ABSTRACT

Unusual or isolated caves in Victoria: karst or pseudokarst?

SUSAN WHITE PhD OAM, Victoria Speleological Association

Caves are usually considered to be predominantly karstic features found in highly soluble host rock such as limestone. Associated solutional features, both underground and surficial are characteristic of karst landscapes. However similar features including caves are found in host rocks that not very soluble in normal surface conditions or are due to other formation processes e.g. lava caves, granite caves. These features are generally classified as pseudokarst. However the boundary between karst and pseudokarst is vague as solution occurs in a range of host rocks and the chemical conditions are highly variable.

This paper will discuss the nature, formation and processes of a number of Victorian cave and related features that are not karstic in the usual understanding of the term. They are unusual in that they are either in a host rock that is not generally known for caves, are in a number of unusual situations and are isolated compared to the caves in most karst or pseudokarst areas.

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Susan Q. White[1 2]

1 Victorian Speleological Association
2 Environmental Geoscience, Department of Ecology, Environment & Evolution. La Trobe University, Victoria 3086

Introduction

Victoria has a range of karst and pseudokarst caves and features. Most caves in Victoria are in either Palaeozoic or Cainozoic limestones or are basalt lava caves. It does not have the most spectacular caves in Australia but there is variety in the rock types that caves and related features occur in. The most common reason for this phenomenon is that caves sometimes form in host rocks that are not regarded as highly soluble e.g. granite, siliceous sandstone, silcrete, and also may be formed by processes other than solution e.g. sea caves. As well as caves in other host rocks there are some very isolated caves. Some have only one cave; others a couple or very few.

Types of unusual host rocks

The less soluble host rocks include granite and granodiorite e.g. Warburton Granodiorite (Britannia Creek Cave), siliceous sandstone e.g. Grampians, Mt Speculation area, silcrete e.g. Taylors Creek Cave, metamorphic siliceous rocks such as shale e.g. Mt Sugarloaf, and Mt

Bogong, and the Cretaceous siliceous sediments of the Otway and Strzelecki basins. There are piping processes, which form caves in dispersive clays at Smiths Gully, St Andrews to the north east of Melbourne.

The caves in very small isolated small patches of limestones include the Paleozoic 'hard' limestones at Walkerville and the softer dune limestones in isolated dunes such as Puralka and Strathdownie in western Victoria.

The volcanic caves in basalt, which are generally found in clusters, however have isolated examples such as the inner Melbourne suburb of Clifton Hill, and at Parwan and other basalt areas.

Processes of cave formation and examples

The most common cave formation process is solution and although in some of the caves such as at Walkerville and Puralka, solution is the major process, many of these unusual caves are not formed predominantly by solution. Solution is a chemical process and in many cases the hollowing out of cavities is the result of mechanical rather than chemical processes.

However solution is not exclusively solution of calcite (limestone) and solution does occur on siliceous (quartz rich) rocks. Examples of this can be found occasionally in granite caves where small speleothems composed of the clay mineral allophane in association with opal-A indicate evidence of precipitation of solutes (Webb & Finlayson 1984), However, no such speleothems have been found in Victorian granite caves and the evidence for solution as a major process is conjectural.

Removal of dispersive clays by suspension of clay particles (piping) has resulted in interesting caves at Smith's Gully near St Andrews (north east of Melbourne) and flowing water has removed weathered material from fissures resulting in Goat Cave (Mt Sugarloaf, Buxton GP-11) and probably the NE-2, the cave on Mt Bogong.

Granite caves are not rare in Victoria, and are also present in other granite outcrops around Australia (e.g. Finlayson 1981; Smith 2019). Generally they are boulder caves where significant areas of granite boulders are either the result of landslides (e.g. Britannia Creek Cave GP 10) or granite intrusions have been weathered and then eroded leaving large tors (e.g. Melville Caves NW 1). The best known and probably the best caving in granite is at Labertouche Cave (GP 7) a 710m long granite-boulder cave valley-infill cave in Gippsland, consisting essentially of intricate spaces between hundreds of large boulders. This cave has 3 or 4 'levels' as the spaces between the boulders result in 3-dimensional spaces. The Underground River (NE1) is a stream cave through a granite rock pile at Mt Buffalo. Most of these caves are where the fine weathered material has been mechanically removed, generally by water action rather than by solution.

Fissure caves are where slabs of rock have separated from a steep slope or cliff resulting in a narrow squeeze. These are often not very long and are often not documented as caves but if we are going to document all caves and cave-like features they should be included. An excellent example is Goat Cave (Mt Sugarloaf, Buxton GP-11) where the fissure does have a short dark zone and is documented by VSA.

A 'caprock' of more resistant material than the underlying rock may result in a cave forming under the caprock. The more common type results in a cave behind a waterfall e.g. the Den of Nargun (GP 5). Den of Nargun is a large overhang 10m deep, 25m wide and up to 3m high at the entrance with no real dark zone. The cave is formed in horizontal beds of red alternating sandstone and conglomerates, typical river deposits (Upper Devonian/Lower Carboniferous), mainly sandstone. The roof is a flat-lying bed of resistant sandstone, and the cave has formed by erosion of the underlying crumbly red mudstone. It contains a sandy floor and a fallen large stalagmitic mass with a couple of upright columns nearby. This calcite speleothem has been derived from carbonates in the overlying sandstone. The cave receives water during flood events on the Mitchell River so occasional extension may occur. The cave forms when

the current stream, a tributary of the Mitchell River, is actively down-cutting in a situation with its very resistant sandstone roof (Webb, 1984).

The second example of an unusual cave with a similar resistant cap rock roof is Taylor Creek Cave (NW 2) in the north-western suburbs of Melbourne. The cave is formed within relatively soft sediments of the Pliocene Red Bluff Sand, overlain by Newer Volcanics basalt and silcrete. The cave consists of a single low chamber, 12m long and 5m wide, that has been excavated in friable sandstone under a resilient silcrete roof; it has formed by an unusual combination of piping and stream erosion. Taylor Creek initially exposed the silcrete surface, and then piping below the silcrete caused tunnel formation in the sandstone. Collapse of overlying material into this tunnel captured Taylor Creek, causing it to flow beneath the silcrete and thereby enlarge the cave to its present size (Webb & Joyce, 1984). When the cave was visited recently the stream was sufficient to prevent access to the cave without getting very wet but it is often dry in the summer months.

Sea caves along the Victorian coast occur in a wide range of lithologies. In particular the Cretaceous sandstones and siltstones of the Otway and Strzelecki Groups have many sea caves. Sea caves are generally the result of mechanical weathering and erosion rather than solution and the high energy Bass Strait coast shows abundant evidence of this. However as well as the standard small sea caves, there are several larger joint enlargement caves, particularly in the Cretaceous sandstones. The most significant example is Ramsdens Cave, which has two chambers joined by a narrow passage; a total 60m in length. The entrance is concealed and almost blocked by fallen rock from the overlying slope and cliff. The cave floor is approximately 12m above sea level and is mainly concealed by large pools of water. The cave is formed as a joint enlargement and is probably the result of a higher sea-level.

As well as caves there are a large number of large and small overhangs in a wide range of lithologies, which are identified as 'caves'. Most of these are small but there are several with significant indigenous art work e.g. on the Grampians, as well as some very impressive large overhangs e.g. Mt Buangor, near Beaufort, where the overhang is at least 40m long and over 10m deep.

Conclusion

Isolated caves in a variety of lithologies occur around the state. Many have been listed above e.g. Goat Cave, but others include a cave on Mt Speculation in the Gippsland Alps, a fissure cave in granite on Mt Bogong, and a small basalt cave in the inner Melbourne suburb of Clifton Hill where the entrance is exposed in the cliff valley sides of Merri Creek. There are small patches of limestone where a small number of caves can be found e.g. Bear Gully at Walkerville where there are a few caves.

Caves can exist in almost any rock type; in most cases these are just one or 2 caves in the right geological situation for cave formation. However it is important to realize that limestone is not the only host rock, they are of interest and importance and that fun can be has exploring them. There is real merit in exploring for and documenting these features.

References

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