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A REVIEW OF NON-LIMESTONE CAVES IN NEW SOUTH WALES

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ABSTRACT

A brief description and suggested mode of formation is given for a number of non-limestone caves within N.S.W. These caves are perhaps best classified in terms of their mode of formation.

INTRODUCTION

Unlike caves formed in limestone, caves formed in non-limestone rocks usually occur singly and are often unique in their mode of formation. In this paper I wish to briefly review the different types of known non-limestone caves found in New South Wales. It is hoped to demonstrate the variety of features which can be produced in non-limestone rocks and how closely they can resemble caves produced by karst processes. The order of discussion is solely geographically from South to North in N.S.W. and does not indicate importance or priority of any kind. The numbering used is arbitrary since some caves have yet to be assigned cave numbers compatible with the A.S.F. Documentation system.

1. (WY7) Bushrangers (Clarks) Cave, Wyanbene Caves Area

This cave is more accurately described as a rockshelter situated on the side of a steep hill. It comprises a cavity approximately 8m long and up to 4m deep with a roof height increasing to approximately 3m. The cave is formed along the uncomformity separating the Devonian conglomerate from the Upper Silurian limestones below.

The initiating mechanism for the cave is not clear but enlargement seems to be occurring by weathering of the poorly sorted conglomerates forming the roof of the cave with a consequent floor composed of rounded pebbles and gravels from the conglomerate. Some enlargement may be occurring by a process of solution of the limestone by percolating groundwater.

Of historical interest is the rumour that it was a hideout used by the bush-ranging Clark brothers, who terrorised the surrounding countryside during the local goldrush at Araluen.

2. The Big Hole, near Braidwood

The Big Hole is a big angular and precipitous pit located near the top of a ridge of quartzitic Devonian sandstone and conglomerates and is much deeper than it is wide. Jennings (1966, 1967) has reported it as varying in diameter from 30-53m and of greatest depth 113m. The floor comprises an asymmetrical cone of sandstone blocks covered with a number of man-ferns. Several recent, small collapses of the walls have occurred. A fault crosses the Big Hole but does not seem to have initiated its formation. The cave is thought to represent a type example of a subjacent collapse doline (Jennings). Although no limestone is found in the cave it is expected that Silurian limestone unconformably underlies the Devonian sequence and that the cave is a result of a sudden collapse into a large cavity created phreatically in the limestone below. Although large chambers have been found in Wyanbene Cave nearby, indicating that

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the limestone could support a sufficient sized cavity, the bottom of the Hole is approximately 21m above the nearby Shoalhaven River and well below the base of the hill in which it is found, so that there is some question as to the postulated mode of formation.

3. Nangwarry Sandstone Caves, Nowra

These caves are formed in sandstone along the banks of the Shoalhaven River west of Nowra. They were first reported by Renwick (1972) and recent investigations by N.S.W.I.T.S.S. have resulted in considerable extension and consolidation into a network of rifts and chambers of total length approximately 400m (Mannell, 1973).

The caves have been formed initially by strong beds of sandstone being undermined by the river, and as the blocks break off and rotate or slip downwards, they leave cracks which form the cave. Enlargement is due to some small extent by wind scour, spallation and collapse.

At least two similar areas of caves are reported from nearby localities, Riverside to the east of Nowra and in the Kangaroo Valley to the north (P. Dykes, pers. comm.).

4. Hilltop Natural Tunnel, Hilltop

This cave comprises a tunnel in sandstone approx. 82m long, 2-4m high and 2-10m wide, of fairly regular cross-section with an almost planar roof of slightly dipping sandstone. The stream meanders across small angular rocks and sand and bedrock in its path through the cave. At the lower entrance the stream falls over a 3m waterfall under a large overhang, (Pavey, 1972a). It is not clear what initiated the cave but it seems certain that it is structural control. It has been suggested that the cave formed down a shale band between two sandstone members and that the waterfall has accentuated the down cutting which is proceeding now by the normal erosive action of the stream. The probable future history for the cave is that as the waterfall continues upstream, the cave will widen and collapse and progressively grow shorter until it ceases to exist.

Some speleothems (mainly flow stones) are observed on the northern wall, presumably indicating some carbonate content in the shale below the sandstone member comprising the roof.

A similar cave approximately 60m long occurs on Cowan Creek in Ku-ring-gai Chase (Shannon, 1963).

5. Limestone Cave, Royal National Park

This cave is in fact only a sandstone overhang similar to many thousands of others around Sydney and the Blue Mountains, but unlike them, it possesses genuine speleothem deposits. This overhang on Palona Brook is some 47m long, 14m deep and 9m high (Pavey 1972b, Nedwich, 1974) with a floor of sand and some fallen rock.

The main feature of the cave is the group of stalactites and a large stalagmite boss in the centre of the cave. They appear to have been formed from water draining through a carbonate rich layer of shale evident at the back of the overhang near the roof. The speleothems have the usual dull non-lustre associated with calcite deposits near cave entrances.

A nearby tunnel below the Palona Brook also contains speleothems. In the same area there is another cave formed from an overhang but this has collapsed and resulted in a complete dark zone within. This cave contains a number of bats (Minopterus sp) (I. Wood, pers. comm.). Some other overhangs in the Blue Mountains have been reported as developing limonite straws (Pickering, 1972).

A more complex cave is Tarrawonga Cave, Sun Valley in the Blue Mountains which may be the result of wind scour and collapse. It comprises one chamber with a rubble strewn floor (Matthew, 1974).

6. St Michael's Cave, Avalon

There are a number of large sea caves along the coast of N.S.W. and recently many of these have been documented (Middleton, 1971; Moore & Taylor, 1973; Toomer, 1973; Ellis, 1974; Stibbs, 1974a, b; Anon., 1973; Toomer & Welch, 1975).

In many caves the size and shape of the sea cave is directly controlled by a structural feature of the rock which has been enlarged by both wave (and spray) action, and mechanical action (rocks pounded against cliff by waves).

As a type example, St Michael's Cave has been selected here for brief discussion as Toomer & Welch (1975) have covered this topic more fully.

The cave is now located 21m above sea level and has an impressive entrance 4.5-9m high, 15m wide. It runs back into the cliff in almost a straight line for over 100m, gradually tapering in width and height. The floor is littered with angular sandstone blocks and consolidated sand (thousands of trampling feet!). The lowest point in the cave is still some 10m above sea level and as depth into the cliff increases, the cross-section changes from wide rectangular through triangular to small, narrow rectangular (Pavey 1972c).

Pratt (1971) considers the history of the cave to be quite complex. Basically a dolerite dyke was eroded and replaced with a poorly consolidated ferruginous sandstone, which was then eroded by the sea during a mid-recent high sea level going back approximately 50,000 years. Since that time the cave has been widened and filled by roof-collapse (giving rise to its characteristic cross-sections).

Certainly not all of the sea caves found along the coast feature such a complex history, many currently at sea level may only be in the initial stages of the process.

Sea caves are not only formed along dykes, the sea caves of the Fraser Park area (Pavey 1972d; Ellis, 1974) formed in a poorly sorted conglomerate seem to have been formed by wave action along a line of weakness such as a joint, giving rise to long narrow tunnels which have then been enlarged isotropically giving rise to almost hemispherical caverns. A more complex and less easy to explain cave is Durras Cave near Batemans Bay (Ibbotson, 1973). The cave was formerly a breeding site for *Rhinolophus megaphyllus* (Hall & Young 1975).

7. Sanchos Hole, near Campbell River

This is a deep narrow slot 25m long up to 8m wide, and between 30 and 50m deep, and partially water filled (Culberg, 1972). The rock type is Silurian phyllite (Shannon, 1963), and how the cave came to be there is somewhat of a mystery. It is well up near the top of a hill and would not be below the level of the Campbell River some 2km to the east. There is no known limestone in the immediate vicinity, so it is not likely to have been formed by subjacent collapse.

8. Endless Cave, Kincumber

The cave is formed in sandstone approx. 150m a.s.l. and 3.2km from the coast. At the entrance there is an overhang 7m wide and 4m deep, 2m high. From the back of the overhang the cave extends back to a depth of 35m. Initially the passage is smooth bedrock 1 x 1m but after 4m the floor rises until the cave is 0.5m high, with a wet earth floor. A flattener leads to a chamber 1.5m high and 3m in circumference, containing about 50 bats (*Miniopterus schreibersi* and *Rhinolophus megaphyllus*). Two small tubes lead off but are too small to explore (Culberg 1973, Mumby 1972a, b). It is unlikely that this is a sea cave and it

may possibly be formed in a similar manner to the Hilltop Natural Tunnel. Further work is needed, however, before anything definite is stated.

9. Lava Caves

Some "lava" caves have been found in the Warrumbungle National Park (James, 1967). These are "blister" caves up to 15m in diameter, low and hemispherical in shape (James, pers. comm.). They are located in the sides of the cones and lava flows. They appear to have been formed by gas bubbles in the molten lava and as the lava cools, it solidifies around these spaces leaving parts of the lava flow and volcanic cones full of holes. When erosion takes place these are exposed and can be classified as caves. Twenty to thirty entrances are recorded from the southern side of Belougery Split Rock. They do not extend far but some entrances are quite large. The other main site is on the eastern side of Mt Exmouth. The lava caves are inhabited by wallabies, goats, possums, etc.

CONCLUSION

As can be seen from these caves found in N.S.W., many different processes operating in a number of rock types can produce cavities. The task of documenting non-limestone caves has only just begun and it is clear that there is wide scope for future research in this field.

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