

CAVES

The Journal of the Australian Speleological Federation Inc.



AUSTRALIAN
SPELEOLOGICAL
FEDERATION

AUSTRALIA

NEW AUSTRALIAN DEPTH RECORD
TREE ROOTS IN CAVES
CAVE VANDALISM

No. 221 • SEPTEMBER 2022



Ticket purchasing opens 1st September

–so make sure to grab your early bird ticket!

<https://asfconference2023.com/>

Conference camping has been confirmed at the beautiful Shelley Beach caravan park; the dunes and beach there are gorgeous and the caravan park owners are friendly and helpful.

If you want to jump in and book a campsite, make sure to mention you are coming to the ASF caving conference and they will put you in our allocated area.

There are also a limited number of powered sites available.

Merchandise, photo competition and speaker abstracts will be up soon;
keep a lookout for updates on our Facebook page and website.

In the meanwhile, it has been great to see so many people at the online talk series.

We have one this month and then possibly a sixth (TBC) before the series ends.

Thanks to all of you who have been attending and participating in the discussions,
and of course thanks to our stellar speakers.

We are really looking forward to seeing all of you in person next year
and we'll keep you updated as planning progresses.

I know I said it already, but: *Don't forget to get your early bird tickets!*

Have a question?

Contact event organisers at registration@asfconference2023.com

COMING EVENTS

COVID-19 is still disrupting international travel and events. Many events are now providing virtual attendance options. Information on UIS-sanctioned events can be viewed at <http://tinyurl.com/y7rgb8ah>

Don't forget that the International Year of Caves and Karst has been extended to this year — 2022. You can find more information about what's going on and what you can do to help the cause at <http://iyck2021.org/>

CAVES AUSTRALIA

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Cover: Deb and Jess at the Womping Willow in Potters Way BAA108 Bullita Caves, NT. Photo: Garry K Smith

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Editor and Production Manager Needed

The positions of Production Manager and Editor will become vacant at the beginning of 2023. Fresh faces are needed for these roles. My last issue will be *Caves Australia* 222 (December 2022). Please contact me if you're interested in either or both of the roles and we'll discuss what's involved.

— Alan Jackson: alan.jackson@lmrs.com.au

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President's Report

A LOT of caving has been happening across Australia in the past few months, from annual Top End expeditions in the dry season to caving in Tasmania under waterfalls of snow melt. Several newsworthy items have been in the media recently:

A new Australian depth record was set in early June via the Delta Variant entrance to the Niggly Cave system in the Juneeflorentine, Southern Tasmania, adding 4 m to the Growling Swallet/Niggly system. Congratulations to everyone involved in the huge team effort exploring the system.

The Southern Bent-Wing Bat has won the *Cosmos* magazine's 2022 Australian Mammal of the Year award, beating the Dingo with 60 per cent of the vote (thank you to everyone who voted!). This is a fantastic opportunity to raise awareness for this critically endangered bat, whose population is restricted to only three known maternity caves in SA and Victoria.

The Flinders Ranges has been nominated for UNESCO World Heritage status for its natural and geological heritage. The area also contains several caves which contain significant indigenous heritage and palaeontology sites.

The ASF Executive has also been busy the past few months, but what they have been doing is better read as where have they been.

Phil Maynard (General Secretary) certainly holds the record for distance travelled in the pursuit of caving. He was out on the Nullarbor for the whole of April, then up to Chillagoe in June. In July, Phil and Andrew Stempel (Executive Secretary) escaped the cold, making multiple new discoveries and mapping many kilometres at Bullita. Then Phil was back down to Naracoorte to run a cave survey course for the SASC Kangaroo Island project, before heading to Spain in August and visiting the entrance to the

~1580 m deep Systema del Trave!

Steve Milner (VP) has been to the 'bor three times in as many months, and it's getting Nullar...boring. No, not really, he's loving it. Steve has been out there cave mapping, investigating recent cave vandalism with Mirning Elders and researchers, and has been shedding some light on Nullarbor blind spiders with Andrew Stempel. The Nullarbor is the place to be this time of year! Valdi Jonsson (Treasurer) has also been out on an exploration trip with CE-GWA recently, investigating many surface features. While not on the Nullarbor, Steve also undertook a values assessment of the Naracoorte Caves World Heritage Area and while in the Upper South East of SA, observing undescribed invertebrates, and more cave mapping. Janice March (VP) spent her COVID isolation week finishing off digital surveys of three Mole Creek



BRIAN EVANS

caves (Kohinoor, Diamond and Aqueduct Swallet). After a trip to Central Queensland to escape the cold, she's back to the in-cave survey work for Haile Selassie.

Rod Smith (Membership Secretary) has also been to Central Queensland, caving with MSS in the Mt Etna area.

Dan Lansom (VP) has been up on the Cape Range, Exmouth wandering in Wanderers Delight and other caves in the region. Prior to that, WASG members completed a weeklong expedition through the restricted gorges of Karijini National Park. He's also been active in the Arrowsmith Green Energy project, working with the company to provide a detailed karst report to ensure it remains protected.

My caving has had a more sedate and local flavour with FUSSI beginners trips — taking keen new O-week sign-ups for a crawl around Corra Lynn and a weekend of in-cave surveying practice to explore and fill a few holes in the maps of Naracoorte Caves.

Wherever you are in Australia, I wish you all the best for your own caving adventures, or the next best thing, to sit back and enjoy a read of the latest *Caves Australia*.

— Sarah Gilbert



Daniel Lansom and fellow WASG cavers in Karijini gorge

New Australian Depth Record

A Cave Named 'Delta Variant'

Stephen Fordyce
VSA/STC

FOR A couple of years now, I've been orchestrating a grand dye tracing study with the Hobart-based Southern Tasmanian Caverneers (STC) in the extensive cave systems in the Junee-Florentine (JF), under Mount Field National Park.

Club members have put in a huge effort to deploy many of the electronic loggers and detectors I've developed and to release dye in many different places (~150 dye releases at time of writing).

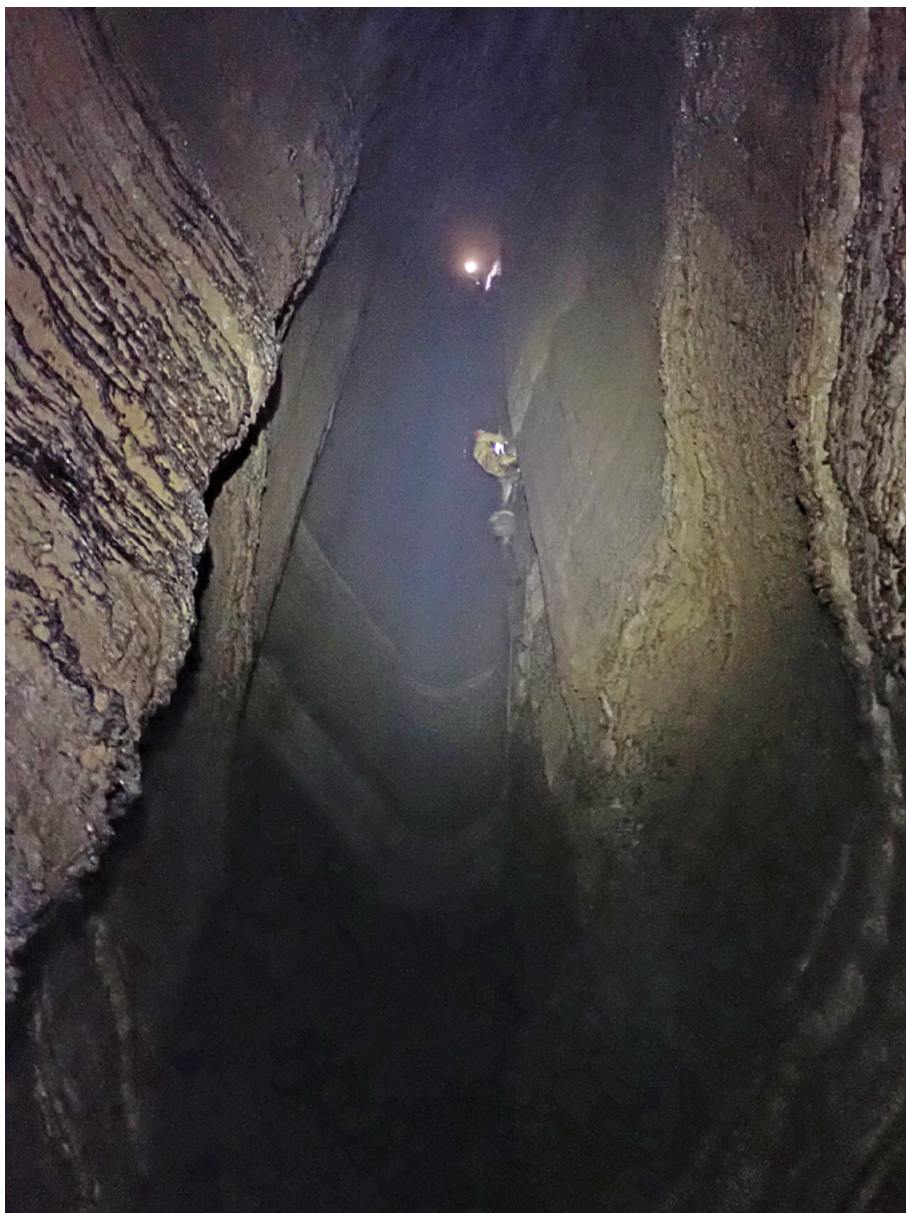
The major hydrological connections between caves had already been confirmed, but we sought to get a much finer resolution, establishing minor links too.

After several failed attempts to verify that a major waterfall in Niggly Cave (JF237) was from Bunyips Lair (JF236) — a long-held assumption — or North Chrisps Swallet (JF704), or even Boulder Jenga (JF398), it seemed a mystery was afoot.

The mysterious waterfall was big — it should correspond to a large stream on the surface, with associated swallet. But in between buying up the affordable housing, the 'Boomers' in the 1980s and 1990s had traversed the slopes thoroughly, finding all the streams and following them down to their respective sink points.

I had a lot of time in lockdown to stare at LiDAR and other data, and developed a nagging suspicion that they must have missed one.

So when Tasmania let the drawbridge down (for six days) in August 2021, I was on the first plane over Bass Strait for a miserable weekend of winter Tassie caving, which was fricken awesome. After a Saturday of unrelenting horror pushing the bottom of Turret Cave (JF719), I spent



GABRIEL KINZLER

Cavers ascending the 50 m Quarantine Pitch.

TEAM (TO DATE):

Karina Anders, Ben Armstrong, Lachlan Bailey, Rolan Eberhard, Stephen Fordyce, Lauren Hayes, Corey Hanrahan, Jemma Herbert, Alan Jackson, Anna Jackson, Gabriel Kinzler, Brendan Moore, John Oxley, Ciara Smart, Petr Smejkal

an equally miserable (awesome) Sunday walking the contour in light snow above the caves, checking for streams — alas, all matched the known swallets.

After a good deal of head-scratching and staring at things, I had an epiphany: the catchment above Niggly Cave was much too big for the small stream going in.

There were lots of little streams in the sides of the Niggly catchment (I'd walked diagonally up from the Niggly entrance); perhaps one of those fed the known cave entrance, while a major stream sank up the gully ABOVE Niggly.

With the little streams funnelling together in the reverse of a river delta,

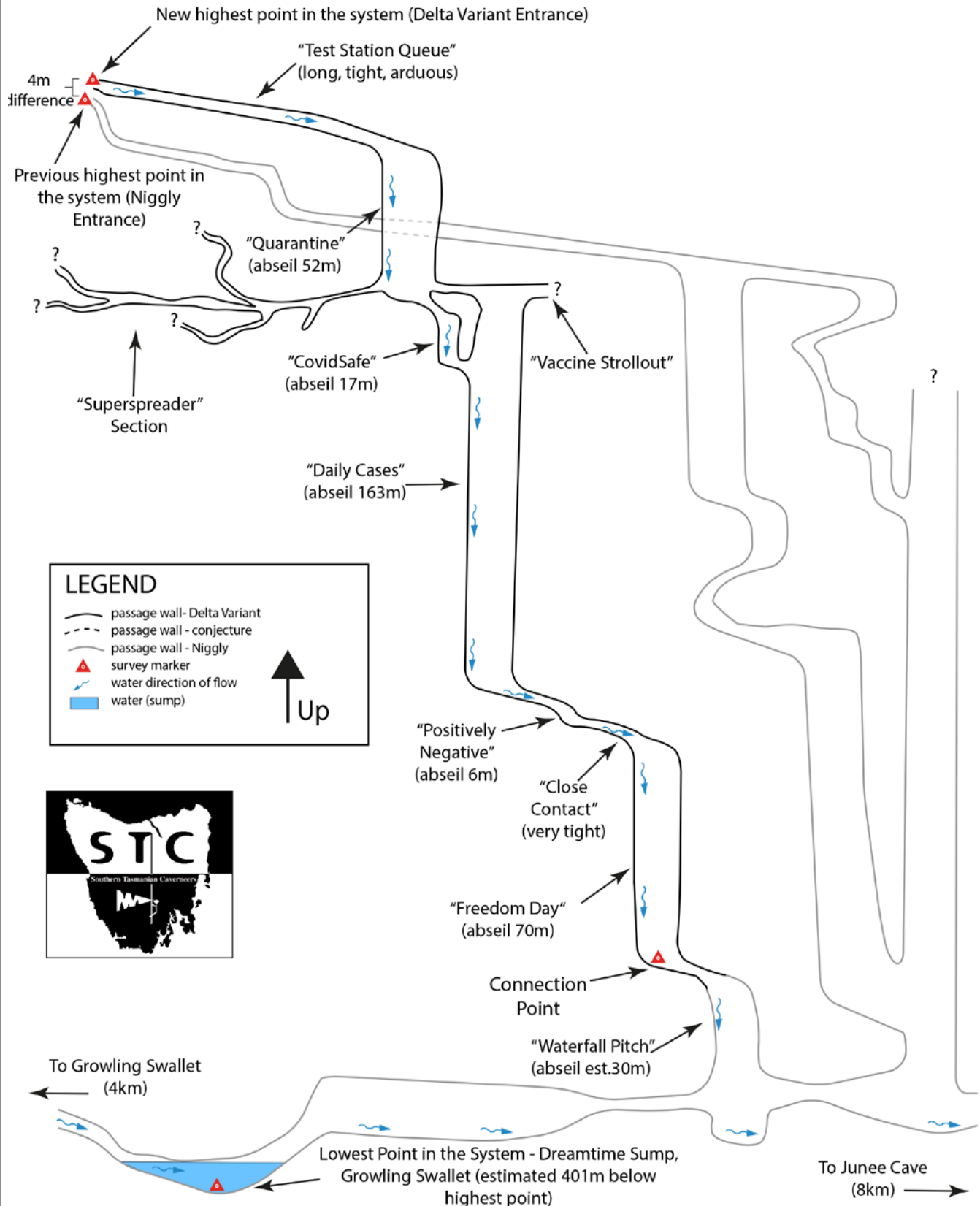
Delta Variant/Niggly Cave Systems: Simple Side View

Junee-Florentine, Tasmania

Drawn by Stephen Fordyce, Ciara Smart (July 2022)

Delta Variant

Niggly Cave



and delta variant being the flavour of the pandemic at the time, I optimistically pre-named the theorised swallet ‘Delta Variant’ and published my theory in *Speleo Spiel* (Fordyce 2021).

Surface prospecting in Tasmanian winter is sub-optimal, and my (undeserved!) reputation for wild theories meant that this particular one wouldn’t be tested for four months. But in January, the fabled swallet was found and tagged JF761.

Bizarrely, it is 10 m 3D distance from the Niggly entrance (literally a stone’s throw and within earshot of the big stream). A 3 m cliff/canyon had blocked it from view, and none of the many visitors in the last 30 years had bothered to traverse around the top of the canyon. The epic shot of ego boost was off the charts, and probably not very healthy.

The entrance wasn’t huge, but it was a goer if ever there was one, and with 350 m in both horizontal and vertical it was going to be a wild ride.

If it connected into Niggly as expected (and promptly dye-traced), being a higher entrance, it would set a new Australian depth record, as Niggly was the highest entrance in the Growling Swallet (JF36) system. Spoiler: it did.

It’s no exaggeration to call this a once in a lifetime find (at least at this point in time), so it was to be savoured with reptilian slowness. A COVID naming theme was applied and the shell-shocked Melbourne and Sydney lockdown veterans went to town.

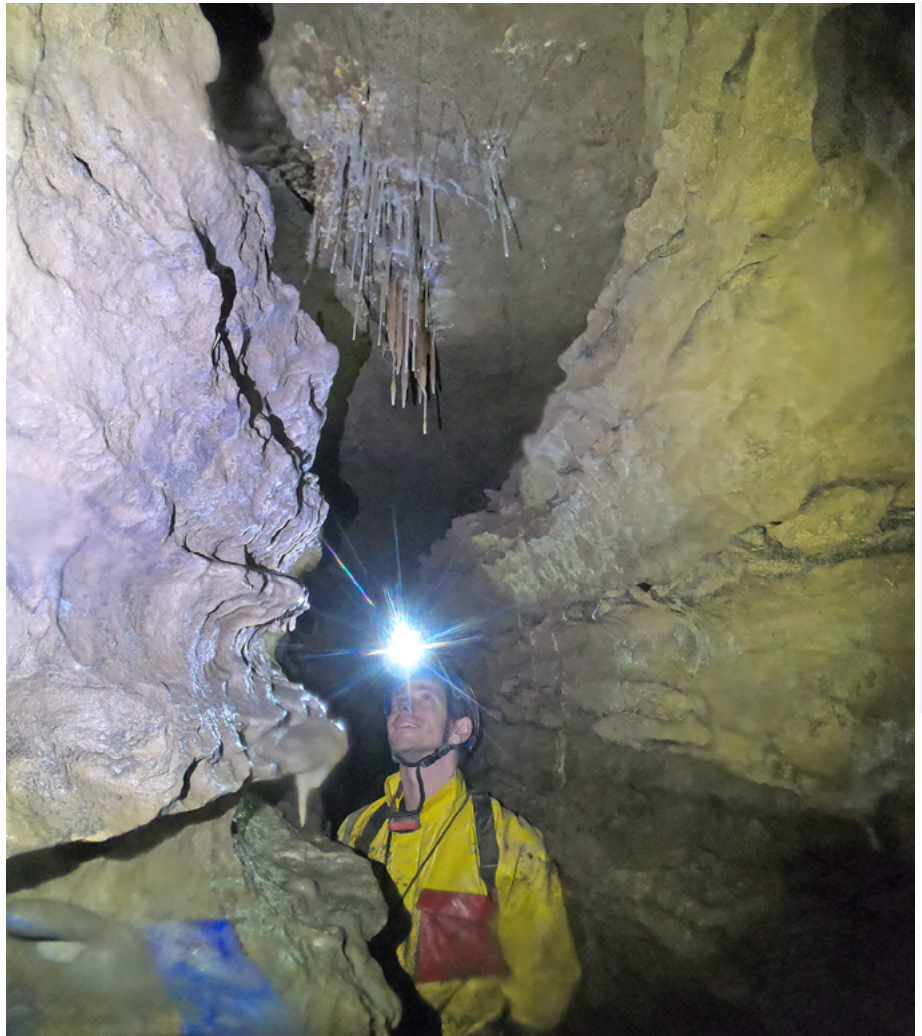
Over the next seven months, approximately 10 trips involving 15 cavers pushed the cave.

It was indeed epic. The initial meandering section named ‘The Test Station Queue’ is slow and torturous, requiring walking sideways but also stooping. It’s a bastard with heavy rigging bags.

After 250 m or so, the floor dropped away and belled out into a delicious 50 m pitch named ‘Quarantine’, with a spray-filled cathedral-sized chamber at the bottom — ‘5 km Radius’. A side passage (‘The Nasal Passage’) went 200 m to some interesting stuff explored later, but the exploration party followed the water to rig the 16 m ‘COVIDSafe’ pitch. Like the COVID-Safe app it was named for, the pitch seemed like a good idea initially, but soon nobody used it any more.

We’d been hauling in the horizontal pretty fast and didn’t have much left — fingers were crossed for a big vertical and it happened when the short crawl below COVIDSafe intersected an epic shaft.

Jemma and Corey came back with googly eyes, babbling about a big one. Rocks near the drop were kicked over the edge (for



BRENDAN MOORE

Typical vadose meander with a smattering of speleothems in the Test Station Queue passage.



GABRIEL KINZLER

Gabriel, Jemma, Karina and Ciara all clean and shiny before a trip into DV.

safety purposes) and fell for 6.5 seconds before a distant boom could be heard. At this point in mid-January 2022, Australia had just opened up and COVID numbers were going through the roof everywhere — Corey pointed out that the only thing bigger than this pitch was ‘Daily Cases’ and we cheered as it immediately stuck.

Trips happened monthly or thereabouts

after the grand excitement of January and lots of different people will get to tell their grandchildren about their time on the pointy end. Nobody went on all the push trips, which was healthy.

A big side lead split into a whole bunch of leads (‘Superspreader’) and one survey station ended up apparently 3 m above the surface (‘Negative Dig’). Daily Cases ended

NEW AUSTRALIA DEPTH RECORD — A CAVE NAMED 'DELTA VARIANT'



JOHN OXLEY

Rolan and Gabriel in the Test Station Queue passage.

CIARA SMART

Ciara brings some sub-surface filth to a pristine wintry surface.

up being Australia's third longest pitch at 163 m, but with the biggest single drop-waterfall (~150 m), took three trips and ~200 m of rope to rig.

The late Ken Murrey's rope collection was put to good use. It has eight rebelay and a redirect — we kept hangs to 20-30 m to make it easier and more efficient to pass. There is also a lot of horizontal offset, to keep out of the water.

Below Daily Cases, another meander was found and named 'Close Contact', with a short pitch named in (dis)honour of everyone's favourite American politician: 'Positively Negative'.

A final big pitch with a particularly painful approach (water, bad rock, general technicalities) was right where the survey said the Niggly waterfall dropped in from a big aven. As this was to be the culmination of a great deal of effort, heartache, sacrifice and commitment, it was named 'Freedom Day' (60 m). The elation of restrictions lifting after months of COVID lockdown is not easily forgotten.

After putting the brakes on for months, it became apparent that the project was a laughing stock at monthly STC meetings and in general.

All the regulars had had some glory and it was about time to go out with a bang (or as it turned out, a whistle).

With that in mind, the penultimate trip used a mix of forgetfulness, self-control, and creativity to rig the cave to a rebelay 30 m off the floor of what we assumed to be Niggly, but stop there rather than make the connection.

A complicated spreadsheet and consultation process were followed by a wait of nearly two months, but all those who had been involved in the exploration efforts so far were given the opportunity to be there for the connection trip.

We would make the connection, set a new depth record, exit through Niggly for the first through trip, and take advantage of hordes of excited cavers to de-rig the 400 m of old rope and 8 kg of hardware (Delta Variant would become the new route to the master cave in Niggly). We wouldn't want to make it too easy, that would be boring.

We split into teams — an all-female new-generation team (Karina, Ciara, Jemma) went ahead to fix/install the rigging, while the rest of us of the sub-optimally large party of nine did other useful things.

It worked out pretty well, and by 6 pm we were in Niggly, celebrating with party whistles and drinking hot powdered everything-together from the communal billy. Spirits were high, which was a good thing, because getting eight people up Niggly and bunching up as a result of the de-

rig meant that we didn't get out of the cave until 1:30 am (having gone in about 11 am). A surprise gusher of snowmelt on the entrance pitch put icing (ha!) on the cake.

It was a good day, and it wasn't finished yet. We stumbled down the hill and got back to Maydena about 3 am.

Extra beds at the AirBnB were filled and the glass was broken on the emergency garlic bread brought along for just such an occasion.

Photos and videos were sorted, survey data entered and a media release finalised before the last of us got to bed at 5 am. Closing loops and stuff was just not going to happen at that point, so we used the surface survey to add 4 m to the 397 m Niggly depth and called it done.

There is still the possibility of another entrance and/or pitch series to cross reference and come up with a final number. Fingers crossed it doesn't change by more than 1 m ...

We'd made a conscious decision to shoot for a bit of media coverage, for reasons including:

- Showing caving to the public in a positive light;
- Enjoying a brief celebrity status; and
- Sharing a cool story with the world.

Ciara took the lead on media co-ordinating, with great support from the team — those who wanted to get a good taste of stardom.

In fact, it blew up way more than we expected (perhaps a new and positive spin on COVID was irresistible?) and the story was covered all over Australia, and internationally on the likes of the *Daily Mail* (UK) and CNN (USA). Thanks to the STC committee who kept passing on enquiries from outlets trying to get in touch.

It was a great day, one which everyone involved will remember fondly. And there's more to go — the cave still has leads which are yielding to pushes; there are climbs, alternate pitch series, and several places where it goes very close to the surface.

The extensive network of high-level horizontal passages is actually quite unusual for the Junee-Florentine, and may make other small draughting holes in adjacent gullies a bit more exciting. There is also more to do in the large horizontal stream passage down the bottom, and it will be a welcome relief to swap the well-known evils of the Niggly descent for the still-novel tribulations of Delta Variant.

And the dye tracing results have revealed another mystery ...

REFERENCE

Fordyce, S. 2021 JF Surface Walking & Theorising. *Speleo Spiel* 445: 11-14



STEPHEN FORDYCE

Petr starts up Daily Cases pitch.



GABRIEL KINZLER

Brendan and a smattering of speleothems

NEW AUSTRALIA DEPTH RECORD — A CAVE NAMED ‘DELTA VARIANT’

STEPHEN FORDYCE



Ben Armstrong

STEPHEN FORDYCE



Lauren Hayes

STEPHEN FORDYCE



Stephen Fordyce

STEPHEN FORDYCE



Party time with Ciara, Karina and Jemma

CIARA SMART



The connection trip team: Jemma, Rolan, Steve, Brendan, Ben, Lauren, Karina, Petr and Ciara.

STEPHEN FORDYCE



Steve and Petr

STEPHEN FORDYCE



Jemma and Ciara

GABRIEL KINZLER



Karina and life-saving Thermos...

Tree roots influence cave atmosphere and biota

Garry K Smith
NHVSS

PLANT ROOTS are found in most caves in Australia. They can vary in size from fine hair-like rootlets up to large root bundles of >0.5 metre diameter.

The roots of shrubs and bushes tend to only penetrate caves up to several metres below the surface, whereas some tree roots have been recorded as deep as 50 metres. Day *et al.* (2010), summed up tree roots nicely with, 'Roots are opportunistic and will grow wherever environmental conditions permit'.

Roots play a part in karst processes as well as influencing a cave's atmosphere, nutrient levels and fauna. For instance, root mats in particular are an important food source and habitat for troglobitic life (troglofauna and stygofauna). In addition to a reliable food supply, such as plant roots and bat guano, a humid cave atmosphere is critical in supporting a diverse and healthy population of troglobitic fauna.

Hardy trees such as figs, boabs, kurrajongs and gums that grow on limestone often become established in small pockets of well-drained soil trapped in the karst.

In the quest for moisture and nutrients, their roots can penetrate cracks following the path of rainwater deeper into the limestone.

The roots of large well-established trees penetrate to such depths that they can enter through the ceilings and walls of caves absorbing condensation from the humid subterranean atmosphere or water running over rock surfaces or in cave sediments. They may continue to grow down into a cave's earth floor, which is often rich in nutrients from bat droppings or possibly rotting vegetation washed into the cave.

This rich source of nutrients and moisture supports the continued growth of the tree and its expanding roots may apply such pressure through cracks in the rock that they aid in prising the cracks further apart.

Other factors also come into play here. The trees growing on karst become a catchment and can preferentially funnel rainwater from the leaves on to branches,



Fig 1. A showerhead called Eve's Shower in Deer Cave, Mulu, Sarawak.

to the trunk and ultimately down the root system, thus influencing the path of water which dissolves the limestone. This is the main mechanism involved in the creation of 'showerheads' in tropical karst caves (Shopov 2004). (Fig. 1)

TREE ROOTS PUT CARBON DIOXIDE INTO CAVES

The process is fairly complicated; however, the following summary is provided in simplified terms.

Trees absorb carbon dioxide (CO₂) from the atmosphere through their leaves while water and inorganic nutrients are absorbed through their roots and with the energy from sunlight and a process called photosynthesis makes sugars.

The waste product is oxygen (O₂) that is released back into the atmosphere through the leaves. The sugar is converted into

starch and can be stored in the tree's trunk or the roots, or used for immediate growth.

But what is often overlooked is that trees also need oxygen to convert the sugars and stored starch back into energy through a process called 'respiration' in order to create cells for growth. The waste product of this respiration is CO₂.

Above ground, leaves can easily take in oxygen from the air to grow, but at depth the roots also need oxygen to grow, so they absorb it from the soil or from a cave's atmosphere.

For root growth it is too far for a tree to transport the O₂ from the leaves down to the roots, but in the ground air and water are held in little pockets called soil pores.

A cave provides an environment where the tree roots can grow to far greater depths because they provide water, oxygen and nutrients. The same type of tree growing away



Figure 2: A cave cricket on a root mat in Church Creek (CC4), NSW.



Figure 3: Large tree roots in Two Fishes Cave at Bullita, NT.

from karst in a compacted type of soil with limited O_2 at depth may cause the roots to grow predominantly at shallow depth where there is oxygen (Portland.gov 2021).

Generally speaking, about half the volume of CO_2 initially absorbed by a tree during photosynthesis is released back to the atmosphere as a result of respiration. Since on average approximately 30% of a tree's biomass is made up of the root system, it would be expected that a similar percentage of a tree's growth occurs in the roots.

Tom Aley (1994) reported that trees release approximately 20–25% of their CO_2 atmospheric gas uptake through root respiration. This may reflect why trees growing on karst (particularly in seasonally dry areas such as northern Australia) tend to have a higher percentage of their biomass in roots penetrating to greater depths in search of water.

Therefore, roots that have penetrated a cave can add considerably to the CO_2 content of a cave's atmosphere. In areas of caves with little air movement, CO_2 concentration can become elevated and remain so until barometric conditions or temperature gradients create some flushing of the cave atmosphere.

In addition to tree roots directly influencing a cave's atmosphere, microbial and fungal activity breaking down dead roots will reduce the O_2 content and increase CO_2 concentration. Bats and other cave dwelling biota also take up oxygen from the cave's atmosphere and respire CO_2 .

Cave atmospheres can reach a concentration which is life-threatening to humans with recordings as high as 7% CO_2 and below 14% O_2 found in some deep caves with poor air circulation (Smith 1997, 1998).

ROOTS INFLUENCE THE BIOTA IN CAVES

While trees are growing, part of their biomass is allocated to long-lived stems, branches and the main roots. However, some biomass is seasonally shed and falls as fruit or nuts, leaves, branches and bark above ground, and discarded roots below the surface.

In drought periods trees may shed more of their biomass, including roots that have become dry. Organic material in soil is slowly decomposed by microbiota, releasing CO_2 into the soil; however, in the case of decomposing roots in caves the CO_2 is released directly into the cave atmosphere. Many troglobites have adapted to tolerate cave atmospheres with a high concentration of CO_2 and low O_2 .

Tree roots in caves can support a diverse range of biology including bacteria, archaea, protista and fungi that play an im-

portant role in the breakdown and cycling of organic matter. Some microorganisms contribute to the weathering of rock by producing organic matter by chemoautotrophy and others are involved in deposition of minerals such as moonmilk.

Many troglobitic and stygobitic organisms either feed directly on tree roots (alive or decomposing) or other organic material or eat other biota that feed on roots. Examples of cave biota include crickets, amphipods and isopods which are omnivores but feed extensively on roots (Fig. 2). Millipedes also feed on rotting organic material and associated micro-organisms. It is widely accepted that tree roots in caves play an important role in the subterranean food chain.

TREE ROOT ADAPTATION TO KARST AND CAVES

Fig and boab tree roots have been observed at depths between 30 and 50 m in karst areas across Northern Australia, which are subject to seasonally humid climate (Figs. 3, 4 & 10) (Gillieson 1996, 2004, Smith 2018). In these tropical areas with seasonal wet and dry periods, great stress is imposed on trees during the dry period. Trees growing on karst have adapted by growing long roots able to obtain water from deep within a cave. They may remain green year round, while others growing in soil off the karst may shed their leaves in the dry season (Fig. 5).

In arid regions or areas with little soil to retain moisture, trees and other vegetation have adapted by sending roots down into the caves where they hang from the ceiling like drapery. These fine rootlet masses (aerial roots) hang in the cave's high humidity atmosphere, absorbing condensation droplets which form on them (Smith 2007, Fong 2019), an example being L23 cave (incorrectly called Quarry Cave in Smith 2007) near Naracoorte, South Australia (Figs. 6 and 7).

Tree roots which have reached the sediments on a cave floor can even grow upwards in search of moisture. Winkelhofer (1975) was the first to describe root stalagmites found in German sandstone caves.

Then Lamont and Lange (1976) documented the occurrence of 'stalagmiform' roots up to 12 cm tall in ten limestone caves in and near Yanchep National Park, 50 km north of Perth in Western Australia.

These unusual root structures in WA, associated with large trees of *Eucalyptus gomphocephala* had some calcium carbonate deposited amongst the vertical growing rootlet mass.

Also in limestone karst, Monbulla Cave (L5) near Naracoorte SA, contains roots



Figure 4: Tree roots deep inside a cave at Bullita, NT.



Figure 5: Fig trees growing on bare limestone at Bullita, NT.



Figure 6: Jess Bayles surrounded by aerial roots in L23 cave Naracoorte, SA.

growing upwards from the earth floor beneath localised drip points, and they are partly coated in calcite (Smith 2007) (Fig. 8).

Du Preez *et al.* (2015) described upward growing Namaqua fig tree roots in Botswana caves as 'hairy stalagmites', because they were mostly coated in calcite but had fine rootlets growing from the central root mass. The hairy stalagmites ranged in height from just a few centimeters to >1 m, and their diameter varied between 3 and 5 cm.

Roots in caves that are coated in a secondary deposit, most commonly calcite, are called rootsicles (Hill and Forti 1997, Smith 2022). If the root completely decays then the remaining secondary mineral skeleton is still considered to be a rootsicle (Fig. 9). Tree roots can adapt to the cave environment and if there is no soil they may spread out to form a root mat covering bare rock faces in search of moisture and nutrients (Fig. 2).

PLANT ROOTS LINKED TO SPELEOTHEM LUMINESCENCE

'Calcite speleothems frequently display luminescence, which is produced by calcium salts of fulvic and humic acids (Shopov, Dermendjiev & Buyukliev, 1989). These acids are released by the roots of living plants, and by the decomposition of dead vegetative matter' (Shopov 2006).

Luminescence is the glowing (emission of light) of an object due to an increased energy level of its atoms and without perceptible heat. The atoms can be excited by radiation, such as light or by electricity and is re-emitted at any wavelength, but is most familiar as visible light. Two forms of luminescence are 'fluorescence' and 'phosphorescence'. Analysis of speleothem chemistry and luminescence can yield information about paleosoils, past vegetation and solar activity index.

SUMMARY

Tree roots are an important part of the food chain within a cave ecosystem. Their presence plays a large part in influencing the types of biota and population within a cave. Trees growing on karst can influence the path of rainwater flowing into a cave and deposition of speleothems. Their roots will grow wherever environmental conditions permit. Roots can also alter the composition of a cave's atmosphere. On the flip side, a cave can provide a tree with both nutrients and moisture to sustain it through both wet and seasonally dry periods.

ACKNOWLEDGEMENT

Thank you to Katerina Fulton for proof-reading this article.



Figure 7: Condensation on aerial roots in L23 cave near Naracoorte, SA.



Figure 8: Stalagmitiform roots in Monbulla Cave (L5), SA. Note AA battery for scale.

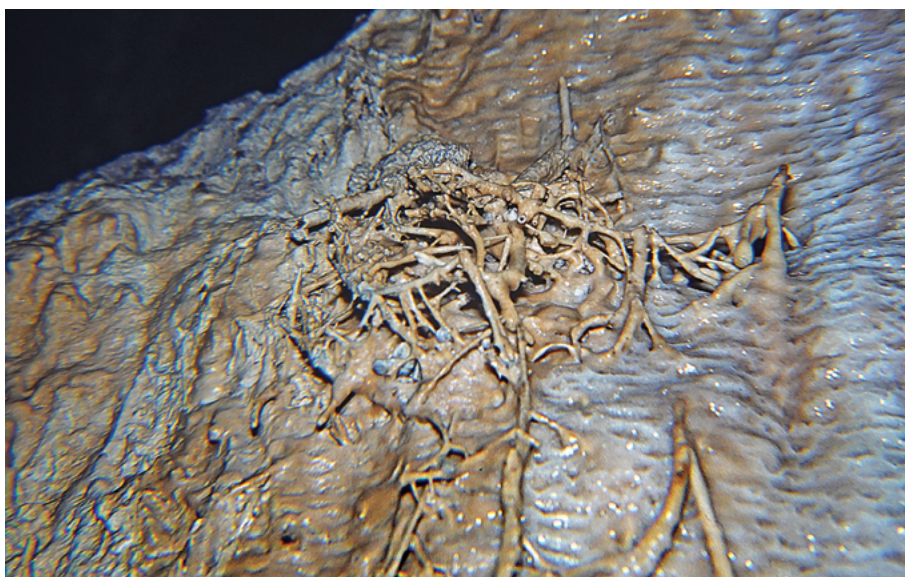


Figure 9: Rootsicle in Bone Cave, Crawney Pass, NSW.





GARRY K SMITH

Figure 10: Tree roots penetrate a crack in the ceiling of Two Fishes Cave BAA11 at Bullita, NT

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Koonalda, Art and Governments

Clare Buswell

Chair ASF Conservation Commission.

SOMETIME in the last 12 months, very serious damage occurred in Koonalda Cave, a cave listed on both the South Australian and National Heritage registers due to the presence of Aboriginal heritage and rock art.

This art, which includes finger flutings, is believed to be 30,000 years old, perhaps older. The finger fluting gallery is found behind Koonalda's locked gate.

Access is strictly controlled via scientific permits and acts of Parliament which require permissions from the Nullarbor Parks Advisory Committee (NPAC), the Far West Coast Aboriginal Corporation (FWCAC), the Department of Premier and Cabinet and Aboriginal Affairs and Reconciliation (PDC-AAR), the Department of the Environment and Water (DEW), and the National Parks and Wildlife Service (SA).

Although graffiti has long been a problem with people writing their names or initials and date in the gallery, this latest is wilfully destructive.

The graffiti is 1200 mm by 600 mm in size, covering and obliterating a major section of the gallery. The words, which include 'THIS IS A DEATH CAVE', have been incised into the underlying finger flutings, with other flutings being brushed away. Aboriginal representatives are both devastated and angry.

This vandalism runs alongside another sort of vandalism: that sanctioned by the state. State and Federal laws, set up and administered by Aboriginal Affairs Departments, are supposedly devised to protect aboriginal heritage.

The Far West Coast Aboriginal Corporation, NPAC, and NPWS (SA) have all been supportive of new research occurring in Koonalda Cave. Research proposed within the last six years has included 3D imaging of the finger fluting section of the cave. Such imagery could tell us much about who painted it.

However, due to what can only be described as foot dragging by the DPC-AAR in granting permissions, and the failure of

the SA Heritage Committee to grant the FWCAC status as a Registered Aboriginal Representative Body, no access has been given to undertake this work. Thus, now we have a situation of no 3D imagery of what could well be the world's oldest art.

The ASF Conservation Commission, working with representatives of the FWCAC, and archaeologists, has written to the SA Minister for Aboriginal Affairs, the Minister for the Environment and to members of the SA Parliamentary Aboriginal Lands Standing Committee over this issue.

An online meeting between Minister Kyam Maher, who is also the SA Attorney General, senior Aboriginal elder, Mr Clem Lawrie, and Dr Keryn Walshe, resulted in promises being made and action to beef up the security of the gate. We are watching this space, with more letters going to other ministers and politicians.

As a speleological community we have within our photographic collections images from the art gallery in Koonalda Cave which record what was present before 2019. It is imperative that we collect this material and sort it, with the aim of making an image or images that show what this art looked like before this damage. Could I ask you all, in the first instance, to contact me regarding this request? The issue is important to all involved.

WOMBEGAN

The Commission, with the help of the NSW Shadow Minister for the Environment, Ms Penny Sharpe, managed to get an online meeting with Mr James Griffin MP, the NSW Minister for the Environment.

Around the virtual table were the Minister, James Griffin, Kim Preston-Hiney, Parliamentary Adviser to the Minister, a representative for the Shadow Minister for the Environment, Penny Sharpe and Mr David Crust, Director NPWS Blue Mountains Region.

The speleological community was represented by the President of the NSW Speleological Council, the President of ACKMA,

the ASF Conservation Commission and the ASF Librarian.

Discussion was to the point, with David Crust answering on behalf of the powers that be. We emphasised that we are not opposed to the need to improve the amenities at Wombegyan, but stressed that early consultation with us would have vastly improved this development, lessening the environmental impacts.

We raised concerns re hydrological impacts, the photic environment at the Arch and the impact of building within this zone, protecting Aboriginal heritage and the need to follow protocols within NPWS by taking advice from the Karst Management Advisory Council (KMAC).

Follow-up letters have been sent, stressing the need for up-to-date vertebrate and invertebrate fauna studies in and around the arch itself, the need for new hydrological studies and to work with people who specialise in karst landscapes before building commences.

The Karst Management Advisory Council met mid-August, with David Crust in attendance. KMAC is pushing for better outcomes re this development. As a community we must keep pushing Blue Mountains National Parks people to work with us.

NULLARBOR, HYDROGEN, WIND AND SOLAR FARM

Although things look to be a bit quiet on this project, they're not. We have had a bit of a forerunner of things to come, via another wind and solar project at Arrowsmith, WA. This is on land specifically purchased for the project. It appears that they thought they were purchasing a bit of scrub, with one cave on it and lots of wind. How wrong they are, in terms of the cave bit, that is.

Dealing with the Arrowsmith wind and solar farm has allowed us to understand how development projects are assessed in WA via its Environmental Protection Agency. Basically a company does all that is





STEVE MILNER

*Recent vandalism in the Koonalda Cave finger fluting gallery
Permission to publish photo granted by senior Mirning elder, Clem Lawrie*

required when lodging its development application with the EPA. This means that the company outlines what it proposes to do and build, does a desktop EIS for example, assesses any Aboriginal heritage and any number of other items deemed necessary.

The EPA notifies only those who have registered on its website for notification of developments that an application has been lodged.

Then there is one week to argue what should happen with the project proposal. It is only at this point that if public comments overwhelmingly argue that EPA recommends that the project should go out for wider public consultation that it does so. If not, then that is pretty much it.

I have been warned by the Conservation Council of WA that by the time a project gets to the EPA, things are pretty much done and dusted. All one can argue for after that is some tightening of environmental requirements.

This is currently the situation with the Arrowsmith wind and solar farm, with the area under consideration being declared an industrial site before all due processes are completed. So the time to make some noise is now.

A CALL TO ACTION

Over the past months the Commission has been holding a number of online meetings to plan strategies to stop the Nullabor development.

We need ideas for everything from social media campaigns to stickers and more. We need people to put their hands up to help. After all, ASF cavers have fought many cave conservation battles, from Mt Etna to Exit Cave and more.

Karst landscapes need a protective voice, so let's get on with it before environmental vandalism greenwashes the lot.

Letter to the editor

Hi Alan,

I write in response to the excellent article on Bats in Tasmanian Caves (*Caves Australia* 220).

John Wylie reported on limited known occurrences of bats in caves.

On 30 April 2022 I saw probable microbat remains calcified on a shelf in a side passage of Welcome Stranger (JF229).

Deb Hunter
STC



DEB HUNTER

Possible microbat remains in Welcome Stranger (JF229), Tasmania

Caves with unrestricted access

Timor Caves Reserve, NSW: an observer's case study

Garry K Smith
NHVSS

THIS IS one of those articles that discusses the good, the bad and the ugly, while looking at the pros and cons of caves with unrestricted access.

BRIEF HISTORY OF THE RESERVE

The first thing that springs to mind is the question of how far back was the value of the Timor Caves recognised and what was done to protect them?

A Water Reserve – No. 6 was gazetted to include the caves on 12th March 1867 (Wilson 1867), however 'as there is no water on this reserve, in all probability the land was retained as a Water Reserve on account of the caves' (Dunlop 1924). If this is the case, then these limestone caves are among the earliest to be reserved in N.S.W. Note that Jenolan Caves were formerly reserved from sale in October 1866, and finally gazetted as a caves reserve in 1868.

Reserve R88036, Lot 160 for the Preservation of Caves was notified on 4/12/1970 - previously notified as Water Reserve No. 6. On this reserve is Main Cave (TR1) and 16 other caves. Then on 9/6/1982, Lot 213 (4.562 ha) was added to the caves reserve at Timor. This additional area encompassed Belfry Cave (TR2), Helictite Cave (TR4) and Shaft Cave (TR3 & 17). Lot 215, DP 263278 (3585 m²) was then registered on 25/8/1982 and contains Hill Cave (TR7 & 8). Lots 217 and 220 were also added to the reserve in 1982 and Lot 1 in 1983.

There are 33 known caves on the reserve out of the 88 tagged in the whole Timor area. The reserve now consists of the following land portions: Lot 1 DP 632080, Lots 215, 217 and 220 DP 263278, Lot 213 DP 44391 and Lot 160 DP 750922.

The Caves Reserve is in a remote location surrounded by private property. A public road goes directly past the reserve, providing easy access for the general public and there is a camping area between the road and reserve. Management of the reserve defaults to the Minister administering the *Crown Land Management Act 2016*.

The nearest Crown Lands Office is in

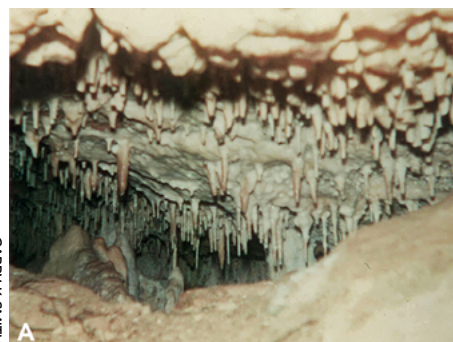


Fig. 1A. The passage in Belfry Cave, containing many straws in 1968, prior to vandals smashing their way through in 1974. There were many longer straws and slender columns further down the passage, not shown in this photo. Fig. 1B. The same passage in 2018, now called 'The Long Squeeze', although taken from a slightly different angle and position, the photo shows polished rock surfaces and passage devoid of straws.

Newcastle, which is a three-hour drive (216 km) from the reserve. The Department responsible for the land does not monitor who is accessing the reserve or caves, and it would be reasonable to say they have neither the staff nor resources to monitor activities on the reserve.

OBSERVATIONS OVER THE YEARS

I have, on a very regular basis, been visiting the Timor Caves Reserve since the age of 7 years as a Cub Scout through to the present, spanning 60 years. Over this time I have noted a wide range of horrendous and destructive vandalism, which has



Fig. 2A. The formation called The Ghost, photographed in early 1976, just a year after the breakage of straws in The Long Squeeze allowed access to the chamber. Note the red arrows point to dirt on flowstone where people have already touched it. Fig. 2B. The same formation in March 2018, covered in mud as a result of people touching and climbing all over it. Arrows point to broken stalactites. It is not necessary to touch The Ghost formation to explore all of this chamber. The caver in this picture (for scale), can easily walk around behind the formation without touching it.

significantly degraded the caves and speleothems on the reserve. In contrast, the caves on surrounding private property have, on the whole, remained in good condition with little or no vandalism.

An example is Belfry Cave (TR2) located on the Caves Reserve. At a location inside the cave now called The Long Squeeze my photograph (Fig. 1A) taken in 1968 shows a narrow passage full of small stalactites and straws.

I recall photographing the passage with a Box Brownie film camera and a handheld flash bulb. At the time the passage looked small and impassable because there were so many straw stalactites along its length and I thought it was a lovely unspoiled part of the cave.

Then in 1974 an unknown group smashed their way through the straws to open up the long tight squeeze and gain access to several small chambers. They found a decoration later called The Ghost (Fig. 2A) and in a lower pit found a full skeleton of a kangaroo (Fig. 3) embedded in the underside of a section of flowstone (false floor).

Within several weeks the full skeleton had been chiselled out of the flowstone and it was obvious that it would have broken into a thousand pieces. As luck would have it, I was at Timor the week after the vandals had broken their way into this Belfry Cave extension and noticed that the passage had been totally stripped of straws; I went in to investigate. The photo in this article is probably the only one in existence of the kangaroo skeleton before it was vandalised.

Over the years the pure white Ghost formation has been coated in a considerable amount of dirt from inexperienced cavers touching or leaning on the white flowstone surface (Fig. 2B). The Long Squeeze has become coated in mud and the rock surfaces worn smooth and parts coated in mud (Fig. 1B).

This is just one example of the impact of vandals, inexperienced cavers and unrestricted access by the general public.

Other parts of Belfry Cave have high vaulted ceilings that are far beyond the reach of cavers, yet even these once pristine ceilings and walls covered in speleothems have not escaped the wrath of thoughtless vandals.

There has obviously been a mud fight or more likely a prolonged mud throwing episode in an attempt to stick as many globs of mud on the ceiling and walls as possible. This occurred somewhere around the 1970s-80s and large globs of dark brown mud are still stuck to the ceiling and pure white speleothems to this day.

Other caves have suffered from large-



Fig. 3. The skeleton of a kangaroo or wallaby on the underside of a flowstone false floor – photographed in 1974 just one week after its discovery. The fossilised skeleton was totally destroyed by vandals several weeks later.



Fig. 4. NHVSS members removing painted graffiti from the walls of Main Cave (TR1) using wire brushes.

scale acts of spray paint graffiti (Fig. 4), an example being the Main Cave (TR1) as detailed in the article about graffiti removal in *Caves Australia* 209 (Smith 2019). This has occurred on several occasions. On at least two occasions above-ground fluoropink arrows were sprayed over rocks and trees along the tracks leading to various cave entrances. Each time this has occurred NHVSS members have endeavoured to remove the graffiti with wire brushes and have achieved reasonable results.

Then there are the breakages of speleothems. In the early years, following the caves' discovery, there were adventurous day trips to the caves by locals. Old timers talked of large sections of stalactites being broken off and taken home as souvenirs to be used as doorstops, bookends or garden borders.

There were even stories of guns being

used to shoot at stalactites to dislodge them from locations high on the ceiling.

Certainly, wilful breakages were not confined to the late 1800s or early 1900s. Since my first trip in 1962, I have visited the caves regularly and on many occasions I have gone into various caves on the Timor Reserve to find countless broken stalactites scattered across the floor. Obviously, someone had broken stalactites and removed some as souvenirs but there were also a large number broken indiscriminately as part of wilful destruction.

There are in excess of a 1,000 Eastern Bent-wing Bats (*Miniopterus schreibersii oceanensis*) that roost in the large chamber of Main Cave (TR1) during the summer-time. Because of the high ceiling and size of the chamber they are pretty well out of reach from humans. Although they may be initially disturbed upon first entry of humans, the bats quickly find an out of the way safe roost in a high ceiling aven.

However, most caves that have bats contain fresh guano piles. The Main Cave, in contrast, has no fresh guano piles on the ground because they are constantly being squashed flat by humans walking over them.

As a result the insects (invertebrates), that rely on this food source are rarely found in the cave and hence other predatory insects that depend on the smaller insects are also absent. In fact, because there are no defined tracks in the caves, almost all of the cave's earth floor has been completely compacted by humans and finding any cave biota is rare.

Even as recently as November 2021, vandalism has occurred in Helictite Cave (TR4) (Hadley pers. comm.) where someone had chiselled foothold notches in near-vertical flowstone walls to gain access



GARRY K SMITH

Fig. 5. Venturer Scouts during 1993, practicing SRT and ladder climbing skills during a training course in Main Cave (TR1)

to helictites more than four metres above the floor. A large number of helictites and shawls were wilfully broken off. Some were obviously souvenired, but many lay broken on the ground.

There have been many times in the past when NHVSS members have gone through collecting rubbish from the caves on the reserve e.g. drink bottles, tins, candles, matchboxes, batteries, plastic bags and paper.

Much of this littering can be put down to the general public's lack of education, unsupervised youths or just plain laziness.

There have been a couple of new caves discovered on the reserve over recent years by NHVSS members. Because these new

caves, if left open to the public, would end up like the other well-known caves, they have been gated and the entrances highly camouflaged or completely blocked up with rocks and soil. It is necessary to do this, as without regulation these newly discovered caves would end up trashed and any scientific value would be lost. Thankfully, there are many caves in the Timor area on private property that have remained in near pristine condition, protected by restricted access and guardianship by the property owners. New discoveries continue to be made on private properties as a result of digging and these caves are being documented and protected for their aesthetic and scientific values (Smith 2022).

THE ADVANTAGES OF UNRESTRICTED CAVES

What are the benefits of having some caves freely accessible to the public?

1. With no permits, monitoring nor imposed restrictions, families, groups and individuals can turn up at the reserve and go caving at any time.
2. Youth groups such as Scouts, Guides, church groups, Boys' Brigade etc. use the caves as a training ground to build character, encourage leadership, foster team spirit, adventure and to teach their youth about caves and the fragile environment. Groups such as Scouting also teach youth members the skills and techniques required to negotiate caves safely (Fig. 5) and also the ethics of protecting and preserving caves. These skills can be used later in life and become a basis for membership of ASF affiliated speleological clubs.
3. There are many cavers currently within the ASF who enjoyed their first caving adventures in caves on the Timor Reserve and similar unregulated caves around Australia. Unfortunately, these caves have become severely degraded over time and as such are appropriate venues to teach beginners all aspects of caving, including the nature and consequence of cave user impact. Trips with Scouts and other groups inspire youth interest in caves and they may become guardians of caves in the future. Without the involvement of cavers who often gained their appreciation of caves as youths, it is unlikely there would be as much motivation to fight for cave conservation.

Examples of past battles to save caves include; Mt Etna, Yessabah, Bungonia, Colong, Buchan, Cape Range and Cliefden. These were championed by many cavers who first gained their interest in caves through youth groups visiting places like the Timor Reserve.

THE DISADVANTAGES OF UNRESTRICTED CAVES

1. Caves with no access restrictions become extremely degraded over time with the entry of people who don't have any knowledge of what causes cave damage (Fig. 6) and how their actions can affect cave biota.
2. Over time cave biota becomes almost non-existent in the unregulated caves. This is largely due to floor areas in the caves being frequently trampled and compacted.
3. Intentional speleothem breakage and souvenir collecting is common amongst individuals not affiliated with a group with ethical principles.



Fig. 7. A stalactite in Glen Dhu Cave (TR15) (on private property), broken sometime before 1980. A gate was later installed at the entrance to prevent further entry by vandals. By 2018, the straws had only grown 37 mm since the breakage.

4. An open access situation also provides access to the minority of people who are intent on vandalism and graffiti. This wilful damage is cumulative and continues to compound the degradation of the caves, year on year. This problem has been reported in caves in other karst areas e.g. Cotter Cave (Brush 2021). Damaged caves just do not recover in our lifetime because deposition of calcium carbonate to create speleothems is so slow (Fig. 7).
5. Unskilled members of the public entering caves can be dangerous without the presence of someone who has underground experience. Hence there is always the increased possibility of a serious accident occurring.

CONCLUSION

While many of us may cringe or complain about access restrictions imposed on caves in National Parks and the requirement for permits, this on the whole is protecting these caves.

The permit system restricts entry to people with the ethics and safety as set out in guidelines such as those adopted by the ASF.

There is a requirement for the leader to possess appropriate skills and knowledge to lead the trip. It is the responsibility of each member to comply with ethics and safety guidelines. Those less skilled in the group should be learning from those more skilled.

Overall, this transfer of knowledge and caving in small groups has protected the caves in National Parks. In some caves there are track markings to guide cavers past sensitive or delicate obstacles and in other areas it is left to common sense where not to walk or touch. Also knowing exactly who is in a group allows the Parks administration to monitor people doing the right or wrong thing.

So while we may grumble a little about having to obtain permits for National Park caves, the system is protecting the aesthetic



Fig. 6. Example of speleothems in Belfry Cave muddied by cavers climbing all over them (photographed in 2011).

values of our caves for future generations to enjoy as well as protecting their biota and scientific values.

One can only imagine what the caves on the Timor Reserve would have looked like before they were frequented by humans not following Minimal Impact Caving practices. A tantalising example is shown in the article about Eyrie Cave (TR81), detailed in

Caves Australia 219 (Smith 2022).

ACKNOWLEDGEMENTS

A special thank you to Murray Dalton for tracking down the land titles and dates when the Timor Caves reserves were gazetted. Also thank you to Katerina Fulton and Andrew C. Baker for proofreading and helpful suggestions for this article.

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CONVERSATION ON CONSERVATION

Perspectives on Cave and Karst Conservation: Consequences of change in Federal Government

Nicholas White
VSA

THE Federal Coalition Government lost power at the May 2022 election.

It had been sitting on several important reports; it had severely downsized and constrained the operations of the Department of Environment, particularly those of responsibilities under the *Environment Protection & Biodiversity Conservation Act 1999* (EPBC) and as a government was in denial of climate change and its consequences in Australia despite evident problems with heat events on the Great Barrier Reef, with bushfires and more recently repeated flooding and had ignored its responsibilities internationally. Graeme Samuel's Independent Review of the EPBC Act was released in December 2020 (Samuel 2020) and there was no response from the Coalition Government, despite evidence of increased severe weather events.

What do we expect of the new Labor government? How will this affect caves and karst and how should ASF and its members respond to opportunities? When political change occurs we should seize the opportunities to advance cave and karst conservation.

The Karst Conservation Fund (KCF) has provided funds to the South Australian speleological groups for Kangaroo Island cave investigation and restoration activities following the bushfires.

This seed funding had a flow-on effect with a significant grant of funds to more intensively study the Kangaroo Island caves and karst. KCF funds have also been provided to ISS for assessing damage and change at Bendithera and to SUSS for Jenolan studies.

Both ISS and SUSS have been prevented from completing their projects due to access problems. HCG was funded to assess the bushfire effects on the West Deep Creek Cave and catchment at Yarrangobilly. This

exploration found an alternative way into the cave system and represents one of the most important new discoveries in NSW in recent times.

Under the EPBC Act 'Critically Endangered' species require that 'Recovery Plans' be prepared but very few of these have been initiated.

The Southern Bent-wing Bat (SBWB) has a very active Recovery Team which is well supported by both Victorian and South Australian State Governments but the Department of Environment in Canberra has been largely absent except for providing a very effective initial chairperson — but not with funding.

The Karst Conservation Fund has supported three PhD students whose studies have generated important information about the SBWB which ruled out disease as the cause of population decline and two studies have contributed knowledge of the bat movements between roosts and during feeding which are contributing to knowledge relevant to the effects of wind turbines on the population of the SBWB, which is an obligate cave-dwelling bat dependent on maternity sites at Naracoorte, Warrnambool and Portland.

However, the SBWB has declined in numbers in recent years and there is no easy answer to this population decline, but habitat changes such as insect decline, farming intensity, diminished water in the landscape and the cumulative impacts of wind turbines could all be contributing.

The Cape Range in WA was included with Ningaloo Reef on the World Heritage list. Despite its karst grandeur it was partly its distinctive cave biota which allowed the NHL and World Heritage nominations to succeed. The cave biota related to important relict species, anchialine taxa in the water table on the coast of the Exmouth

Peninsula which has a seawater-freshwater interface. These species include the only Australian troglotic cave vertebrates, the blind fish (*Milyeringa veritas*), the blind cave eel (*Ophistemon candidum*) as well as the invertebrate Cape Range Remipede Community. The remipedes are an ancient lineage from the Tethys Ocean before the Atlantic and Indian oceans split apart during the Cretaceous period. Remipedes are crustacea represented in the Cape Range coast aquifer but elsewhere in the Caribbean Sea and other Atlantic Ocean coastal aquifers. Some of the caves on Cape Range have invertebrate species which exhibit speciation between caves demonstrating isolation between each cave population (paradoxosomatid millipedes).

I have examined the Cape Range caves and coastal water table biota since they are now well protected under the EPBC Act as well as having state, national and international protection. The cave biota for the rest of Australia is not so secure.

The Cape Range listing raises the question of whether there are other karst areas which exhibit attributes warranting protection or better legislative protections such as the Cape Range at State, National or International levels.

■ The Endangered Ecological Communities, Root mat Communities of Yanchep and those in caves on Leeuwin-Naturalist National Park. How secure are these? What happened during the drought? Western Victoria and the Lower South-east of South Australia have similar root mat communities which have not been well described.

■ The spider in the Dome area of Mulla-mullang Cave (*Tartarus mulla-mullangensis*) has not been seen to my knowledge for many years. Is this an extinction and if so, was it due to caver



pressure or over-collecting?

■ The Ghost bat is known from fossil remains from southern Australian caves but populations have disappeared from Central Australian sites during the last century and the Mt Etna population collapsed after their over-wintering cave was damaged by mining and the population is now less than 50 individuals. There is evidence this bat is affected by climate change judged from the fossil record. Mining appears to be affecting Pilbara populations.

■ The Southern Bent-wing Bat (SBWB) is listed as critically endangered under the EPBC Act and it has a National Recovery Team actively assessing the population size, its roosting caves and threats. It is evident that it is affected by drought

periods and lack of water in the landscape may be affecting the population.

■ Engagement and participation of indigenous people in decision making and management of cave and karst areas has improved in recent years. State legislation protecting indigenous sites has been changed in several states due to events such as site damage or destruction as at Juukan Gorge and other Pilbara sites. Butterfly Cave, West Wallsend, NSW is under threat from urban encroachment and Koonalda Cave, Nullarbor, SA which has Federal National Heritage Listing has recently experienced a serious incident of vandalism.

We have not seen responses from the new government to either the State of Environment Report 2021 or to Graeme

Samuel's report on the EPBC Act 1999 (as of August 2022) but these are expected. There are numerous recommendations which could be adopted, many of which could affect karst areas. However, times of changed political circumstances provide opportunities for pressing your cave conservation objectives. The possibilities could be more secure protective legislation for karst, caves and the associated biota and better funding for management.

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Peter Matthews receives an AO for services to speleology

Miles Pierce

ASF Awards Commission Convenor

AT THE RECENT Queen's Birthday Order of Australia honours, Peter Matthews was made an Officer (AO) in the General Division of the Order of Australia, 'for distinguished service to cave and karst, surveying, documentation and publication, and to speleological organisations'.

This award is the highest honour conferred on an Australian citizen for services to speleology, putting Peter up there with Ash Barty and other high achieving Australians who received awards this year.

Peter commenced his involvement in organised caving in the late 1950s as a member of the Victorian Cave Exploration Society (VCES) and in 1960 was a founding committee member of the Sub Aqua Speleological Society (SASS).

He is a foundation member and Honorary Life Member of the Victoria Speleological Association which was formed in 1967 by the merging of VCES and SASS. In the latter club, Peter served as Records Keeper 1967-90 and Cave and Karst Numbering Coordinator 1967-2018.

Within the ASF, Peter was Commissioner for Documentation from 1964 to 1999. In this capacity he edited the 1968 *Speleo Handbook* that brought together information on and policies of the Federation, articles on cave science and equipment and techniques, along with the first national listing of Australian caves on a state-by-state/area-by-area basis. This was followed by Peter editing the *Checklist of Australian*



PETER ROBERTSON

Caves and Karst (1979) and the *Australian Karst Index* (1985) that used a digital database containing numerous fields for succinctly documenting C & K features. It utilised the C & K numbering code that Peter had spearheaded in 1979 which evolved into the national digital Australian Karst Index. As such, Australia became a leading country internationally in systematic documentation of cave and karst features.

At the international level, Peter has chaired the International Union of Speleology (UIS) Informatics Commission since its formation in 1986, been Convenor of the Cave Data Exchange Standards Working Group since the mid 1980s and Convenor of the UIS Karst Glossary Project. He was also initiator and manager of UIS Internet Facilities, 1994-2013. Based on this extensive background, Peter authored the 'Documentation and Databases' chapter in White *et al.*, *Encyclopedia of Caves*, Elsevier, 2019.

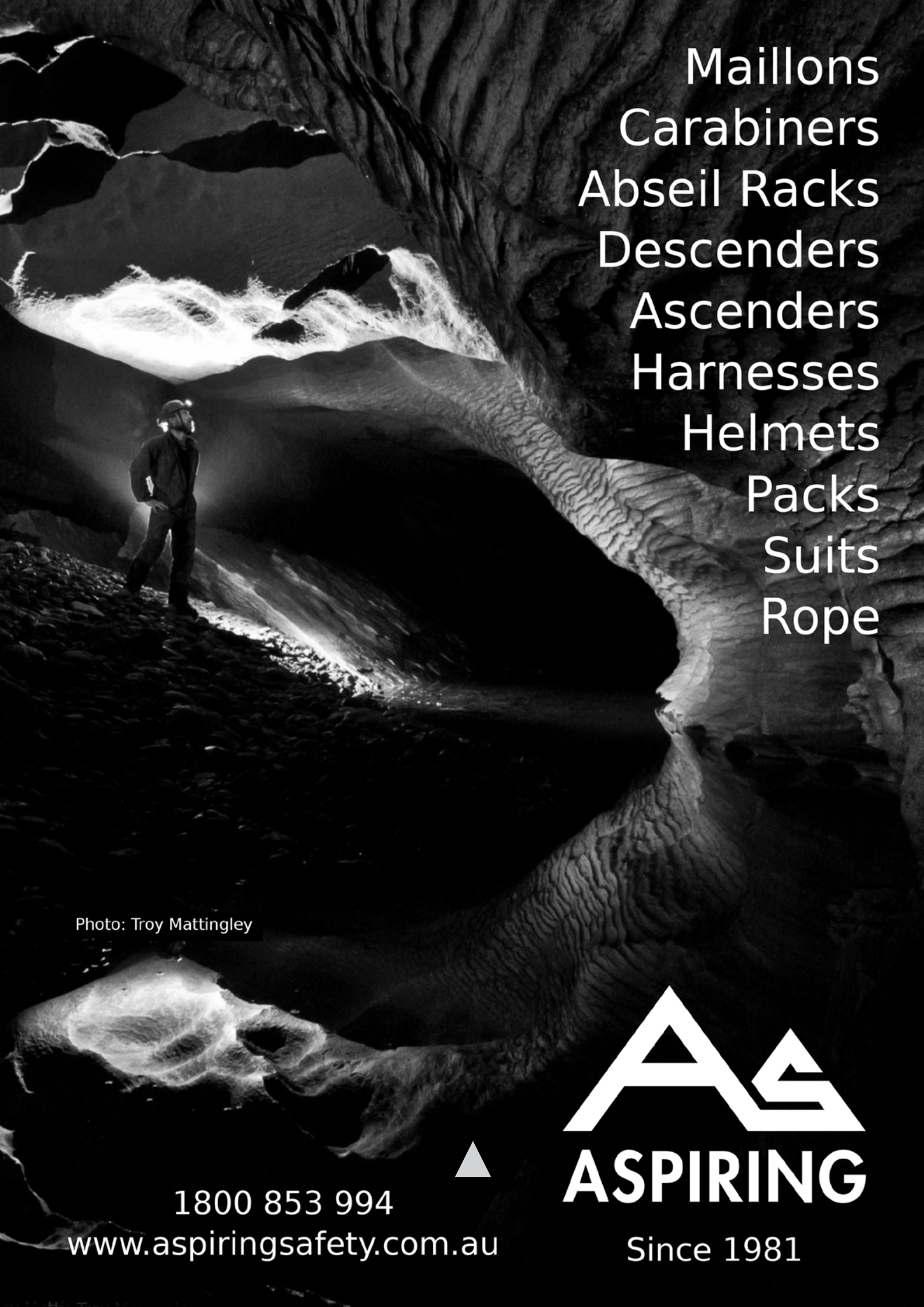
In recognition of his sustained and

ongoing services to ASF, Peter was made a Fellow (Honorary Life Member) in 1985. His receipt now of an AO recognises his sustained services to speleology, particularly in the field of systematic documentation of cave and karst features, both nationally and internationally. A personal commitment that has now spanned over some sixty years. Peter has indeed been a 'a quiet achiever' whose long-term dedication and attention to detail is now recognised by this well-deserved, high level national honour.

Thanks for the AO Award

THE ACTUAL award was presented at Victorian Government House on Wednesday 7th September.

The Australian Honours Secretariat does not reveal who the proposer nor the referees were for an award, so whoever they were, I would like to say thank you for your efforts — there is no doubt a fair bit of work involved in preparing a proposal and doing all the research needed to justify it. And thank you to ASF and its members, and especially those of my local Victorian clubs, who provided the environment, incentive and hands-on help for developing the cave documentation and publication systems. The timing of the award also worked out well for helping raise public awareness of speleology during this International Year of Caves and Karst. — Peter Matthews



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