Creators Statement:

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Title: *Across the Nullarbor – From Karst to Caves*

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Statement:

2021 is the 'International Year of Caves and Karst'. Up until ten years ago, I would not have known what 'karst' meant. My limited understanding of this word dates back to 2010, when my husband Peter and I embarked on a nearly year-long adventure in our motorhome, travelling from Melbourne in Victoria, across the Nullarbor to Western Australia, on to the Northern Territory, and returning the same way. Flicking back through hand-written travel journals reveals how little I actually knew at the time, and how much there was to learn as we travelled. Those 'bursting at the seam' A5 journals – dating from 2007 to 2013 – now take up a small bookshelf in my study at home in Melbourne, and are filled with tiny hand-writing (to save space), and pasted-in brochures or sections of pamphlets. It took some time, but I eventually found the one related to the early part of our travels in mid February 2010. Initially in my journal I wrote 'Nullabor', until I learned that the term stood for 'nullus arbor' or simply 'no tree', a treeless plain. That was a 'light bulb moment', and I have spelt the word correctly ever since. For the purposes of this creative story-telling exercise to celebrate caves and karst, I wanted to reflect on crossing the Nullarbor, the visit to the two caves in south-west Western Australia, and to relate my own personal experiences, impressions and travel records. The first four sections are about that journey, followed by research on the same topics, areas, history and speleological features, that I carried out in September and October 2021.

Discovering Nullarbor karst, caves and blowholes in 2010:

I recalled reading about 'karst' – or soft, limestone rock that dissolves and slowly erodes in water – when, driving in our motorhome, we crossed the Nullarbor, a former shallow seabed which contains

the biggest karst area in Australia. We stopped at signage at the eastern end of the Nullarbor, and it looked pretty treeless, at that point – a flat, olive-green bumpy ‘carpet’ in all directions. We turned off the main highway and headed towards the Head of Bight, on the Great Australian Bight coastline. The Visitors Centre was closed, but we went for a wander outside, and it was well worth it.

I may not have been there for many years, but I can still see it in my mind’s eye, and in the dozens of photos I took at the time. We stood well back from the steep edge of the Bunda Cliffs, which mark the southern edge of our continent, and watched the pounding Southern Ocean. These awe-inspiring cliffs join the Bunda Plateau and the Nullarbor Plains, which stretch further inland. The 25 million year old limestone cliffs continue for around one hundred kilometres towards the west, and have an endless array of caves and jaw-dropping precipices varying in height from 60 to 120 metres. These were formed from the combination of erosion, cracks, continual saltwater sprays and forceful tumbling winds. This rugged and magnificent coastline is the most easterly edge of southern Australia, where the warmer temperate waters of the Leeuwin Current meet and mingle with the cooler southern waters.

We drove on that day, into the Nullarbor National Park. My memories and written travel notes indicate that I saw the plain as densely vegetated, covered with low round scrub or shrubs – probably saltbush and bluebush – and slightly larger mounds of rounded trees growing in more favourable spots. It was a memorable multi-coloured tapestry of natural green hues – olive-green, light, dark and bright green – plus bleached sandy soil. The road was very straight. And we visited one of several Bunda Cliffs lookouts for additional photographs and memories, the wind whipping into our faces.

The Caiguna Blowhole provided more learning points for these travellers. The Blowhole was formed by chemical and physical weathering processes eroding through the limestone bedrock to underground cavities, where cave heights vary between 0.5 to 1.5 metres. These caves ‘breathe’ vigorously, with air movement at one entrance measured at over 70 kph. When low and high pressure weather systems pass over the landscape, air pressure equalisation above and below ground causes these natural features to ‘breathe’. Amazing. Beneath the vast limestone plateau of the Nullarbor, there are about 20 such caves, with kilometres of spacious underground passages, underwater pathways, and even lakes. This arid and semi-arid area has the driest limestone – karst – in the world, with only 150 to 250 mm of rain annually, and faces temperatures ranging from nearly 50 degrees C at the height of summer to below freezing in winter.

The Caiguna Blowhole did not look much when we saw it, as I recall, filled in a bit with stony rubble. Not like the photos of a clear round hole entrance that I have since seen on the internet. The Nullarbor was full of surprises and beautiful in its own way, even though prior to this trip I had

imagined a very barren environment. The only wildlife we saw over two days was two wedge-tail eagles, two small kangaroos, one emu dashing off over the plain, and a few small birds flitting here and there. But we were travelling inside the motorhome, along the unbending '90 Mile Straight' – the 146 kilometres of the Eyre Highway – not out in the surprising landscape, making discoveries at ground level.

The caves of the Leeuwin-Naturaliste Ridge:

There were many overnight stops along the way into Western Australia. Fast-forward four weeks to when we arrived at the Leeuwin-Naturaliste National Park in mid March 2010. There are four tourist caves in this south-west section of the Leeuwin-Naturaliste Ridge: Jewel, Lake, Mammoth and Ngilgi Caves. We were planning a 'Caves Day' of exploration and enlightenment in two of them, aware that we were just two modern-day people travelling lightly and mindfully in Wadandi Noongar country, that has evidence of occupation dating back nearly 50,000 years. Ancestors of the Wadandi (Saltwater) people sheltered in similar caves – such as Devil's Lair and Tunnel Cave – tens of thousands of years ago. There are spiritually significant stories associated with nearby Ngilgi Cave, which we did not visit on this occasion.

Visiting Jewel Cave in 2010:

First up for us on the day was the 9.30am tour of Jewel Cave. My travel journal notes and pamphlet fragments state briefly that the 'Wind Hole' entrance was discovered by European settlers in 1908, then 1918, and explored by Tim Connolly. The entrance was 're-discovered' in January 1957 and February 1958, with mention of stately pillars and a canopy of formations, including red shawls. The cave was opened to the public near the end of 1959, after extensive work and preparations. Jewel Cave is one of the most highly decorated caves, with the longest straw stalactite reaching down 5.43 metres, and stalagmites soaring for up to 8 metres. Impressive. The easiest way for me to remember the difference between the two forms was learning that 'stalactites hang on *tight* to the cave ceiling, and stalagmites *might* eventually reach up there!'

We gazed in awe on erratically twisted and turned helectites that defy gravity, a frozen waterfall, organ pipes, club-like pendulites, draped shawls, and straws coloured by different water over the years. Spiralling tap roots from the trees above the cave were seen growing through the ceiling, in the endless search for moisture. Apparently the bones of a thylocene – Tasmanian tiger – were found here, and are now in the museum. The large skeleton of a 500 year old brush-tailed possum was also visible in the small chamber known as the Jewel Casket. My photos were not so impressive inside the cool underground cave, but that didn't stop me taking them.

After visiting Jewel Cave and before the next tour at Lake Cave, we took a break in the Interpretive Centre, and were further educated and informed about the formation and history of the local caves, and others throughout Australia and internationally.

These caves are part of the region's karst, or soluble limestone. Other types of caves can be formed from lava or glaciers. But rainwater is acidic, and soaks down to a saturated zone in the water table, causing a chemical reaction that dissolves the limestone. Hence the creation of stalactites and stalagmites. As the water table lowers, or an entrance ventilates the cave, the 'growth' of the spectacular formations ceases, and the process stops.

Visiting Lake Cave in 2010:

According to my travel journal notes, the first non-indigenous discovery of the entrance to Lake Cave was made in 1867 by Frances 'Fanny' Bussell, the sixteen year old daughter of Alfred Bussell. The huge doline – circular crater – was a bit of a surprise when she was out riding her horse, chasing wild cattle. Fortunately the horse stopped in its tracks.

Charles Conigrave returned from an exploration in November 1900 with the first exquisite images taken inside Lake Cave – more on that later. The spectacular Lake Cave is particularly famous for its sinkhole entrance and the 'Suspended Table', a magnificent crystal formation weighing several tonnes, that hovers over the mesmerising waters of the permanent underground lake. I do remember that well.

My memories, travel notes, crumpled brochures and blurry photos from ten years ago do not do full justice to the intriguing story of Jewel Cave and Lake Cave, so I embark on an internet search to catch up on missing links, facts and figures, and historical and speleological anecdotes …

Discovering more about the Leeuwin-Naturaliste Ridge in 2021:

There are more than one hundred caves along the Leeuwin-Naturaliste Ridge, which is approximately 90 kilometres long and 3 kilometres wide. The millions of years old granite rock was more recently – possibly one million years ago – covered with a limestone cap, formed when lime-rich sands from coastal sand dunes blew in with westerly winds over the coastline. It was cemented together to form limestone by the action of rainwater, and is a porous limestone, comprising crushed shell, beach sand and coral fragments, rich in calcium carbonate. This resulted in beautiful formations of crystals – such as those in the two caves I visited – when water flowed through the limestone.

Learning more about Lake Cave in 2021:

Jinni Wilson of earthseastar.com writes about the early exploration of Lake Cave in an intriguing article, 'Lake Cave and the Magic Lantern', published 12 January 2020, which provided valuable background material for this section, as well as showing two images taken from within the cave.

Back in the day when Frances Bussell and her horse stumbled on the entrance to what is now known as Lake Cave, she told her family about the discovery. But it wasn't until about thirty years later that Tim Connelly and others again found that mysterious doline – a collapsed underground cavern – and went inside. They used 15 metres of rope to climb down onto the sloping floor of the limestone hollow, and found the small narrow entrance to the actual underground cave. And so the explorations began, using hand-lamps for illumination.

Frances Brockman (nee Bussell, married to John Brockman) was advocating for the protection of such caves from vandalism in the 1880s, and was one of many locals appealing to the state government for assistance. In 1900, a Caves Board was established, and Tim Connelly became the first caretaker at Margaret River. In September that year, local government surveyor, Marmaduke Terry, in the process of documenting the caves along the Ridge, re-discovered the Lake Cave doline, and was able to inform Mrs Brockman of this.

On 22 November 1900, 18 year old photographer and museum zoologist Charles Price Conigrave was invited by Connelly to join him and William Nelson, to explore Lake Cave. Conigrave had a scientific background, and a very handy box camera to record images. The three men entered the deep doline carefully via a swaying rope ladder, traversing loose edges to the cave entrance and the rocky tunnel. Their impressions once inside the magical cavern were profound, as they took note of crystalline ledges, galleries and towering stalagmites, as well as stalactites varying from icicle-thin to massively thick. Magnesium flares were used for lighting, and the cave decorations appeared snowy white under this illumination. Conigrave took only five photographs within Lake Cave, under extremely difficult lighting conditions, but they were a spectacular record of the first exploration.

Conigrave returned to his West Australian Museum work, and published his images in newspapers. He also undertook a series of popular magic lantern slide shows for the next five years, using glass slides of his cave images for this early form of projector.

In 1901, the Lake Cave was opened to the public. It was known then as the 'Queen of the Earth', named by Tim Connolly who was so impressed by its beauty. Visitors descended via a wooden staircase for access, and walked along an earthen pathway in the middle of the cavern.

By 1905, Conigrave had given at least twenty slideshow lectures, and was instrumental in bringing general interest in and funding for the protection of the unique caves. According to

Wilson's article, it is not known what happened to these early slides, the very first images taken within Lake Cave.

For present day visitors, the doline entrance – created when the ceiling of the cavern 'fell in', creating a massive sinkhole – is approached through a sunken forest of towering, rustling karri trees (Eucalyptus diversicolor) that grow in its depths. 325 steps lead you down into the small but deep cave, with fascinating visuals throughout the entire journey. The entrance and exit are via the same point, so all the steps you descend have to be ascended as well. The good news is there are staged resting points along the flat boardwalk platforms in between steeper sections of steps.

This actively 'dripping' cave provides its own peaceful soundtrack, an indication that the stunning crystalline formations are still growing. Lake Cave is 62 metres deep – the deepest tourist cave in the South-West region – and the underground stream which formed the cavern features a tranquil lake chamber 82 metres long, with a water depth of 0.5 to 1.5 metres. Evocative reflections are available at water's edge along the way.

To avoid bumping your head or shoulders, there are places inside the cave where you need to bend a little, or turn slightly. But most of all, I remember gazing up at the immense cavernous space, admiring its intricate jewel-encrusted beauty.

'Speleothems' – from the Greek, meaning 'cave deposits'– is the correct name for the myriad of wondrous but fragile formations and decorations made from calcite, that are found in places like Lake Cave. Some of the limestone rock dissolves as rainwater seeps inside over a period of many months, resulting in a calcium carbonate solution that is subsequently redeposited as calcite. These delicate and surreal crystalline formations are extremely photogenic. The 'Suspended Table', unique to this cave, is a sheet of flowstone supported by two columns that formed when stalagmites and stalactites joined up together – the natural 'table' dangles mere centimetres above the surface of the lake. Normally the calcite solution flows down a central canal in a stalactite, but if this is blocked, it runs down the outside surface, and the stalactite grows thicker and longer. The stalagmites grow taller when calcite solution drops from the ceiling. And flowstone is created in large areas, when calcite seeps out of walls or flows down over the sloping floor of a cave.

There are many straws hanging inside Lake Cave – long and thin stalactites the diameter of a water droplet (2 to 9 mm) with a hollow centre. I recall taking numerous photographs of the beautiful shawl formations – wavy sheets of calcite, often with coloured layers – hanging from the walls and ceiling. Helectites are formed by surface tension and attraction, growing and twisting in many different directions, from a central capillary canal.

The features of Lake Cave are highlighted beautifully these days, with excellent lighting. The tour guides turn the lights on and off at times, and use torches to point out particular features, so there is no need to bring your own. Flash photography is allowed, but most people find they can take

better photos without it. No tripods or selfie sticks are permitted, in order to preserve and protect the delicate cave decorations from accidental damage, and to ensure the tours are not held up or delayed beyond the allocated time. Visitors are also asked not to bring food or drinks on tour, apart from water. The current layout of steps and stairways was completed in 1980; boardwalks are re-planked when necessary.

There have been several episodes of flooding within Lake Cave. In 1924, the doline subsided after an extensive bush fire, heavy rain, runoff and saturation, which blocked the passage of the **Or 'a'** stream. A tunnel was constructed, taking seven to eight months to build, which released the floodwaters. A flood again in 1941 cleared away in three days, due to this previous work. Lake Cave tours proceed now every day (except Christmas Day), even if it's very wet outside. And you should be comfortable regardless of the weather, because the temperature inside Lake Cave is quite constant, and only varies seasonally between 14 degrees C and 16 degrees C.

Learning more about Jewel Cave in 2021:

The largest tourist cave in Western Australia is Jewel Cave – which has three massive chambers filled with a diverse variety of exquisite natural formations – and its name derives from the small Jewel Casket chamber. The cave lies 42 metres underground, accessed by 250 steps, and the floor is 24 metres above sea level. Its many glittering decorations include a beautiful 'Frozen Waterfall' flowstone, the 'Organ Pipes' flowstone, a massive 'Karri Forest' stalagmite, cave coral, pendulites and many helectites. One of the cave decorations was dated at 466,000 years old, and a limestone sample was dated at 780,000 years old. An ancient landscape indeed.

This region of south west Western Australia was also where Thylacinus cynocephalus – the elusive Tasmanian Tiger – once roamed, before it became extinct on mainland Australia more than 3,000 years ago. Marsupials may have fallen into the cave and died here; the well-preserved skeleton of one was found in June 1960, six months after Jewel Cave was opened to the public on 26 December 1959.

I delved into the National Library of Australia's 'Trove' for this research, and came across a 1958 article in 'Walkabout' magazine by Lennox V. Bastian – *Caveman's Glory: Exploring a New Cave at Augusta, Western Australia* – which filled the gaps and told the story of the discovery and subsequent exploration of Jewel Cave.

In 1908, young William (Bill) Ellis was chasing a missing horse whilst on an outing with other people visiting Moondyne Cave, when he came across the small 'Wind Hole'. He told the others about the small depression in the ground from which leaves and twigs were blowing, but the incident was gradually forgotten. When old cave guide Tim Connolly died in 1933, no-one except Bill Ellis remembered the story. In 1955, or thereabouts, cave-lover Jack Burrows accidentally

found the same ‘Wind Hole’, and recognised the importance of this feature. Moondyne Cave guide, Cliff Spackman, was lowered 60 feet (over 18 metres) down into the depths, and reached the floor. They decided to keep the location a secret to reduce the chance of vandalism, until it was possible to return and fully explore the new cave.

Lex Bastian, then a student at the University of Western Australia, and experienced cave explorer Lloyd Robinson, returned to Augusta in the summer of 1958 with a 60 foot cave ladder. They met up with Bill Ellis, who gave directions on how to locate the mysterious ‘Wind Hole’ he had discovered around fifty years earlier. It took nearly two days of searching through dense head-high scrub before Robinson finally found the depressed entrance to the cave, where cold air came out of a black shaft.

A long cave ladder was tied securely to the base of a small karri tree, and they began the descent, initially down a smooth grey shaft. The sight that greeted them in the main cavern was incredible enough – great stalactites hanging from the domed roof, and a forest of spires, domes, and pillars. Further on were impressive red shawls, a draped canopy formation, broad areas of flowstone, and a terraced floor.

Robinson and Bastian then came across a submerged lake, which they waded through carefully, noting the marvels all around them – stalagmites reaching up from the lake bed below, a sheet of flowstone like a frozen waterfall, and a magnificent deep red curtain.

The two explorers went back above ground, to inform Bill Ellis of their discoveries. They returned some days later with Cliff Spackman – and Robinson’s inflatable boat – to continue the exploration of waterways within this beautiful new cave at Augusta, where they found a series of interconnected tunnels.

Further discoveries included ivory white, cream, red and brown shawls and curtains, pools covered in flaky calcite, and a symmetrical tunnel. In another chamber, they came across a casket of glittering crystals and – by contrast – black stalactites. They returned to the lake for further explorations in a different direction. When unable to travel further by boat, the three men continued on foot. The bent flame of a candle indicated a draught of air, meaning there was more to be explored. As the space became smaller, the men had to crawl on all fours, squeezing along towards a new lake, and trudging through deep mud, near the end.

On their way out, they came across a skeleton of a small animal, but were unable to continue in that direction as it was too steep and dangerous. Re-tracing their steps, Bastian, Robinson and Spackman, returned to the surface, well satisfied with their day’s work, but not finished with their explorations.

Additional trips and photographs revealed new discoveries, including a magnificent stalactite of unprecedented length. On the last day of their initial series of explorations, another lake was

encountered. A further cave connected to the same system was subsequently discovered on a separate trip, by digging down through a small hole from which an air draught was coming.

Lex Bastian's writes about the awe of seeing and recording the beauty during the early days of exploring this magnificent cave system, which he saw as a photographer's paradise. The three explorers believed it to be the most beautiful cave in Australia.

Lennox Vernon Bastian indeed found such beauty worth protecting all his life. Forty-five years after writing the article for 'Walkabout', he received an OAM on 26 January 2003, "for the service to speleology in Western Australia as an explorer and surveyor, and to the protection of caves."

Visitors to Jewel Cave today will not observe the deep lakes and waterways that Robinson, Bastian and Spackman discovered back in 1958, due to the declining levels of water within the cave system that occurred from the late 80s to the late 90s. The famous shimmering reflections observed in those earliest photographs – for example, of the Organ Pipes – are no longer visible.

But there is much to be appreciated and wondered at.

Step carefully underground and find out for yourself.

Additional Information on Lake Cave:

Lake Cave tours cost $22.50 for adults, $20 for Seniors, with tickets for children aged 4 to 16 years costing $11.50 each. Children under 17 must be accompanied by an adult. Tours run for one hour, and are available from 9.20am to 4.00pm daily, except Christmas Day, subject to availability. The entire Lake Cave site is open from 9am to 5pm daily, with a cave model, cafe, interpretive centre, and some attractive walks on the grounds. The viewing platform of the Lake Cave Deck – made from local timbers with glass portholes – is built suspended above the doline in the karri treetops.
Tours can be booked at www.margaretriverattractions.com, or phone (08) 9780 5911.
Caves Road and Conto Road, Forest Grove, WA, 6285

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Tours can be booked at www.margaretriverattractions.com, or phone (08) 9757 7411
Jewel Caves Road, Deepdene, WA, 6290

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