rainfall, drought and groundwater related?

First, we need to understand what drought is. Is it a water shortage? Or a lack of rainfall? Or something else? In the USA, the National Climatic Data Center define drought as the 'absence of water'. They identify four types of drought:

1) meteorological drought (a lack of rainfall),
2) hydrological drought (a loss of surface water or groundwater supply),
3) agricultural drought (a water shortage leading to crop failure), and
4) socioeconomic drought (where demand for water exceeds availability).

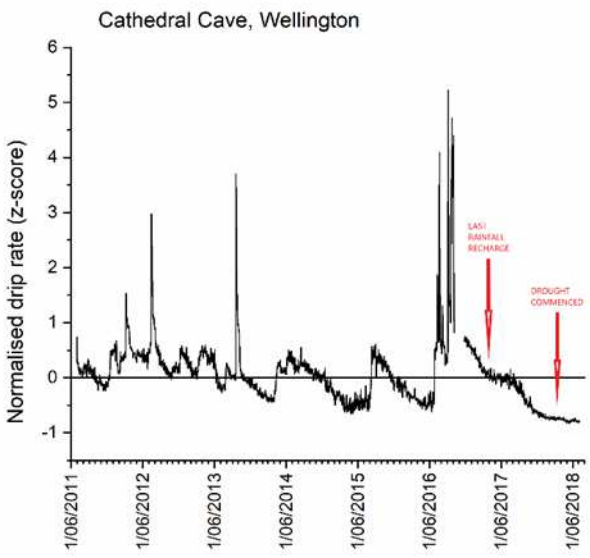
Here in Australia, the Bureau of Meteorology (BoM) defines drought as 'a prolonged, abnormally dry period when the amount of available water is insufficient to meet our normal use'. They add that 'drought is not simply low rainfall; if it was, much of inland Australia would be in almost perpetual drought'. Much of inland Australia depends on surface and groundwater for their economy. If those regions experienced a groundwater drought, it would therefore be bad news.

Let's look at New South Wales again. It covers both coastal regions, such as Sydney (where I am writing this), as well as a vast interior (where most of my research is based). The BoM produces meteorological drought maps based on rainfall amounts over recent months. The current map shows large areas of New South Wales are experiencing rainfall totals that are in the lowest 10 percentile ('serious'), lowest 5 percentile ('severe') and the lowest on record.

How does this deficiency in rainfall affect groundwater? And is there a groundwater drought? Long-term measurement of groundwater levels in boreholes (also called wells, depending on your country) can tell you whether water levels are rising or falling. Wells integrate groundwater recharge that comes from both surface water (e.g. rivers that lose water through their base) and from rainfall (also called diffuse recharge).

Real-time data of water levels from telemetered boreholes can provide timely information on groundwater drought (for example, here for NSW). Satellite products such as GRACE, which can infer groundwater levels from small changes in gravity over time, can provide large scale spatial coverage. Modelling products can calculate water balance from meteorological, soil and land use data.

The current BoM map shows that deep soil moisture is very much below average across New South Wales. If we assume that deep soil moisture levels are only determined by rainfall recharge, then from this we would expect no rainfall recharge of groundwater to be occurring over large parts of New South Wales. From one location, Wellington, close to the middle of the drought region, we have the measured evidence from inside a cave that shows that rainfall recharge hasn't occurred for 18 months (and counting).



Since 2011, forty data loggers have been measuring the water percolating through the unsaturated zone of the limestone at a depth of 25 m at Wellington Caves. This winter, I did the latest download of the data. Or rather, the lack of data, as only four drip water sources were still active. Conditions in the cave are the driest since we started collecting data in 2011.

Drip rates have been on the decline since the winter of 2016. But note the decline temporarily slowed in 2017, starting in early April. That is the response to the last time there was rainfall recharge there – owing to almost 70 mm of rain falling over three days in late March 2017, eighteen months ago.

In the inland of New South Wales, it is clear that, in dryland farming regions, the lack of rainfall has now led to an agricultural drought. In contrast, latest available data from our groundwater monitoring networks shows that there is currently no decline in groundwater levels in the major irrigation districts, which is where river recharge occurs. But for our dryland farmers, and ecosystems that rely on rainfall recharge, the karst drip data show that the groundwater drought has hit. Australia is often called a country of drought and flooding rains. Flooding rains are what we need next so that we also have some river recharge to replenish our groundwater resource.

Wellington, NSW. July 2018. This is the UNSW Research Station, normally stocked and cropped, but not this year.

Don't forget to register!!

The "Save Cliefden Caves" Campaign

The campaign to object to dam construction on the Belubula River that could have flooded the Cliefden Caves has now worked to its conclusion. ASF, the Save Cliefden Caves Association and other groups under the auspices of the Nature Conservation Council NSW conducted this campaign. The NSW National Trust (and others - including ACKMA members) nominated the Cliefden Caves Area and associated fossil exposures in the limestone for inclusion on the NSW Heritage Register. After some consultation with Orange Speleological Society (OSS) on the boundaries, the nomination was accepted. OSS instigated studies on the cave dwelling bats (Eastern horseshoe bat and Eastern bent-wing bat) as well as the forest bats of the Belubula River valley. Information on the bat populations was important in the campaign.

There is no question that there are water issues in the communities of the Central West. There is still a perception that there should be more available water for farming and mining interests and that this should be provided in the interests of development and productivity.

Water NSW submitted its investigations to the NSW Cabinet in 2017. In October 2018, the NSW Cabinet decided its position on the "Water Security Investigations for the Lachlan River and Central West". These were that:

- no dam on the Belubula River be built; and
- a business case for lifting the dam height of the Wyangala Dam be investigated.

This effectively means the Cliefden Caves and associated limestone fossils are not under threat from flooding. The Water Minister, Niall Blair MLC, in announcing the decisions relating to the report, said that a dam at Cranky Rock "would be tied up in Green and Red tape for many years and we wouldn't see anything flowing through to the community."

This campaign has produced the result of no new dams and recognition of the significance of the Cliefden Caves and surrounds (including the Belubula River valley).

An overview of public access lava caves in California

By John Brush
UIS Commission on Volcanic Caves

Introduction

If, like most ACKMA members, you have a passion for caves but are becoming a little jaded with the limestone variety, then perhaps you need a trip to California to visit a few lava caves (or tubes) which are easily accessible and open to the general public.

Literally thousands of lava caves are known in northern California. While a good many of them are on public land, access restrictions and/or paucity of location information make it difficult for the casual visitor or traveller to visit them. From a cave conservation perspective, this is not a bad thing. However, between 20 and 30 caves can be visited by the general public on a self-guided basis.

- These caves are signposted;
- Located close to vehicle parking areas;
- Have walking paths or trails to their entrances; and
- Have either walk-in entrances or infrastructure in place to facilitate easy access.

They also have passages that are relatively easy to negotiate. Two of the caves are in National Forests, which are managed by the US Department of Agriculture, and the rest are in the Lava Beds National Monument, which is managed by the National Park Service.

Marjorie Coggan and I were able to visit a good number of the public access caves in July 2018 while in California for the 18th International Symposium on Vulcanospeleology. The caves in the Lava Beds National Monument were the key focus of the symposium field trips. We also navigated our way to the caves in National Forests while en route to the Lava Beds area.

The following notes briefly cover how to find the caves and what are their features. I also offer some comments on management. The cave location information is based on distances and direction from the northern California city of Redding, which itself is about 350 kilometres (or 3-4 hours' drive) north of San Francisco.

Subway Cave, Lassen National Forest

Subway Cave is one of the easiest and most readily-accessible public access caves in California. It is in the Lassen National Forest about 100 kilometres (62 miles) east of Redding and is just off the Volcanic Legacy Scenic Byway (Highway 89). A signposted, sealed access road from the highway leads to a car park where there are several picnic tables, a toilet and a well-formed path to the entrance, which is just over 100 metres away. The carpark and picnic tables are in a shady grove of Ponderosa pines, as is a camping area a few hundred metres away on the other side of the highway. At the cave, however, the vegetation is more open and shrubby.

A permit is not required to visit the cave and there is no entry fee to the cave or the forest. The cave is open from May until November each year.

Concrete steps with steel handrails provide easy access into the cave. The passage is typically arch-shaped, 2-5 metres high and 2-6 metres wide and has a flat floor. There is very little breakdown. It is a very easy walk up the passage to another entrance about 400 metres away.

NOTE: All photos by John Brush

The flat floor in Subway Cave makes for easy walking. Note the camouflaged graffiti on the right hand wall.

As if the solid walls of the single passage were not obvious enough to lead visitors through the cave, there are reflective route markers at regular intervals. At the other entrance, there is another set of concrete steps and a return track to the car park, but on a hot day it is more pleasant walking back through the cave to the lower entrance. A torch is the only gear needed to explore the cave.

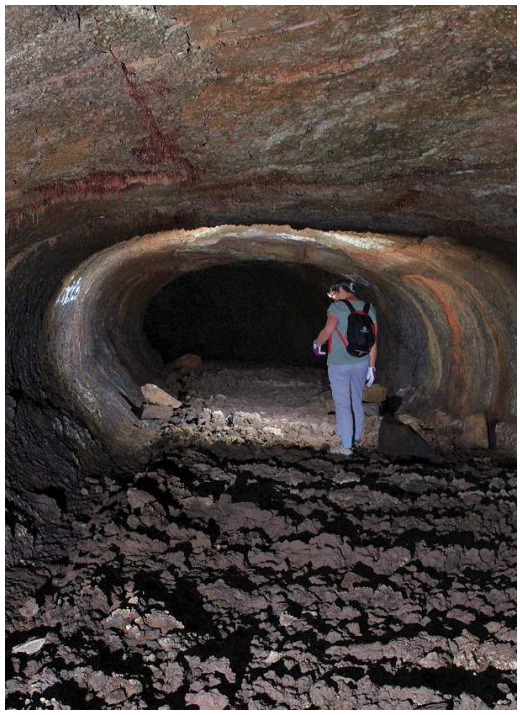
Much of the solid pahoehoe (ropey) lava floor has a thin covering of earth or sand. Some of this probably washed or blew in but it is likely a fair proportion of it was tracked in on the footwear of the many thousands of visitors who must have visited the cave over the years. At the time of our visit (and when we stopped in for a picnic lunch on our return trip south about a week later), the carpark was busy and there was a steady trickle of visitors to and from the cave.

The section of cave between the two entrances would give first time visitors to a lava cave a fair impression of what a lava cave is like as it has a range of features in good condition. But is it not stunning. Another section of the cave down-flow from the entrance steps is more interesting - as it is in better condition; exhibits a wider range of features; is more colourful' and has little mud or sand.

To its credit, the Forest Service actively discourages visitors to this section. There is no mention of it in any interpretive signs or brochures and the passage would be easy to miss it unless you were specifically looking for it while going down the entrance steps.

The lesser known down-flow section of Subway Cave has spectacular colours and impressive features such as the tube-in-tube structure in the roof (above and below)

There is an obvious management presence at Subway Cave. The surface facilities are in good condition and are clean. There are interpretive signs at the car park and at several points in the cave. Although there were obvious signs of wear and tear, principally the erosional effects of foot traffic, the cave is in pretty good condition. There was virtually no rubbish and, at first, we thought there was an absence of graffiti. However, after we returned home, a close inspection of our photos revealed graffiti had been painted over in an attempt to discourage the practice and improve the appearance of the cave.



Welded clinker floor in down-flow section of Subway Cave.

Pluto's Cave, Klamath National Forest

Pluto's Cave is a spacious cave in desert country of the Klamath National Forest about 140 kilometres (87 miles) north of Redding. Getting there is a little more complicated than finding Subway Cave.

So, from Redding take the Interstate Highway (I-5) north to Weed, then follow Highway 97 (part of the Volcanic Heritage Scenic Byway route) for about 20 kilometres (about 12 miles) and turn left onto the A12 (also known as the 99-97 cut-off route). In about 4 kilometres (less than 3 miles), there is a sign to the Juniper Flat OHV (Off-Highway Vehicle) Recreation Area.

The track to Pluto's Cave

A kilometre (0.6 of a mile) further on, there is dirt track on the left. This is the access track to Pluto's Cave. If you look very carefully, you will see it is marked with metal letters nailed to a nearby telephone pole. However, chances are you will miss it, as we initially did. When you do locate it, follow the rough track for about 400 metres to a rudimentary car park. From there, it is a 400 metre walk to the cave along an unmarked (but obvious) foot track.

The cave is reputed to be about 1.5 kilometres long. A permit is not needed for a visit and there is no entry fee. The only gear required is a good light.

There are no facilities at the cave car park but the nearby Juniper Flat OHV area has picnic shelters, barbecues and a toilet. The picnic area was deserted at the time of our visit and it was a pleasant place for lunch - and had great views to snow-covered slopes of the 4300 metre Mt Shasta volcano. However, the area may not be as pleasant when there are trail bikes and quads screaming around the nearby OHV trails.

The foot track to the cave leads into the second of the cave's five collapse entrances (counting from the south). It is an easy scramble to the floor of the pit. Here, a left turn leads to a short bridge section of cave that has a steep rocky slope leading up to the small southern-most entrance. The passage is very dusty and has a very distinctive and unpleasant odour resulting, we were later told, from seasonal occupation by a particular species of bat. It is not a place to linger.

Continuing in the other (down-flow) direction from the second entrance, the route passes under another short bridge section; crosses a large vegetation-filled collapse pit; and enters a semi-dark section of cave. The passage is huge - generally 5-15 metres high and at least 10-15 metres wide. At first, it is easy walking over a sandy floor interspersed with breakdown areas.

About 200 metres in, there is a large skylight hole, which, at the right time of day, enables a shaft of sunlight to beam into the passage. The final and northern-most entrance hole is a little further on. Beyond that, the cave is dark. Very dark. The route is not always obvious as it meanders over, around and under huge breakdown blocks. Further in, there is less breakdown and parts of the original roof lining remain intact. As our time was limited, we did not carry on to the end of the cave.

The huge passage dimensions and the interesting play of light around the skylight holes are the cave's main features of interest. As it is relatively old, around 190,000 years, many of the passage features that are commonly seen in lava caves have been destroyed or obscured by breakdown.

A skylight entrance into Pluto's Cave.

The cave also looks very 'used' - with footprints everywhere and worn trails across the breakdown. There is a lot of painted graffiti throughout the cave. Some of it may be historic, but much of it looks to be quite recent and is mindless. There is also some littering.

The cave and its surrounds appear to have a less obvious and less effective management regime than there is at Subway Cave. A rudimentary sign at the carpark and the Forest Service Website have a little basic information about protecting the cave and what gear to take. However, there is not much evidence of an active management presence. Little effort appears to have been made to deal with the graffiti problems but we were later told that local cavers do a rubbish clean-up about once a year.

The cave may be worth a quick look if you are in the area and have some spare time. However, the time would be more profitably spent in caves at the Lava Beds National Monument, a couple of hours drive further north.

Caves in the Lava Beds National Monument

The Lava Beds National Monument lies in the far north of California, very close to the Oregon border. From Redding, it is a 240 kilometre (150 miles) drive that will take about 3 hours. From San Francisco, it nearly 600 kilometres (360 miles) - in effect a full day's drive.

The Lava Beds caves are relatively young, resulting from extensive and widespread volcanic activity 30,000 to 40,000 years ago. More than 800 caves have been recorded across the 190km2 area of the Monument. About 25 of them are usually open to the public. The public access caves are signposted; have paths or trails leading to them; and, where necessary, have steps, handrails and bridges to enable safe and easy access.

In several caves, the walking trails have been made easier by moving aside the breakdown. Much of this was done in the early days after the Monument was formally established in 1925. Only one cave, Mushpot, has electric lighting. It also has concrete paths and illuminated interpretive signs. In reality, it is a self-guiding show cave.

In addition to the caves and surface volcanic features, the National Monument includes several important historic sites. Most of them relate to the Modoc people and their ancient ancestors who inhabited the area for more than 10,000 years until being forced off their land after the first European settlers arrived in the 1850s. In the 1870s, there were wars with the US Army, culminating in a standoff in the rugged volcanic terrain where around 60 Modoc warriors and their families held more than 1000 troops at bay for more than six months. Unsurprisingly, it did not end well for the Modoc leaders.

The National Park Service charges an entry fee to the National Monument of $US20 per vehicle and this is valid for seven days.

Although the public access caves all have free access, regulations have recently been introduced to reduce the risk of White Nose Syndrome (WNS), which has not yet been detected in the Lava Beds area. WNS is a fungal disease that is having devastating effects on bat populations in many parts of the United States. All visitors intending to enter any cave in the area must now go through a screening process at the Monument Visitor Centre where they either certify they have no gear that has previously been used in other cave areas or have their gear decontaminated on the spot. Following that, staff will issue a dated permit card to hang on the rear-view mirror.

Staff will also suggest suitable caves to visit - noting that some caves may be temporarily closed when bats are present. They will also give advice on caving gear and even offer to "lend out a flashlight".

An informative brochure handed out at the Visitor Centre notes features of geological and historic interest and provides general information on lava cave formation. It also emphasises the importance of caving softly and safely and includes a map showing the locations of the public access caves. The map divides the caves in 3 categories: least challenging (essentially walk-through); more challenging (caves with stooping sections and rough floors); and most challenging (some crawling involved).

More than a dozen of the public access caves are accessed from the Caves Loop Road - a 3-kilometre one-way paved road that starts and finishes near the Visitor Centre. The road has parking areas at regular intervals. From these, signposts and footpaths direct visitors to the cave entrances. Walking distances are generally less than 100 metres. Caves that are temporarily closed are indicated by chains strung across the access paths and moveable self-supporting signs at the entrances.

Eight of the public access caves lie "beyond the loop", to use the local parlance. Several of these have their own access roads, most of which are sealed. Walking distances varies from as little as 30 metres (Valentine Cave) to about 1.5 kilometres (Symbol Bridge Cave).

With more than two dozen caves available, as well as a range of surface features and historic sites, it would be easy to spend at least a week in the area. During the vulcanospeleology symposium last July, five afternoons were devoted to field excursions to surface and underground locations (including to several restricted-access caves). In the time available, most participants felt they had barely scratched the surface.

It is beyond the scope of this article to describe each cave in detail. However, it is worth noting that most caves have at least a couple standout features, including:

Catacombs Cave, where there are welded clinker floors and spectacular secondary calcite and silica encrustations.

Golden Dome Cave, which is renowned for its abundant gold-coloured bacterial mats (commonly referred to as cave slime) on the walls and roof (**see right**) as well as a wide range of fresh-looking lava features and stranded boulders that were originally carried along in the lava stream.

It also has impressive lava cascades and rafted blocks (chunks of rock that were carried along in the lava stream).

Symbol Bridge and Big Painted Caves, both of which are short but very spacious and have ancient pictographs on the walls.

Mushpot Cave, which has electric lighting, interpretive signs and concrete pathways. It also has a presentation area with seating for around 30 people. This short cave is still worth a look as it has a good range of features, including sections of intact wall lining. It has the Mushpot, a small pit with a raised rim that formed when lava welled-up through the floor and subsequently receded.

Sentinel Cave, which has spacious passages, lava benches, skylight holes and several levels. A through trip is possible.

It has several ladders, bridges and handrails to improve visitor safety.

Breakdown has been moved aside to clear an easy walking route (**see right**). Note the large lava bench along the wall, marking a former level of lava in the passage.

In most of the public access caves, the added infrastructure and cave modifications to facilitate visitor access are not too intrusive. In fact, away from the entrance area, most of them look and feel like wild caves. However, several caves have also been more extensively modified, to protect either the cave or its visitors.

Skull Cave is a popular destination for visitors to the Lava Beds National Monument. It is a cave where quite a lot of infrastructure has been installed to facilitate access and protect its features.

This cave has a huge entrance passage with early European inscriptions on a wall. The lower level has permanent ice and Bighorn sheep bones.

It has a formed pathway leading to a long flight of steps to the lower level (**see upper right**) where there is a steel viewing platform above remnant permanent ice and an ugly steel barrier to stop visitors walking on and degrading the most extensive area of ice.

Marjorie Coggan examining an ice-filled passage beyond the barrier in Skull Cave (**see lower right**).

Heppe Cave, which is noted for its huge passages and extensive breakdown. It also has a pool of water, which is an uncommon feature in this desert country.

Hercules Leg-Juniper Cave System, which has flat pahoehoe lava floors, wall dribbles and large Wood Rat nests. It also presents an opportunity to do a long through-trip.

Hopkins Chocolate Cave, which has chocolate-coloured walls, rafted blocks, slumped wall linings and superb lava drips.

Past visitors have left finger-mark graffiti in bacterial slime in Hopkins Chocolate Cave (**see immediate right)**.

Valentine Cave, which has fabulous lava cascades (**see upper right**), lateral lava benches (**see lower right**), pillars and looped passages.

Annual visitation to the National Monument is now running at many tens of thousands of people each year. As cave access is largely unsupervised, it is hardly surprising that it is not very difficult to spot the odd broken lava 'stalactite'; finger marks in the gold bacterial slime; signs of wear and tear on smooth lava floors; or the odd small piece of litter. However, considering how many visitors must have visited the caves since the National Monument was established nearly 100 years ago, these caves appear to be in remarkably good condition. National Parks staff in the Visitor Centre are helpful and appear to project appropriate messages in a positive manner to intending cave visitors. They also appear to take their obligations to minimise WNS risk seriously. Rangers regularly patrol the area in their vehicles. However, while we were there, the only time we saw any of them underground was on special ranger-led interpretive trips.

In conclusion, the Lava Beds National Monument has a rich tapestry of geological and cultural history and has an immense variety of relatively young lava caves in good condition. It is well worth the long drive (from anywhere) to get there.

Victoria Fossil Cave, Naracoorte Caves **Photo: Margarete Smith**

2019 CAVE GUIDES' SCHOOL

Wednesday 15 May – Friday 17 May 2019 (Programme on page 20)

followed by

ACKMA AGM

Saturday 18 May – Sunday 19 May 2019 (Programme on page 21)

VENUE

Naracoorte Caves National Park – World Heritage Site

ACKMA gratefully acknowledges the support of

Naracoorte Lucindale Council
Better by Nature

the LIMESTONE COAST
unearth our treasures