

Journal of the

Australasian Cave and Karst Management Association



The ACKMA Journal

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FRONT COVER: At Vennachar Point on Kangaroo Island. This shaft is 60m deep and connects to a geo through a cleft with a rounded boulder beach and there is audible surf – photo: Dave Gillieson—see article from page 8

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EDITORIAL

There is little about which to editorialise on this occasion. Although the Association's committee has been active during the period since the last Journal, that activity is later reported upon comprehensively by our President.

There are two matters to which I bring your attention. The first is that there will be a change of editorship of the Journal commencing with the preparation of the September issue.

Because our incoming editor, Christian Bom, the Chief Guide at Capricorn Caves, will not be able to fulfil the editorial role until his return from long leave, I have agreed to produce the June edition, the first under the new arrangement discussed below – a production which will enable a transition to the new regime for the Journal.

My term as editor will finish with the production of the June Journal (one edition more than I had hoped would be the case).

The second matter concerning the Journal is, at this stage, simply something that I foreshadow – as it remains subject to committee consideration and, subsequently, ratification by the forthcoming Annual General Meeting.

Full editorial and layout preparation for an edition of the Journal is a quite time-consuming task. For the past three years, the editorial functions (and proofreading which I share with Tony Culberg, who has been an enormous assistance to me) takes perhaps 10 to 12 hours spread out over the period during which material is submitted for inclusion.

This aspect of the editor's role I have found to be reasonably able to be accommodated within the ebb and flow of the demands of my judicial and family lives. However, doing the Journal layout is quite a different proposition. Toward the end of each period, preparing the layout of a Journal for distribution to the membership (whether in the old printed/electronic format or now in the solely electronic format) takes me a full weekend—an activity of two very lengthy days.

In a discussion within the committee over the past several meetings, it was agreed to explore the option of having an external party contracted to undertake the layout function – thus leaving it to the editor to prepare the material in a traditional editorial fashion. This only involves pre-layout checking and correcting copy; proofreading the copy (Tony has agreed to continue in this role and I thank him for this); selecting and captioning photographs; and identifying where, within the text, photographs were to be inserted. The final role is to check the page proofs.

A quote was sought from our former printers, Hansen Print in Naracoorte, South Australia, for undertaking this layout task. A sample of their layout work has also been provided to the committee. I have made a recommendation to the committee that the Hansen Print quote be accepted. I expect, from indications to me from members of

the committee, that that recommendation will be adopted after this Journal edition has been put to bed. I therefore expect that this new arrangement will operate after the Annual General Meeting and commence with the June edition.

It has been a pleasure, dear readers, to produce twelve editions (with one to come)!

As ever, however, your editor will be dependent on the contributions received – contributions which have, at a very general level, come from a comparatively small pool of authors. Although these COVID-19 times remain dark and potentially impacting on us all, I encourage you to “put fingers to keyboard” and produce contributions for future editions of this Journal.

Tim Moore

In Andy Spate's article in the December Journal, he asked to be sent pictures of cave pearls. Ian Eddison sent three images (all from Cathedral Cave, Wellington NSW):



President's Report

Ian Eddison

As I write this President's report, it is a beautiful Autumn Sunday in Bathurst, NSW. News in our world is a little more positive and I am encouraged that, although COVID-19 challenges continue, here in Australia and New Zealand the number of cases is considerably lower compared to the recent past. With the roll out of vaccines, our society may return to some sense of normalcy. We must remain vigilant, however. While cave tourism sites are hoping to increase carrying capacity (which could be good economically), it does put us at risk of the threat of new outbreaks. It remains a challenging time.

Your committee along with several ACKMA members have been busy on a number of fronts:

Yarrangobilly – A proposed Mountain Bike Trail Network in Kosciuszko National Park potentially would have impacted on the Yarrangobilly Caves catchment. This proposal hid behind the idea that it would bring tourism to Caves House, cave tours and the region – creating many jobs in both construction and maintenance. The reality, though, was that proper environmental research of the risks had not been done nor proper consultation undertaken. This meant we responded strongly against this proposal. In particular, I want to thank John Brush for his tireless work on this. David Gillieson, Andy Spate and I (along with John) worked on our considered response to this proposal (and the following related issue).

Bushfire and Local Economic Relief Fund in NSW - There is a NSW Upper House inquiry into the distribution of grant money to councils from this fund. Our committee has, in particular, been concerned about the Snowy Valleys Council push for the Mountain Bike Trail Network in Kosciuszko National Park (see above). Local newspaper editorials occurred supporting the proposal before the closing of submissions for the fund! We have submitted our concerns.

Timor Caves, NSW – A 'Hills of Gold Wind Farm' proposed within 5km of Timor Caves was opposed by our committee for its intention to clear habitat and potentially creating erosion; and for its close proximity to cavernous rocky landscapes including the limestone caves at Timor. The desire for renewable energy seems to be gathering such momentum that other aspects of the environment are being ignored in the process.

Renewable Energy Zone Central West NSW - I attended the NSW Department of Planning, Industry and Environment presentation in Gulgong for the proposed Renewable Energy Zone (REZ). This was largely an information session but also enable departmental representatives to gather comments from the community about where a new high voltage network could be installed to which projects would connect - these being being solar and wind energy farms. There was little argument about environmental gains because renewable energy is positive for the environment compared to coal extraction and coal-fired power



generation. However, nothing was mentioned about selecting a network route for minimal environmental impact. No overlay of the geology or karst areas was provided, nor one of the floristic habitats involved. I made the observation that many of these rural lands have remnant woodlands that are endangered ecological communities—meaning that great care is required not to reduce these habitats further. There is more to this than the money for the landholders who will carry the network or host the projects that feed into the new grid or the grant opportunities that may be offered to community or other not for profit groups. This is likely to be repeated in other states around Australia so be involved and informed.

Liaison and relationship building with ASF and NZSS – At a joint committee meeting between ACKMA and ASF, where we not only exchanged pleasantries, we agreed that we often have similar interests and should communicate more often if possible. Discussion on the International Year of Caves and Karst led to the exploration of a creative celebration of caves and karst in Australasia. Our relationship is a positive one and these discussions led to NZSS becoming part of the combined effort in the creative Celebration of Caves and Karst in Australasia happening. I am encouraged by this relationships building between our organisations. ACKMA, ASF and NZSS will contribute to a \$1,000 grand prize and Ledlenser are providing four \$500 vouchers for each of the divisions of the creative competition. More details are later in this issue. Check out the conditions and get creative!

The Ann Augusteyn Award - Submissions closed on 15 March. Cathie Plowman has done a sterling job organising this and sending out reminders. The announcement of a winner will occur at our online AGM in May.

President's Report continued ...

What a wonderful way to pay respect to Ann through the recognition of those of you who share and teach interpretation skills.

Atmospheric Data Logger project - This project continues to gather momentum with data coming in and analysis being conducted by Professor Andy Baker enabling a better appreciation for all our members. This project, funded by ACKMA, assists tourist cave sites to harvest data of temperature and humidity levels during the closure (and, thus, without visitors) of caves in 2020 and for it to be able to be compared with the data recorded as tours begin to run again. Andy Spate, David Gillieson and Andy Baker have all worked on making this a successful program.

Sixteen Legs - This exciting travelling exhibition through Bookend Trust is up and running again. It is currently in Queensland at Capricorn Caves. Do consider how you might be able to work your town in with this team (especially for those of you who work in cave tourism).

Wellington Caves Creative Immersions (WCCI) - The Dubbo Regional Council Cultural Development Unit invited me, as ACKMA President, to write a letter of support for a program at Wellington Caves which links to the International Year of Caves and Karst but which may give an ongoing annual opportunity for creative and scientific

communities to be showcased. Watch this space.

Cave tourism site restoration - It is heartening to know that various cave tourism sites are undergoing new infrastructure planning and restoration following devastating bushfires. Some, also, suffered huge flooding as well. The renewal programs include Jenolan Caves, Wombeyan Caves, Buchan Caves and Kelly Hill Cave on Kangaroo Island.

Kangaroo Island Karst - Good planning continues for both the Flinders Chase Reimagining project and a Management Plan for the western end of the island's National Parks. David Gillieson is actively involved in both of these. One of the most interesting things to come out of the fires on Kangaroo Island has been the ability to locate and log new, previously unknown cave entrances. No doubt we will hear more on this as information becomes available.

Best practice guidelines for show caves - This project continues to be co-ordinated by Andy Spate and David Gillieson. Input is invited from those managers who can contribute from recent experience. This project really is an extension of, and update on, past guidelines.

The ACKMA Strategic Management Plan - This ongoing project is being worked on by Jodie Strickland. Get in touch and contribute where you can.

Detailed Map for 404 Caves of Phong Nha Cave System Created

After some 30 years of research, experts from the British Royal Caves Association (BCRA) has created a detailed map for 404 caves that have staggering length of 231km in Phong Nha-Ke Bang National Park in Quang Binh Province.



Tien (Fairy) Cave

Scientists estimate that Phong Nha-Ke Bang and adjacent areas are home to over 1,000 caves. There are more than 600 caves that still remain unrevealed. Artificial intelligence (AI) will be applied to discover caves and digitize the entire cave system for scientific study and tourism development, said the director of Phong Nha-Ke Bang National Park.

Of which, there are many caves containing information of the process of Earth formation over 400 million years ago.

The Phong Nha cave system has 157 caves with a length of 103km. The specialists made surveys of 58 grottos measuring 48km and 20km of the 60-cave Nuoc Mooc system. Outstanding caves are Phong Nha, Tien Son, Son Doong, Thien Duong, Va, and En.



Experts from the British Royal Caves Association (BCRA) has created a detailed map for 404 caves in Phong Nha-Ke Bang National Park.

From "Cave Talk", the newsletter of the National Caves Association of the USA

CELEBRATE THE
INTERNATIONAL YEAR OF CAVES & KARST

2021 ACKMA MEETING

Wellington Caves NSW

18-20 October 2021 - Caves Guide School 'Eco Guide'
Certification conducted by Savannah Guides

21-22 October 2021 - Post-Bushfire Workshop,
operational adaptation to COVID-19

This event will be different to any other ACKMA event as we adapt to social distancing guidelines. Regardless of the changing restrictions and border closures, you can participate. In order to forward plan and cost all aspects of this event, including online facilitation, please consider your options and complete the expression of interest form.

P: (02) 6840 6480 E: enquiries@wellingtoncaves.com.au



2021 ACKMA Meeting Expression of Interest

If you can join us physically or would like to participate online, please register your expression of interest. Registration fees will vary based on your participation and fees will be included on the final registration form.

If you would like to present during the Post-Bushfire Workshop or COVID-19 response, please prepare your abstract and forward through to

president@ackma.org for consideration.

Please note presentations are limited to 20 minutes.

Accommodation

The Wellington Caves Caravan Park has a number of options available including suites, powered and non-powered campsites.

Please visit our website ***www.wellingtoncaves.com.au*** for further information on each accommodation type. If you would like to make a booking please contact our office on 02 6840 6481 (Monday – Friday) and mention you are attending the ACKMA event.

Expression of Interest Form

Please note a formal Registration Form will be required closer to the date.

Please return to enquiries@wellingtoncaves.com.au

Please complete and tick your response									
Name									
Phone									
Email									
Organisation									
								In person	Online
Guide School 'Eco Guide' Certification 18-20 October 2021									
ACKMA Meeting 21 – 22 October 2021									
20 minute presentation									
Unisex Conference T-Shirt (select size & indicate quantity \$15 each)									
Collect at the meeting. Add postage for online participants									
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Geoheritage of Kangaroo Island, with an emphasis on caves and karst

Prof. David Gillieson, School of Geography, University of Melbourne

Introduction

There are currently 21 sites on the South Australian geoheritage register for Kangaroo Island (Table 1). These can broadly be grouped into:

- a limited outcrop of Proterozoic rocks;
- Cambrian granites, sandstones and metasediments, with some fossil sites;
- Permian glacial deposits and striations;
- Jurassic basalt; and
- Holocene dune fields.

There are only two cave sites currently on the register: the Ravine des Casoar cave, near Cape Borda, and Admiral's Arch (as a part of Cape de Couedic). There is clearly scope to identify some cave and karst sites on the island to complement those already on the heritage register.

Table 1: Existing SA Heritage Sites on Kangaroo Island. Grid references UTM zone 53S

Site	Easting	Northing	Feature
Big Gully	733500	6060700	Cambrian White Point conglomerate and Boxing Bay formation; richly fossiliferous
Cape de Couedic	653600	6007700	Cambrian metasandstones, dune limestones
Cape D'Estaing	725100	6059400	Cambrian sediments and fossils well exposed
Cape Gantheaume	713600	6014700	Mobile Holocene dunefield
Cape Willoughby granite	781800	6031500	Cambrian granite overlying Early Cambrian Middleton sandstone
Christmas Cove	765500	6043300	Cambrian rocks overlain by Permian glacial deposits, excellent glaciated pavement
D'Estrees Bay	736100	6024000	Pleistocene dune limestone of Last Interglacial age
Emu Bay	727000	6058700	Cambrian Emu Bay shale fossils; trilobites
Harveys Return	648200	6042700	Metamorphosed Cambrian sediments with zebra rock (contorted bedding)
Kingscote foreshore	738600	6050600	Eocene bryozoal Kingscote Limestone in cliffs
Little Sahara	702500	6018800	Mobile Holocene dunefield
Old Government Quarry	739200	6051800	Jurassic Wisanger basalt overlying Permian sediments in quarry
Point Ellen	697100	6014100	Cambrian igneous migmatites with granite melts, overlain by Pliocene shell beds
Ravine des Casoars	642900	6038000	Pleistocene limestone; flank margin caves
Remarkable Rocks	658300	6009300	Cambrian granite weathering, xenoliths
Smith Bay	722300	6058200	Permian shales and glaciated pavements
Snapper Point	773800	6041000	Neo-Proterozoic metamorphic rocks of Adelaide geosyncline
Stokes Bay	699800	6055600	Pleistocene dune limestone overlying Early Cambrian rocks
West Bay	639800	6027300	Cambrian Middleton sandstone with sedimentary structures
Wilson River dune	765200	6028600	Holocene dune overlying floodplain deposits, bedding very clear

Geological Overview

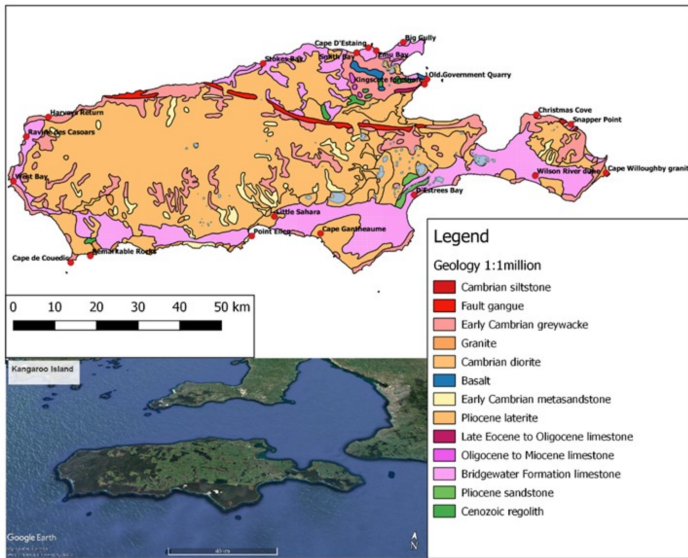
The broad geology of Kangaroo Island is made up of a central plateau capped with late Neogene laterites, probably of Pliocene age, with deep weathering profiles and ferricrete nodules. On the north coast, the underlying Cambrian sandstones and metasediments are exposed at the coast. These are part of the widespread Kanmantoo group of South Australia. There are similarities with the geology of the Fleurieu Peninsula and the Mount Lofty Ranges. The sandstones are steeply dipping and are unconformably overlain by phyllites and other metamorphic rocks formed in a shear zone associated with the Cygnet-Snelling fault. That feature is dominant in the topography of Kangaroo Island and extends from near Kingscote to Snelling Beach on the north-west coast. The Cambrian sandstones and siltstones were deposited in a deep oceanic trench and, as sediments accumulated, the depression of the crust initiated igneous intrusions around 400 million years ago. These are today represented by a number of granite outcrops along the south coast and on the Dudley Peninsula, most noticeably at Cape Willoughby. The best-known example of this granite is the Remarkable Rocks.

During the Permian, much of Australia was covered with ice sheets, as the landmass was much closer to the South Pole. Ice flowed north north-westwards in a trough be-

tween the present-day Dudley Peninsula and the main mass of Kangaroo Island. Glacial striations can be seen at Christmas Cove near Penneshaw and at Smith Bay, while glacial tillites and some erratics are found at Boxing Bay on the northern extremity of the island. During the Jurassic, extensive lava flows were extruded to the west of Kingscote in the Wisanger area. There was extensive uplift and folding of the landmass of Kangaroo Island during the Neogene and this is best seen on the extreme west coast of the island to the north and south of West Bay. During the Pleistocene, high sea levels facilitated movement of carbonate-rich shelly sand on to the landmass forming a series of coastal dunes.

There are at least four phases of dune building and consolidation of that material to form the dune limestone or aeolian calcarenite. Soils formed on each dune deposit and these can be seen today in section on the coastal cliffs.

These dune limestones are widespread on the southern and western coasts of Kangaroo Island and are broadly contemporaneous with the Bridgewater Formation in western Victoria and south-eastern South Australia. Karst features are widespread on the dune limestone; in excess of one hundred caves and karst features have been recorded.



Generalised geology of Kangaroo Island. Based on Kingscote Special sheet S153-16, Geological Survey of South Australia.

Heritage sites

Admiral's Arch

This iconic site is a sea cave in Pleistocene dune limestone overlying Cambrian metasandstone. There are numerous outside stalactites in the roof of the Arch. There are also extensive shore platforms on the gently dipping sandstone and a raised beach in the Arch has been dated to 122,000 years ago. This beach deposit has analogues elsewhere on the island, where raised conglomerate beach deposits form benches 5-6m above present sea level. The site and neighbouring Weirs Cove show flank margin caves at several levels related to Pleistocene uplift. This is an important site for tourism and a Long-nosed fur seal colony is usually present in the Arch.



Admiral's Arch: Pleistocene dune limestone overlying Cambrian sandstone

Remarkable Rocks

These residual tors or inselbergs on the south coast are formed in the Remarkable Granite, which is circa 500 million years old and is thus of Cambrian age. Some deformation of the granite occurred about 400 million years ago, and xenoliths (foreign stones) of metasandstone occur in the mass of the granite. Isolated blocks of granite or koppies lie on a rounded dome of granite with well-

developed sheeting joints due to exfoliation (pressure release). There are particularly fine examples of cavernous weathering, tafoni and solution runnels on the outcrops. Salt weathering due to spray and subsequent wetting-drying cycles aid the granular disintegration of the bedrock. There has been a great deal of spalling of the lower rock surfaces due to the extreme heat from the recent bushfires.



Remarkable Rocks in February 2020 after the bushfires

Some additional heritage sites?

Kelly Hill caves

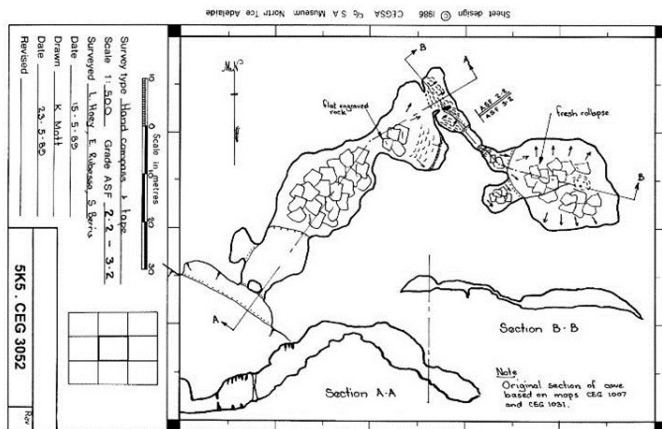
These caves in Pleistocene dune limestone are probably the best-known on Kangaroo Island and a section of the main cave, KH11, is open to the public. The original entrance, K1, consists of two solution pipes which enter the show cave. There is a series of collapse domes, linked by short rift passages. Originally, there was a shallow lagoon just to the north the cave with multiple water entry points into the karst. Progressive lowering of the water table led to a loss of stability of the cavities with roof breakdown forming a series of tensional arches. This mode of cave formation, first described here by Alan Hill of CEGSA, appears to be quite widespread in dune limestones. The cave has abundant speleothems derived from percolation water from the surface. Large collapse blocks are also covered in flowstone and stalagmites, whose orientation suggest ongoing movement of the blocks. The cave is also important for fossils and palaeoclimate studies carried out by scientists from Adelaide and Flinders Universities.



Typical speleothems and evidence of collapse at Kelly Hill

Ravine des Casoars

This is a deep valley running inland from the coast south of Cape Borda, with several flank margin caves. First named by the French explorer Nicholas Baudin in 1803, who thought the now extinct dwarf emus there were casowaries. It was also home to a group of shipwrecked French sailors in 1815, who left an engraving on a flat rock well within the cave. The present entrance is at sea level and the cave is best visited at low tide. The cave has two collapse domes linked by a short passage, with abundant speleothems. There are several other flank margin caves in the north wall of the valley near this cave, and some large dolines to the north and south.



Map of K5 cave at Ravine des Casoars, courtesy of Kevin Mott and CEGSA

Cape Dutton sea cave

This site is located on the north coast of the island, to the west of Stokes Bay. A thick sequence of Bridgewater Formation dune limestone overlies Cambrian sandstones, and is exposed in cliffs 50m high. The cave is located at the contact of the sandstone and limestone and its horizontal tunnel 80m long has a floor of sand and rounded boulders. Its entrance is 5-6m above present sea level, which would suggest that it relates to the Last Interglacial sea level some 125,000 years ago. There are several marine terraces, gravel and cobble deposits at this level at Admirals Arch and at Kingscote along the coast of Kangaroo Island. Below the entrance, windblown sand forms a ramp leading to the entrance.



Sea cliff in dune limestone overlying Cambrian sandstone at Cape Dutton. Sea cave at contact of sandstone and dune limestone with a ceiling height 3m. The cave extends 80m into the cliff

The cave is located on private property and is reached by climbing down a steep ridge to the sea. A large sea eagles' nest above the cave has been occupied by a breeding pair for the last 30 years.

Vennachar Point and West Bay

At the extreme western end of the island, West Bay is a deep harbour regularly used by yachts. To the north of the bay is Vennachar Point, the site of the 1905 wreck of the Loch Vennachar wool clipper. Wreckage from this ship was spread along the southwest and south coasts of the island; there were no survivors. In the days of sail, ships frequently came to grief on this cliffed coast, fully exposed to westerly winds and the Southern Ocean. To the north of the point are deep gulches or geos cut into the Cambrian sandstone, and capped with Pleistocene dune limestone. The massive sandstone dips gently to the northwest and forms tall cliffs and shore platforms.



Aerial image of geos and a deep shaft north of Vennachar Point. Image sourced from Location SA viewer <http://location.sa.gov.au/viewer/>

This site is on a very high energy coast with many deep embayments and geos. Further north, towards Ravine des Casoars, are several large dolines formed in the dune limestone—these are, as yet, unexplored.

Boar Beach trace fossils

This site is located on private property on the southern shore of the Dudley Peninsula. It has been studied in detail by Camens et al. (2017). A series of trace fossils or animal tracks occur within cross-bedded dune limestone (calcarenite) of the Bridgewater Formation. The tracks are exposed in gently dipping laminae of the calcarenite, within the tidal zone, and are periodically covered by sand.

There are several trackways as well as individual footprints of reptiles, shorebirds, extant species such as possums, kangaroos and the Tasmanian Devil.

Of particular interest are the tracks of large extinct marsupials such as diprotodons, short-faced (sthenurine) kangaroos, and thylacines. Possible contenders for the diprotodontid tracks include the giant wombat *Phascolonus gigas*, the "marsupial tapir" *Palorchestes azael* and a juvenile diprotodontid (*Diprotodon optatum* or *Zygomaturus trilobus*).

The deposits have been dated using Optically Stimulated Luminescence (OSL), which dates the last time the sediment was exposed to sunlight. Samples taken above and below the trace fossil layer are indistinguishable at their uncertainty ranges and suggest that the fossilized dune sequence accumulated relatively rapidly. The consistency of the dating results provides a mean age of 135,000 years for the trace fossils at Boar Beach. This puts them in the middle of the Last Interglacial when sea level was higher, and the climate warmer and wetter. A concentration and overprinting of tracks at one point suggest animals were congregating to drink at a shallow freshwater lagoon at the back of the beach.

side stalactites up to 35m above present sea level. About 1km west of the access track, fulgurites are well exposed on a cliff-top dune. These are formed in sand when lightning hits the ground, fusing and vitrifying the grains into hollow tubes about 20cm long, with some minor branching.



Sea stacks in early Pleistocene limestone



Tracks of an extinct juvenile *Diprotodontid*

Effects of 2019-2020 bushfires

In December 2019 and early January 2020, most of the western half of Kangaroo Island burnt in catastrophic bushfires. Strong northerly winds and high fuel loads in native vegetation areas created conditions well beyond the best efforts of firefighters. A total of 165,000ha was burnt, with fire intensity only patchy at the eastern extremity of the fireground. Most of Flinders Chase NP was burnt, although there were unburnt patches along deep gullies on the west coast of the island. Losses of wildlife were very high, despite a concerted effort by several agencies to treat injured marsupials and eradicate cats preying on endangered species such as dunnarts. As a result of the fires, 80 houses were burnt. A large number of sheds and many hundreds of kilometres of fences were destroyed. The Kangaroo Island community is resilient and people have worked together to rehabilitate land and livelihoods in the ensuing ten months. The island economy is slowly recovering and visitors are now very welcome. Flinders Chase NP is progressively re-opening to visitors as facilities are rebuilt and burnt areas rendered safe from falling trees and branches.

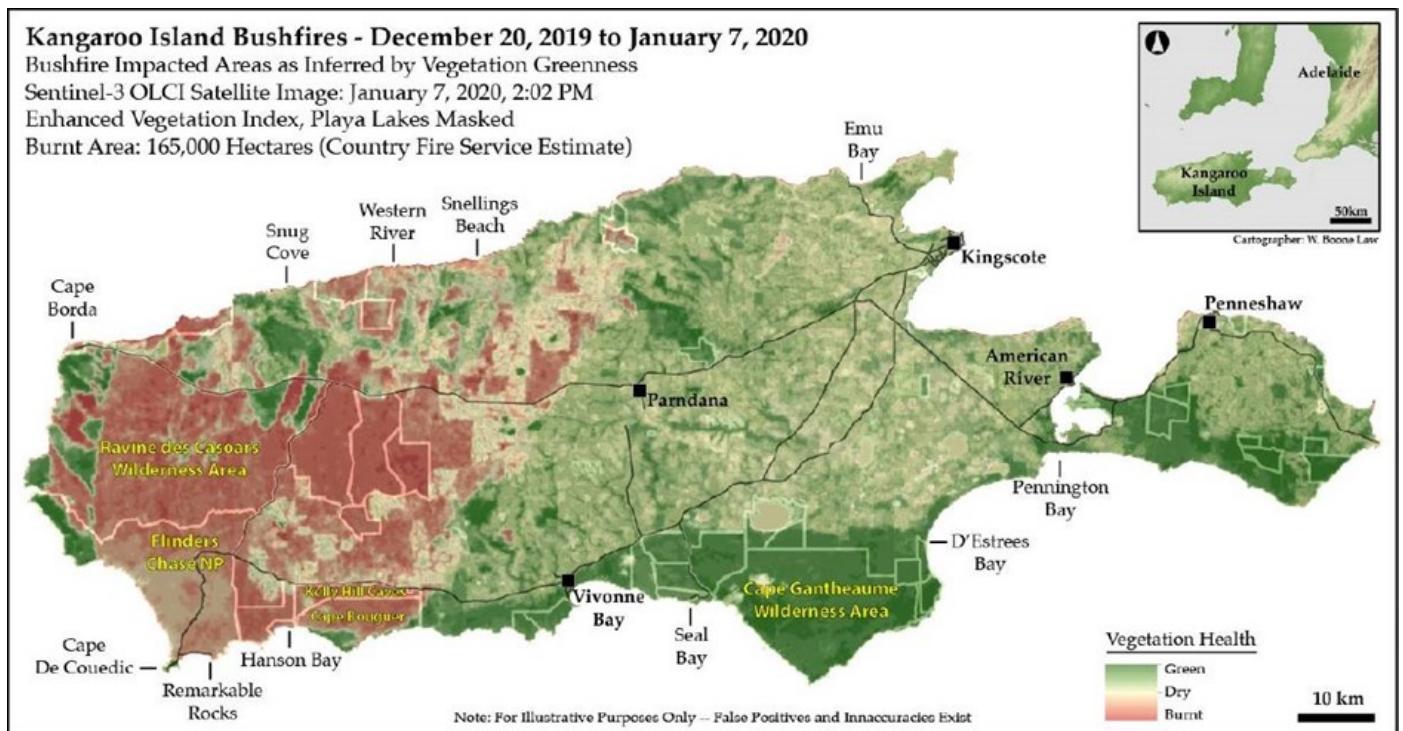
Many karst areas on the western half of the island were burnt. At Kelly Hill Conservation Park, almost the entire area was burnt, including all above-ground infrastructure. Fire intensities were high resulting in widespread spalling of limestone outcrops; baking of soil; and washing of soil and charcoal into closed depressions and cave entrances following intense rainfall of 60mm in late January. Prompt and effective action by Parks SA staff limited washing of fine sediment into the show cave. Sediment and charcoal washing downslope across the main road diverted water flows and partially blocked the three main water sink points along the northern side of Kelly Hill. Within two months of the fires, resprouting of yaccas (grass trees or *Xanthorrhoea semiplana*) and mallee eucalypts was evident and widespread. Subsequently, other native genera such as *Isopogon*, *Petrophile*, *Acacia paradoxa* and *Banksia* have resprouted, while a ground cover of native grasses and *Scaevola sp.* has established.



Tracks of a large short-faced (*Sthenurine*) kangaroo

Flour Cask Bay

This site is located on the exposed south coast of the island, at the eastern end of D'Estrees Bay. The name derives from cask markers mounted on poles to guide sailors into a whaling station established there in the early 19th century. There are sea cliffs 40-50m high, formed in mid-Pleistocene Bridgewater Formation dune limestone overlying early-Pleistocene Cape Hart limestone. At the base of the cliffs are well developed shore platforms and small sea stacks, with solutional potholes and tafoni in the dense limestone. Several pedogenic calcrete layers are visible in the cliffs, with flank margin caves and out-



Further reading:

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Cave Climate Graphs on the ACKMA Website

Rauleigh Webb, Andy Baker, Dave Gillieson and Andy Spate

During 2020, ACKMA instigated the deployment of data loggers to a number of cave sites throughout Australia and New Zealand. This was an attempt to capture the best baseline climate data for all of these caves, as visitation to the caves had been halted due to COVID-19 restrictions. The data collected currently starts from the 28/05/2020 and runs to 19/01/2021. Overall the number of data records is 33935 with Te Anau Cave providing the most continuous data set so far.

Andy Baker asked that interactive graphs be created online so as to provide ACKMA with a way of displaying the data. These graphs would enable the display of the data and allow visitors to interactively interpret the changes occurring in each cave site's temperature and relative humidity data. We propose to provide interpretation of the data beneath each of the graphs in the near future.

At present a webpage has been created that lists all of the sites that have provided data from the ACKMA data loggers, along with links to graphs that are generated online from the raw data.

The links page is shown in the above right table and is at <http://www.ackma.org/CaveClimate/index.asp>. When the Temperature or Relative Humidity link are clicked on at the website, then the relevant graph is prepared by loading the data from the website and thus generating the graph.

The graph shows all of the data that has been provided for each cave site. Each data point is tagged individually so as you move your cursor over the graph you can see the date and time of the point as well as the temperature or relative humidity value.

There are limitations on the number of data points that can be displayed in a graph so we may need to restrict each graph to one year of data. The graphs and data will be adjusted accordingly as required.

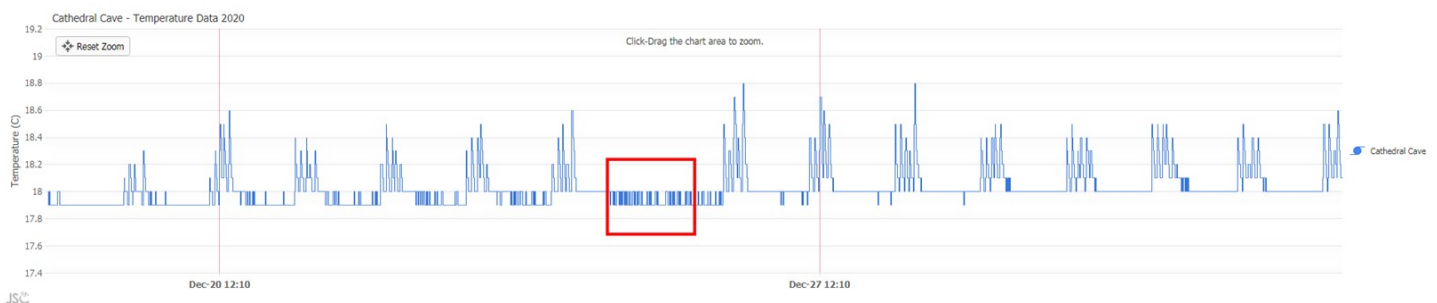
If you want to "Zoom In" to a particular range of points to see finer detail, you can use the cross appearing on the graph as your cursor to select a rectangular shape around the data you want to examine and the graph will re-draw on the data selected. You can "Zoom In" multiple times if required, depending on the size of the data selected.

A Reset Zoom button appears on the graph to allow the "Zoom In" to be reset back to the entire data set. Here is an example from Cathedral Cave at Wellington, NSW, with some interpretation by Andy Baker on the following page. The example below uses the Zoom feature to interrogate the data around Christmas day.

ACKMA Cave Climate Graphs 2020

[Click here for a map showing these cave locations](#)

Cave Name	Temperature Graph	Relative Humidity Graph
Calgardup	Calgardup Temperature Graph	Calgardup Relative Humidity Graph
Careys Cave	Careys Cave Temperature Graph	Careys Cave Relative Humidity Graph
Cathedral	Cathedral Temperature Graph	Cathedral Relative Humidity Graph
Cathedral Cave	Cathedral Cave Temperature Graph	Cathedral Cave Relative Humidity Graph
Crystal Cave	Crystal Cave Temperature Graph	Crystal Cave Relative Humidity Graph
Donna	Donna Temperature Graph	Donna Relative Humidity Graph
Footwhistle	Footwhistle Temperature Graph	Footwhistle Relative Humidity Graph
Gaden Cave	Gaden Cave Temperature Graph	Gaden Cave Relative Humidity Graph
Guillotine	Guillotine Temperature Graph	Guillotine Relative Humidity Graph
Gunns Plains	Gunns Plains Temperature Graph	Gunns Plains Relative Humidity Graph
Jersey	Jersey Temperature Graph	Jersey Relative Humidity Graph
Jewel Cave	Jewel Cave Temperature Graph	Jewel Cave Relative Humidity Graph
Jillabenan	Jillabenan Temperature Graph	Jillabenan Relative Humidity Graph
Kelly Hill	Kelly Hill Temperature Graph	Kelly Hill Relative Humidity Graph
King Solomon	King Solomon Temperature Graph	King Solomon Relative Humidity Graph
Lake Cave	Lake Cave Temperature Graph	Lake Cave Relative Humidity Graph
Mammoth	Mammoth Temperature Graph	Mammoth Relative Humidity Graph
Marakoopa	Marakoopa Temperature Graph	Marakoopa Relative Humidity Graph
Ngilgi	Ngilgi Temperature Graph	Ngilgi Relative Humidity Graph
Nikau	Nikau Temperature Graph	Nikau Relative Humidity Graph
Phosphate Mine	Phosphate Mine Temperature Graph	Phosphate Mine Relative Humidity Graph
Shades of Death	Shades of Death Temperature Graph	Shades of Death Relative Humidity Graph
Spellbound	Spellbound Temperature Graph	Spellbound Relative Humidity Graph
Te Anau	Te Anau Temperature Graph	Te Anau Relative Humidity Graph
Trezkinn	Trezkinn Temperature Graph	Trezkinn Relative Humidity Graph
Yonderup Cave	Yonderup Cave Temperature Graph	Yonderup Cave Relative Humidity Graph



Temperature Graph Interpretation

Andy Baker

The Cathedral Cave graph can be seen on the previous page.

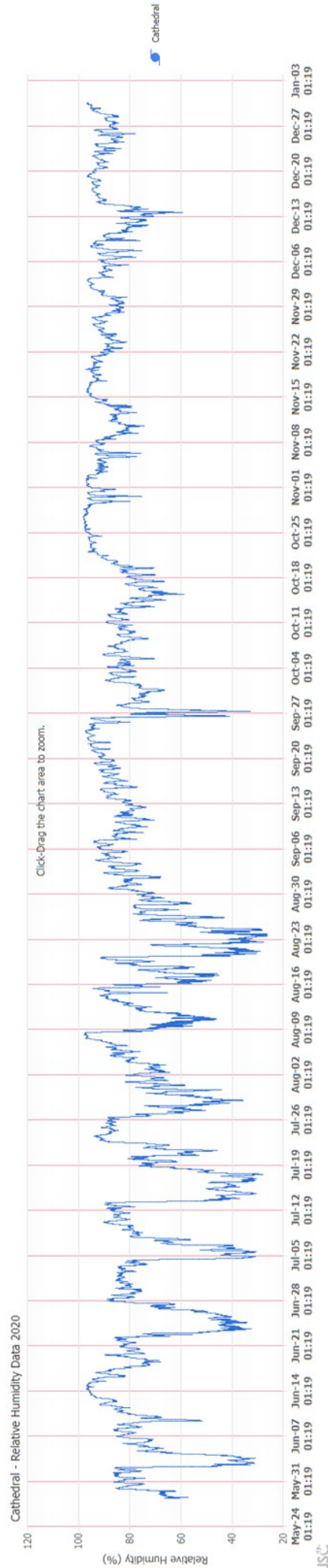
The red rectangle on that graph is for Christmas Day 2020 and there are clearly no visitor temperature changes.

There are small temperature increases occurring after each cave tour, with larger peaks relating to higher visitor numbers, then the temperature drops between tours.

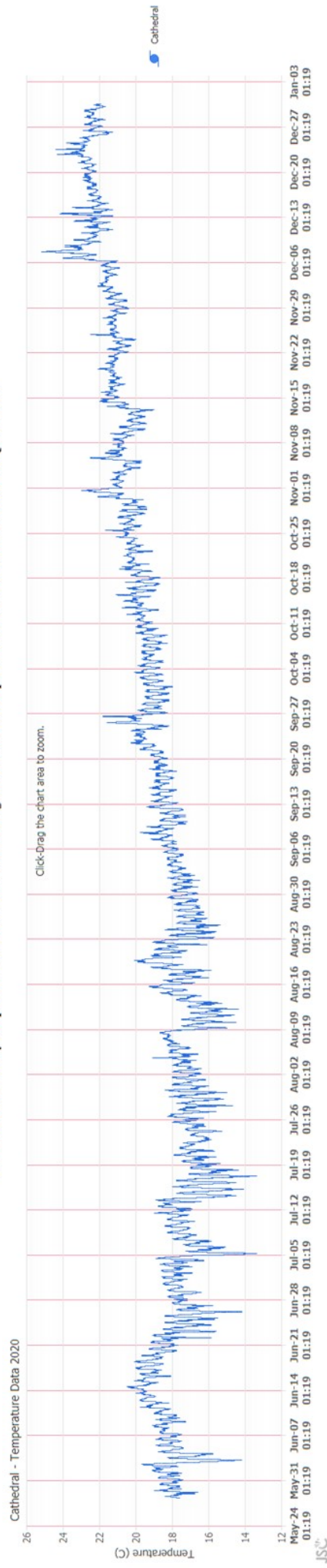
Overnight, the temperature falls back to the overnight temperature for that time of year, good evidence for no long-term effect on cave air temperature.

The daily temperature peaks were not there last June – it will be interesting to compare to this June.

Zoom in to see the Christmas Day data. There were no tours that day as the cave was closed.



This Relative Humidity Graph is for the Cathedral which is a large chamber in the Capricorn Caves at The Caves in Northern Queensland



This Temperature Graph is for the Cathedral which is a large chamber in the Capricorn Caves at The Caves in Northern Queensland

2021

Cave beetle



Australian Cave Animal of the Year

It's Beetle-mania in 2021

Cathie Plowman

Australian Cave Animal of the Year is its third year and, in 2021, along with several other countries with cave animal programs, we're celebrating the many beetles that live in caves.

About a quarter of all animals on planet Earth today are beetles! Over 400,000 species have been described—with beetles living in a wide range of habitats, including the dark world of caves.

The 1832 description of a blind cave beetle collected from Postojna Cave, Slovenia, is now recognised as the commencement of biospeleology as a scientific discipline.

Only about 25 species of Australian cave beetles are troglobitic, meaning that they are specialised for underground life and not found above ground.

Most troglobitic beetles in Australia are short-range endemics, generally restricted to a single cave or karst system. Tasmania has the richest cave beetle fauna in Australia with around 17 described species to date. The other troglobitic Australian cave beetle species are from Victoria, New South Wales, South Australia and the Nullarbor Karst (South Australia–Western Australia).

There are many, many other beetles living in caves which are not troglobites. These include troglaphiles (the term for cave animals that can also be found above ground) and guanophiles (the term for cave animals that live and reproduce within guano piles—the mounds of bat excrement that build up in caves).

For more details on Australian cave beetles visit: www.caveanimaloftheyear.org.au

As 2021 is the International Year of Caves and Karst, the countries that have Cave Animal of the Year programs (there now being eight) were encouraged collectively to focus on cave beetles.

To check in on efforts from other countries with Cave Animal of the Year programs visit: International Cave Animal of the Year – IYCK (iyck2021.org)

Cave Animal of the Year programs are building momentum in efforts to increase appreciation of cave animals and the importance of caves as important animal habitat.

Our Australian promotional products include beautiful posters, bookmarks, stickers and mugs. Our products have won a printing industry award here in Australia and several awards two years running at the National Speleological Society congress in the USA.

Don't miss out!

While the 2021 mugs have all sold and there's only a handful of stickers left, posters and bookmarks are still available in limited quantities.

It would be great if all the Australian show cave sites could join us in our efforts to increase community appreciation of cave animals by displaying the poster and having out beautiful bookmarks available for your visitors (both are free of charge).

To order supplies please email:

hello@caveanimaloftheyear.org.au

Thanks to the Australian Speleological Federation's Karst Conservation Fund for assistance with this program.

CELEBRATE CAVES THROUGH YOUR CREATIVITY

ACKMA, ASF and NZSS invite

All creative arts people of Australasia to celebrate the
International Year of Caves & Karst in 2021



YOUR CHOICE OF MEDIUM - Write a Story, Rhyme, Poem, Song, Sketch, Paint, Sculpt, Photograph or Create a Video.

Four \$500 Ledlenser vouchers and a \$1,000 Grand prize are to be won!

The theme is **Caves and Karst in Australasia**

By submitting your creative piece in an electronic file to asf.caves.competitions@gmail.com you allow ACKMA, ASF & NZSS to showcase your art as part of our celebration of the International Year of Caves and Karst 2021. (See - Conditions of entry)



Australian
Speleological
Federation



Conditions - Creative celebration of the International Year of Caves and Karst – Australasia

All entries are to be emailed to: asf.caves.competitions@gmail.com

Overview

- The theme is Caves and Karst in Australasia
- Open to all ages and levels of skill. (Under 18's must attach a parent consent.)
- All mediums are welcome
- The work is to be produced recently from 2019, 2020 or 2021
- Entry is free
- Closes midday Sunday 21st November with announcements Sunday 12 December 2021.

Creators statement

- Date of work
- Title
- Created by - Collaborations must include their names and role. Entry is by the author (A winning collaborative entry will have the prize awarded to the author/artist)
- Statement - What was it about caves or karst that inspired the work? (500 words max.)
- Medium/treatment/technique

Visual Art and photography – categories Photography; Creative arts

Submissions are to be made as high-resolution, cropped jpegs (no frame, no glass) of at least 1mb10mb max. They need to be easily shared electronically and reproduced in print (no low-res thumbnail images taken from websites, etc.)

Video, audio and recorded performance – categories Stories and poems; Music and song

A maximum running time of 7 minutes.

Video submissions are to be made using a link to YouTube, Vimeo or similar.

They need to be able to be watched/listened to remotely by judges and stakeholders, shared to social media and/or embedded in websites, etc.

Script, lyrics or score for original compositions must also be included with the entry.

Acknowledgements of collaborators, multiple participants and their role are to be made. Clearly state the author which is the person to submit the work.

Writing – categories stories and poems

In the form of poetry, prose, fiction, non-fiction, journalism. – 5000 words max.

Content

The organisers assessment panel reserve the right to refuse an entry based on it possibly being offensive. You are cautioned to avoid culturally sensitive or political issues, nudity, profanity, adult concepts, etc.

Your entry must be your own work or a collaborative work which is clearly acknowledged.

Categories

Photography; Creative Arts; Stories and poems; Music and song

Prizes

Four \$500 vouchers from Ledlenser <https://ledlenser.com.au/> will be issued, one for the best entry in each category. A \$1,000 (Aus.) grand prize will be awarded to the overall best of the categories.

This competition is being conducted jointly by the following organisations

- Australasian Cave and Karst Management Association (ACKMA)
- Australian Speleological Federation (ASF)
- New Zealand Speleological Society (NZSS)

The judging panel will comprise representatives of these organisations. Any correspondence concerning the competition should be addressed, in the first instance, to the email address appearing at the beginning of these Conditions. Any such correspondence will be referred to a representative of the appropriate organisation for direct response.

A condition of entry to this "Celebration of Caves and Karst" is that each entrant authorises the above organisations (ACKMA, ASF, NZSS) non-exclusive use of submitted material for non-commercial purposes online and in print, with attribution and in full.

Copyright remains with the artist/author.



ANDYSEZ 61 Earthquakes and caves

– Did the earth move for you?

Andy Spate

Recently both Ian Eddison and I posted a link on the mailing list from the United States Geological Survey regarding safety in caves when earthquakes occur. We hope you find such postings of interest. Here is the link again <https://www.usgs.gov/faqs/can-you-feel-earthquake-if-youre-a-cave-it-safer-be-a-cave-during-earthquake>

Basically, the message, at Yarrangobilly, is to go to Jilla-benan and avoid South Glory. Or, at Jenolan, go for the Imperial Cave rather than Lucas or the Devil's Coach House.

This ANDSEZ will talk about earthquakes for a while – and then move on to their relevance to caves and karst.

There are four different types of earthquakes:

A **tectonic earthquake** is one that occurs when the earth's crust breaks due to geological forces on rocks and adjoining plates that cause physical and chemical changes.

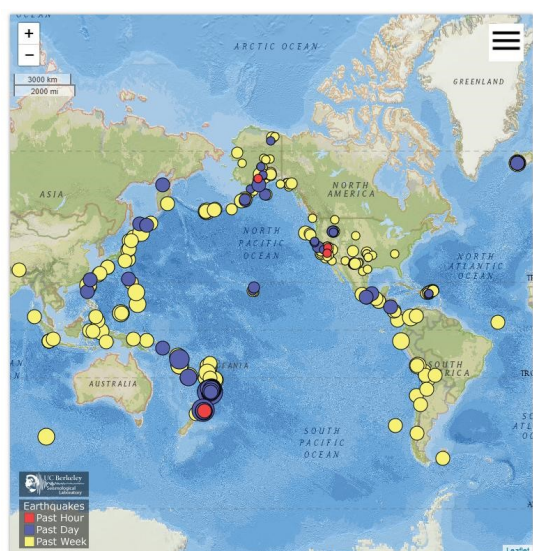
A **volcanic earthquake** is any earthquake that results from tectonic forces which occur in conjunction with volcanic activity.

A **collapse earthquake** is a small earthquake in an underground cavern or mine that is caused by seismic waves produced from the explosion of rock on the surface.

An **explosion earthquake** is an earthquake that is the result of the detonation of a nuclear and/or chemical device.

There may be four types of earthquakes as outlined above but here we are really only interested in two types of tectonic quakes – interplate and intraplate.

Interplate quakes occur when two tectonic (continental) plates rub together—as in New Zealand where the Pacific and Australian plates interact producing many quakes



(think of the 'Pacific Rim of Fire' as in Figure 1 adjacent).

The 'Pacific Rim of Fire' over the week ending 5 March 2021

These are more frequent and powerful than intraplate quakes. In 2010, a magnitude 7.1 struck Christchurch with huge amounts of damage (but few injuries) as it was in the early hours of the morning. Fig 2 shows just how active New Zealand is.

To see Fig 2, you need to copy the below URL into your browser and access the site - [Ten years of New Zealand earthquakes in 20 seconds.](https://www.stuff.co.nz/national/100611311/heres-what-a-decade-of-nz-quakes-looks-like-in-20-seconds)

<https://www.stuff.co.nz/national/100611311/heres-what-a-decade-of-nz-quakes-looks-like-in-20-seconds>

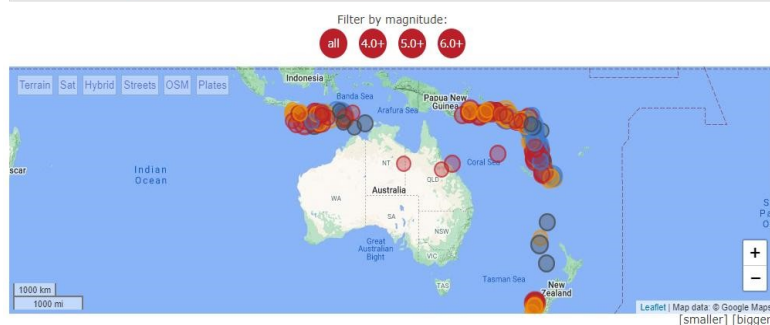
Intraplate quakes are what we have in Australia – on the continental plate – less magnitude and less frequent but still can do some damage (as we saw in Newcastle) in 1986 – magnitude 6.9 Australia's worst in terms of lives lost and damage costs.

Past earthquakes in or near Australia during the year 2020

Australia Meridional | Australia Occidental | Australian Capital Territory | New South Wales | Northern Territory | Queensland | Tasmania | Victoria
Updated 8 Mar 2021 01:36 GMT - 1 day 3 hours ago

During 2020, Australia was shaken by 9 quakes of magnitude 6.0 or above, 143 quakes between 5.0 and 6.0, 470 quakes between 4.0 and 5.0, 897 quakes between 3.0 and 4.0, and 1860 quakes between 2.0 and 3.0. There were also 386 quakes below magnitude 2.0 which people don't normally feel.

Biggest quake: 6.6 quake Coral Sea, 175 km southeast of Lata, Solomon Islands, 2020-05-13 09:41:12 +11:00



Past earthquakes in or near Australia during 2020

But what has this to do with caves and karst? We will find that out later.

By the way Is Australia volcanically dead? The short answer is no!

Volcanologists use a fairly arbitrary 10,000 years as the cut off between active and extinct. We have had volcanic activity in south western Victoria, south eastern South Australia and in far northern Queensland well under 10,000 years ago. In the south, these eruptions are very wonderfully backed-up by the Indigenous oral histories of the regions.

A lecture I watched on Zoom a few days ago had a vulcanologist say that we could well expect an eruption (with only a few days to weeks warning) in the next few thousand years. Do we have plans to cope with such a happening?

The short answer again is no! We know that our friends across The Pond in the Shaky Isles (as they were known to Australians in the late 19th C) are certainly not volcanically dead as we saw in Figure 2.

Earthquake magnitudes

The strength (magnitude) of earthquakes is calculated in a variety of ways but the 'M' numbers are much the same. The table on the following page indicates what damage we might expect from earthquakes of differing magnitudes.

Magnitude	Effects	Est No Each Year
<2.5	Usually not felt but can be recorded by seismograph.	900,000
2.5-5.4	Often felt, but only causes minor damage.	30,000
5.5-6.0	Slight damage to buildings and other structures.	500
6.1-6.9	May cause a lot of damage in very populated areas.	100
7.0-7.9	Major earthquake. Serious damage.	20
>8.0	Great earthquake. Can totally destroy communities near the epicentre.	One every 5 to 10 years

But what has this to do with caves and karst?

We have had at least three earthquake events in Australia relating to caves that I know of – there will be many others ... And I hope in the next Journal there will be more accounts of quakes and cave impacts in New Zealand from our cousins across the pond.

The Western Australian town of Meckering was struck by an earthquake on 14 October 1968. The earthquake occurred with a moment magnitude of 6.5 ... Total damage amounted to \$2.2 million with 20–28 injured. It damaged roads including the Great Eastern Highway, the Eastern Goldfields Railway, and the Goldfields water pipeline.

Jewel Cave was shaken by the Meckering quake with fridges toppling over in the shop (as I recall) – nobody underground felt a thing.

The 1979 Cadoux earthquake (magnitude ~ 6.0) caused over \$4 million damage.

Pete Bell was on a trip to Winjans Cave in Witchcliffe during the Cadoux quake - he knew nothing until returning to Perth and heard media comments.

John Brush has found a reference or two in TVL (TVL = *The Very Latest* is the Canberra Speleological Society's newsletter) to an earthquake at Wee Jasper.

TVL Vol 3(2), Aug 1967:

Trip Reports – Wee Jasper 24-25 June: This was the earthquake trip – an experience that all in the party will probably never forget. The Saturday was spent digging in a good prospect on Punchbowl Hill. The earthquake occurred at 4.36 p.m., with a very loud subterranean roar and a distinct earth movement. An evening trip, taking about 20 minutes in all [what?!!!], into Punchbowl revealed no damage. Sunday went into the Dip and looked very hard for the entrance into No. 3 extension before realising that the boulder choke had settled and was in a very dangerous condition.

And in TVL Vol 3(5), Feb 1968:

WEE JASPER, DECEMBER 1967 [extract]

... A systematic search revealed that the alternate route to No. 3 extension was still negotiable, despite numerous new cracks and fissures. The extension itself, however, was a mere shadow of its former self. What an earthquake could not do, Homo sapiens had accomplished with no effort whatsoever.

Peter Scott remembers this trip a little differently:

I remember that quake! Neil Anderson had just dynamited the bottom of a shaft up on a rubbly hill. Whilst huddling behind a large rock from the blast, we thought that it was going to bring the hill down! Later we found that it was a local tremor. I later went on to do three years of Seismology (and then an MSc, in geology) but at the time we had a bigger-than-needed attitude towards the six sticks we set off.

My friend, Ian Cathles – long term resident of Wee Jasper remembers vividly a tremor around that time a few kilometres from Wee Jasper.

But ... it was 57 years ago ...

So what?

This leads me into the use of caves to investigate speleo-seismicity. What the hell is this you, rightly, ask? It is the use of stalagmites to investigate the long-term history of earthquake events.

Paolo Forti (2004, page 565) says:

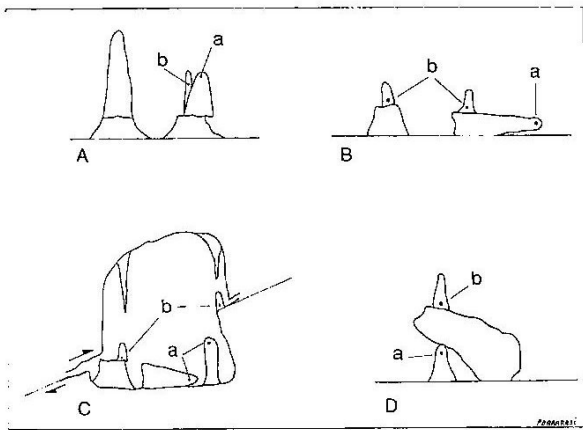
Over the last few decades, seismotectonic studies of speleothems have proved that broken speleothems and actively growing stalagmites are the most powerful tools for the quantitative and chronological reconstruction of seismotectonic events. ... They may be used as a tool for the detection of ancient era, and the relative and absolute dating of speleotectonic activity, the determination of its magnitude, and for improving general seismic hazard evaluation.

Becker et al (2006) sum it up as follows:

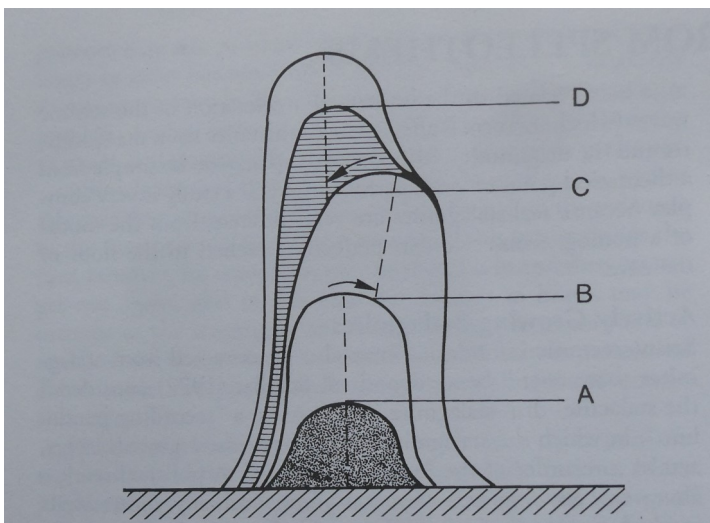
Speleoseismology is the investigation of earthquake records in caves. Traces can be seen in broken speleothems, growth anomalies in speleothems, cave sediment deformation structures, displacements along fractures and bedding plane slip, incision (rock fall) and co-seismic fault displacements. Where earthquake origins can be proven, these traces constitute important archives of local and even regional earthquake activity. However, other processes that can generate the same or very similar deformation features have to be excluded before cave damage can be interpreted as earthquake induced. Most sensitive and therefore most valuable for the tracing of strong earthquake shocks in caves are long and slender speleothems, such as soda straws, and deposits of well-bedded, water-saturated silty sand infillings, particularly in caves close to the earth's surface. Less easily proven is a co-seismic origin of an incision and other forms of cave damage. The loads and creep movements of sediment and ice fillings in caves can cause severe damage to speleothems which have been frequently misinterpreted as evidence of earthquakes.

For the dating of events in geological archives, it is important to demonstrate that such events happened at approximately the same time, i.e. within the error bars of the dating methods. A robust earthquake explanation for cave damage can only be achieved by the adoption of appropriate methods of direct dating of deformation events in cave archives combined with correlation of events in other geological archives outside caves, such as the deformation of lake and flood-plain deposits, locations of rock falls and active fault displacements. [Abstract]

How do they do it? Let's look at some examples from Forti (2004) and the invaluable *Speleothem Science* (Fairchild and Baker 2012).



Paleotectonics from Speleothems: Figure 1. Characteristic breakage of speleothems, induced by seismic stress. Resonance-induced stalagmite fractured along a subhorizontal plane: (A) the upper part is still standing on its base, being only slightly translated and / or rotated from its original position; (B) the broken upper part lies on the floor close to its base; (C) stalagmite collapse caused by the displacement of the adjacent wall; (D) new stalagmite growing over a fallen rock, which covered an older stalagmite. Positions (a) and (b) indicate characteristic sampling points for absolute (U / Th and / or ¹⁴C) dating of deposits which occurred just before (a) or after (b) the seismic event.



Paleotectonics from Speleothems: Figure 2. Evidence of earthquakes as seen in the inner structure of a stalagmite: i.e. sudden and sharp vertical changes in the stalagmite axis (B & C) and abrupt variations in the texture, colour, and chemical composition of the growing layers (A, C, & D) may be induced by seismic shocks.

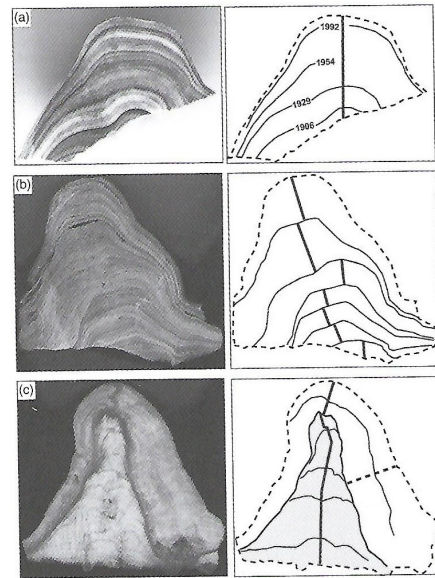


Fig. 7.B2 Polished and scanned images of (a) Asfa-3, (b) Merc-2 and (c) Achere-4 stalagmites from the Mechara caves. Corresponding sketches to the right of each stalagmite show the manifestations of earthquake activities in their growth: Asfa-3 by anomalous growth bands, Merc-2 by deviation of growth axis from vertical, and Achere-4 by a prominent hiatus with distinctly differing stalagmite shapes on either side.

Figure 7 (below) is a view of a stalagmite from Jillabanan Cave sliced vertically to allow wheelchair access to the cave. Attempts to date it failed, unfortunately. But what is interesting is how the drip source has clearly moved from left to right through time. The reasons for this are unknown – and there could be a number of explanations and interactions – and earthquakes probably do not fit this site.



Stalagmite in Jillabanan Cave, Yarrangobilly, NSW. Photo Regina Roach

Figure 8 is from Lynds Cave at Mole Creek and displays a major crack in massive flowstone induced by a magnitude 4-5 quake with its epicentre at Lake Mackenzie not far from the cave. The quake occurred on 24 September 1997 at 3.30 am on a Sunday morning.

The National Library's invaluable Trove lists some locals as sleeping through it, but others said, "his mother started the washing machine"; "it was UFOs"; "toys fell over"; "my chess game was ruined" and "plates and pictures fell off shelves and walls". It was alleged that the quake was felt in New Zealand.

Cathie Plowman remembers the quake:

I remember the earthquake VERY well. It was in the very early hours of a Sunday morning in 1997. I was in David's then house in Launceston and woke in the darkness to the sound of what seemed like a truck about to come through the wall. I can still relive the event in my mind as if it was yesterday.

And there was a minor quake at Yarrangobilly a few days before ...



Earthquake cracked flowstone at Lynds Cave, Mole Creek (photo—Dave Gillieson)

..... but I am looking forward to further cave/earthquakes tales from Australia and New Zealand in the next Journal.

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Around the show caves

Peter Chandler, NZ V-P, reports on events in New Zealand and at Waitomo:

New Zealand has just passed a year since the COVID-19 virus pandemic forced the country into a restrictive level 4 lockdown, one which effectively meant no cave visitors until times permitted us to resume life at level 2 restrictions. So, since May 2020, this is how it has been for us.

After the initial wave of Kiwi visitors getting out and about in mid-winter, things have changed to a steady diet of school holiday and long weekend visitors together with a trickle of Kiwi road trippers, many of them retired, in between.

The lack of international visitors has been especially noticeable over the peak visitor season (November to April). At a guess, this means cave operators are operating at 5% to 15 % of their normal visitation levels. This is a huge downturn for an industry which has grown steadily over the last 50 years – one which, of course, has had its ups and downs throughout this period.

Although it has, perhaps, been toughest on food, transport, information and accommodation providers, the five cave operators in Waitomo have been eligible for a STAPPS (strategic tourism asset protection) grant to assist their survival. In addition, the Otorohanga KiwiHouse has received funding. However, this funding did not include the Museum or Glowing Adventures.

The Waitomo Caves Museum is only open for postal services on weekdays – staffed by Bridget Mosely plus volunteers (plus Toni Hawkes Board and volunteers on weekends). The Waitomo Hotel and Roselands are closed.

At Spellbound, we have moved our office closer to the cave; this appears to be well received by our Kiwi customers. With the continuation of some Waitomo village pickups, this gives us 195, 145 and 85 minute tour options for clients. Taking one or two customers on a tour rather than setting a minimum number seems to be working OK but limiting departures on the really quiet days combined with letting others join on the tour if they arrive in time.

At THL, the Waitomo Glowworm Cave and Black Water Rafting, some staff are employed on 'jobs for nature' with the Department of Conservation. This scheme means they can be recalled for cave tourism, but do conservation work otherwise. Caveworld are also doing this and Kiwi Cave Raft Guides have been volunteering at the KiwiHouse.

Meanwhile, over the last 10 days or so, much of NZ has been basking in an Indian summer, caused by the stationary high-pressure system associated with the extreme rainfall event in eastern Australia.

There is government talk about travel to and from Australian states, even of resuming flights to Hobart. Joinder of the Cook Islands and Niue in the Pacific has also been discussed.

We all need to be positive about the ability to attend the delayed Wellington NSW conference and the Takaka, South Island, New Zealand Conference in May 2022. More details about the latter follow in the next journal.

Finally, a successful book launch was held at Waitomo, on 13 March, for Van Watson and Paul Caffyn's 'The search for the deepest hole in the world', their deepest, darkest 1973 Papua New Guinea expedition.....

David Smith reports from Wombeyan Caves:

Wombeyan and Abercrombie Karst Conservation Reserves are operating at 50% capacity for camping. Hard-roofed accommodation is also available at a reduced capacity (extra cleaning days between occupancies). At present, there are no caves opened to the public for inspection, but this is due not only to COVID-19 restrictions but also ongoing repairs to fire and flood-damaged infrastructure; rock-fall issues; and fire-affected asbestos water lines in the day use areas. Some Wombeyan images below:



Todd Kearns reports from Ngilgi Cave (Margaret River, WA)

Ngilgi (meaning good spirit of the ocean in Wadandi Boodja) Cave is located on the northern end of the Margaret River Region, some three hours south of Perth. Over the past year, with two COVID shutdowns bringing major restrictions in tour capacity (with the need to comply with a 2 m² social distancing rule), we have had to change most aspects of our operations to meet government COVID regulations and a vastly shifting tourist market.

To meet the 2 m² distancing COVID regulations, we have altered the flow of customers through the cave. After the introductory 15 minute conservation and history tour spiel, pre-COVID, a “free-range chicken structure” was in place for the tours. Now, we keep the guests moving in the same direction; asking them to keep six steps between the groups. With halved tour numbers, there is obviously a limit at 50% of our capacity. The tour groups complete a lap of the cave before the next group moves through. This avoids clashes on the narrow stairwells – thus maintaining our compliance with the 2 m² rule.

We have had to endure the loss of international and interstate tourists. This has resulted in very low visitation, outside of boom school holiday periods. Cruise ship and tour bus trade has completely stopped. We have reacted to this by offering 50% discount to locals, when Perth was in lock down and unable to travel to our region, along with other changes to our ticketing structure.

Over the past 10 years we have grown our education portfolio to include fully guided geology and chemistry-based tours, ones which link to the school education curriculum. This portfolio has been essential for our survival over the past six months. The schools' camps are making up for lost time during the shutdowns and are booking more tours at an unprecedented rate.

The biggest opportunities the lock downs provided were rare days with no humans in the cave and an opportunity to undertake major conservation works. We also took the opportunity to refurbish our ticket/souvenir shop. The facelift (and revised retail layout) has seen a significant increase in sales.

Here in Western Australia, I acknowledge, and am grateful for, the fortunate position we find ourselves compared to our cave brothers and sisters in the eastern states. We are thinking of you and wish you well for the future.



Above—The Stromboli volcano—photo Carmelo Bucolo



Right—A large lava roll in Catanese II Cave—photo G I Sanfilippo

19th International Symposium on Vulcanospeleology (August 2021)

John Brush

Chairman, UIS Commission on Volcanic Caves

John Brush has provided an update about the status of the 19th International Symposium on Vulcanospeleology (ISV-19), which is scheduled to take place from 28 August to 4 September this year at Catania in Sicily.

Despite the serious COVID-19 situation around the world, including in several European countries, and the current restrictions and uncertainties associated with international air travel, the ISV-19 organisers remain confident that they will be able to stage a vibrant, successful and COVID-safe symposium this year.

For detailed information on the Symposium, please refer to the [Third Circular](#)— available on the ISV-19 Website and also via the Commission's [website](#). The 3rd Circular was also published in the Commission's *Volcanic Caves Newsletter*, Issue 77 (Published in January 2021). The current [draft program](#) is also available on the website.

The ISV-19 organisers have advised that those who intend presenting a paper at the Symposium will need to send a copy of their paper to the organisers by 31 May 2021 to facilitate preparation and production of the Symposium Proceedings. For further details on presentation requirements, please refer to pages 19-21 of the Third Circular.