TASMANIAN KARST AREAS

by

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Introduction

The two most significant groups of rocks in Tasmania in which cave development has occurred are unfossiliferous dolomites presumed to be of Precambrian age (>500 million years) and the Gordon Limestone of Ordovician age (approximately 450 million years). The latter is by far the most important cave forming rock and accounts for some 90% of all known caves in Tasmania. Both Gordon Limestone and Precambrian dolomites outcrop only in the western half of the state in areas of high to very high rainfall and frequently in rugged terrain covered by dense wet forest vegetation. Further details of Tasmanian karst areas are given in Hughes (1957) and Goede (1967).

Small outcrops of Permian limestones (approximately 250 million years) occur in the eastern half of the state but do not usually contain caves with one exception – near Gray in the northeast where a few small caves are found. Finally we find that on the Bass Strait islands occur scattered outcrops of Pleistocene dune limestone (aeolianite) – a rock quite familiar to cavers from South and Western Australia where it may contain extensive cave systems. In our state only two small caves have been found in it – one each on Flinders and Cape Barren Islands. The caves are of interest chiefly because of their fauna while Ranga Cave on Flinders Island did also contain a bone deposit of considerable interest – excavated a few years ago by Dr Jeanette Hope of the Australian National University.

Precambrian dolomites

They are scattered throughout the western half of the island (Fig. 1) and for lack of evidence to the contrary are all assumed to belong to a single stratigraphic horizon. This may not be true since the structure and stratigraphy of our Precambrian rocks are very complex. The only extensive cave systems found so far in the dolomite are at Hastings. Some small caves have been found at Tim Shea near the Florentine Valley, Trowutta and Montagu. In the last few years members of the Southern Caving Society have investigated a dolomite area at Mt Ronald Cross but have been hampered by inaccessibility, bad weather and in the case of one promising swallet an excess of running water.

Mount Anne – Weld River area. An extensive area with a marked contrast between the southern portion of the outcrop which stands up as a steep-sided ridge and the northern portion – an area of subdued relief in the headwaters of the Weld River. The last area was first visited by cavers – members of the Monash Bushwalking Club – in 1969 and they reported only a few small caves. Its most interesting feature so far is a geomorphological one as some of the dolomite stands up in the form of sheer-sided "castles" or "towers" – a characteristic commonly found in the tropics but unusual in temperate climates. Although this area has far less caving potential than the Mount Anne ridge it should be investigated if only because of its interest to the geomorphologist.

At Mount Anne the dolomite outcrops on a ridge north-east of the summit for a distance of at least three miles at an altitude of between 2500 and 3200 feet. The ridge – partly overgrown with dense alpine scrub – has some very large collapse dolines and numerous smaller shafts while knife edges and pinnacles of dolomite are common (Plate 1). The few sinkholes so far investigated by the Tasmanian Caverneering Club have all proved to be blocked by talus at the bottom and this is not surprising as at this altitude a lot of frost shattering must have occurred during the cold periods of the Pleistocene. Even so there may be some shafts that will connect with horizontal cave systems at depth. From the point of view of cave development the Mount Anne ridge has a few things in its favour as the local relief of the dolomite is up to 2000 feet and also the beds are dipping very steeply so that even if numerous impure layers are present selective solution of favourable beds can produce very deep caves. The valley that separates the north-east ridge from the mountain mass to the south is at least partly excavated in dolomite but has also been heavily glaciated and the half a mile long lake it contains (Lake Timk) is probably due to glacial overdeepening rather than solution. Its shores have recently been explored and the water flowing out of the lake was found to drain underground into two swallets whose resurgence is unknown. A little further downstream another large enclosed depression marks the site of a former lake now completely drained.

Another peculiar feature of the dolomite is the coexistence of surface and underground drainage in the same area compared to areas of Gordon Limestone where – provided there is enough relief – all the water will go underground almost as soon as it reaches the limestone.

Gordon Limestone

This limestone of Ordovician age is the most important from a caving point of view and major caving areas such as Mole Creek, Junee-Florentine and Ida Bay are developed in this rock. Excluding the far south of the state the Gordon Limestone is strongly folded but at Ida Bay and Precipitous Bluff it is gently dipping with dips of less than 10° except where drag dip has occurred near major faults. Two areas will be discussed in detail.

Mole Creek. This area is representative of one where the limestone is strongly folded. Its geology has been mapped in detail and its geomorphology has been studied by Jennings (1967). The extent of the limestone is approximately five

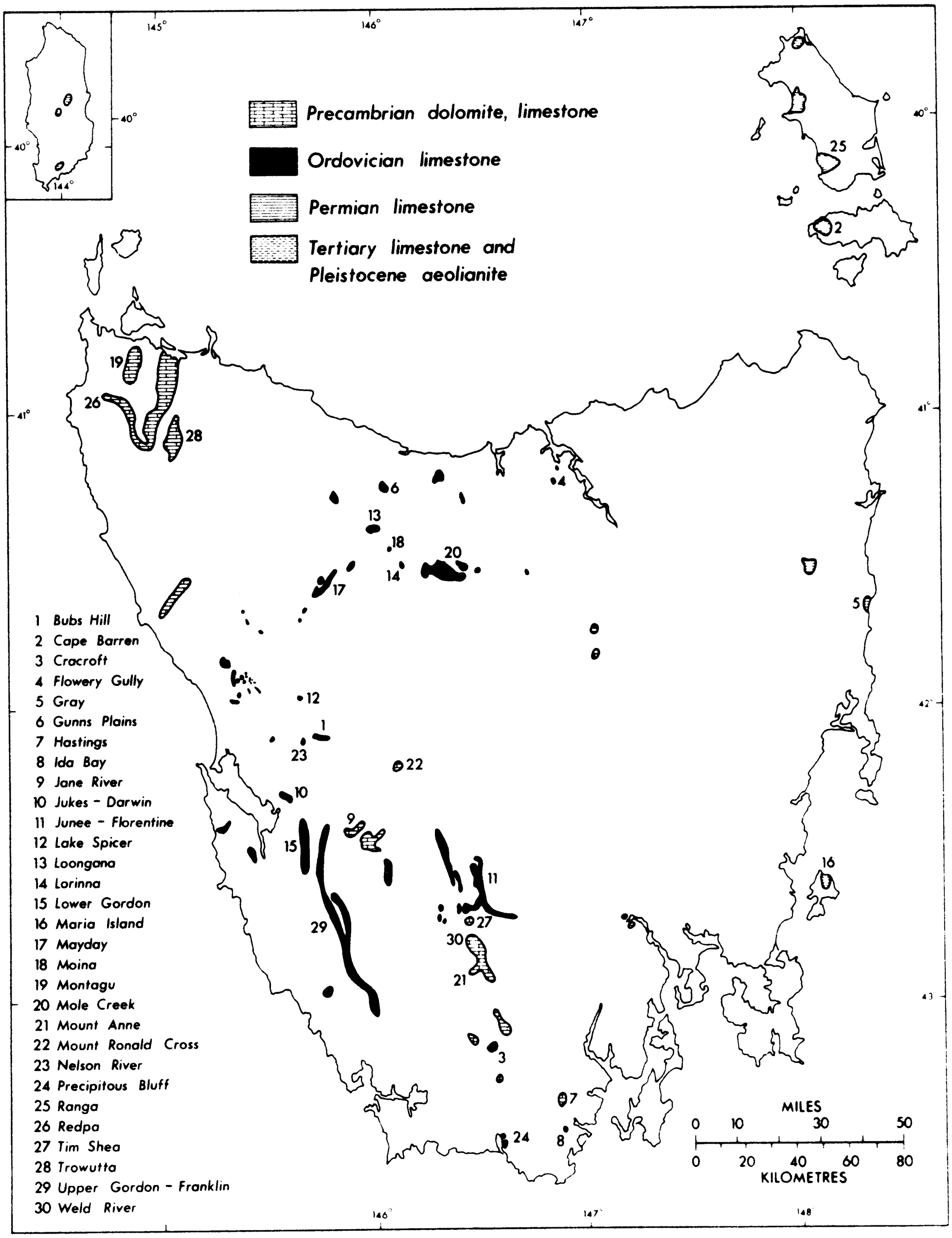

Figure 1 — Map showing distribution of karst areas in Tasmania

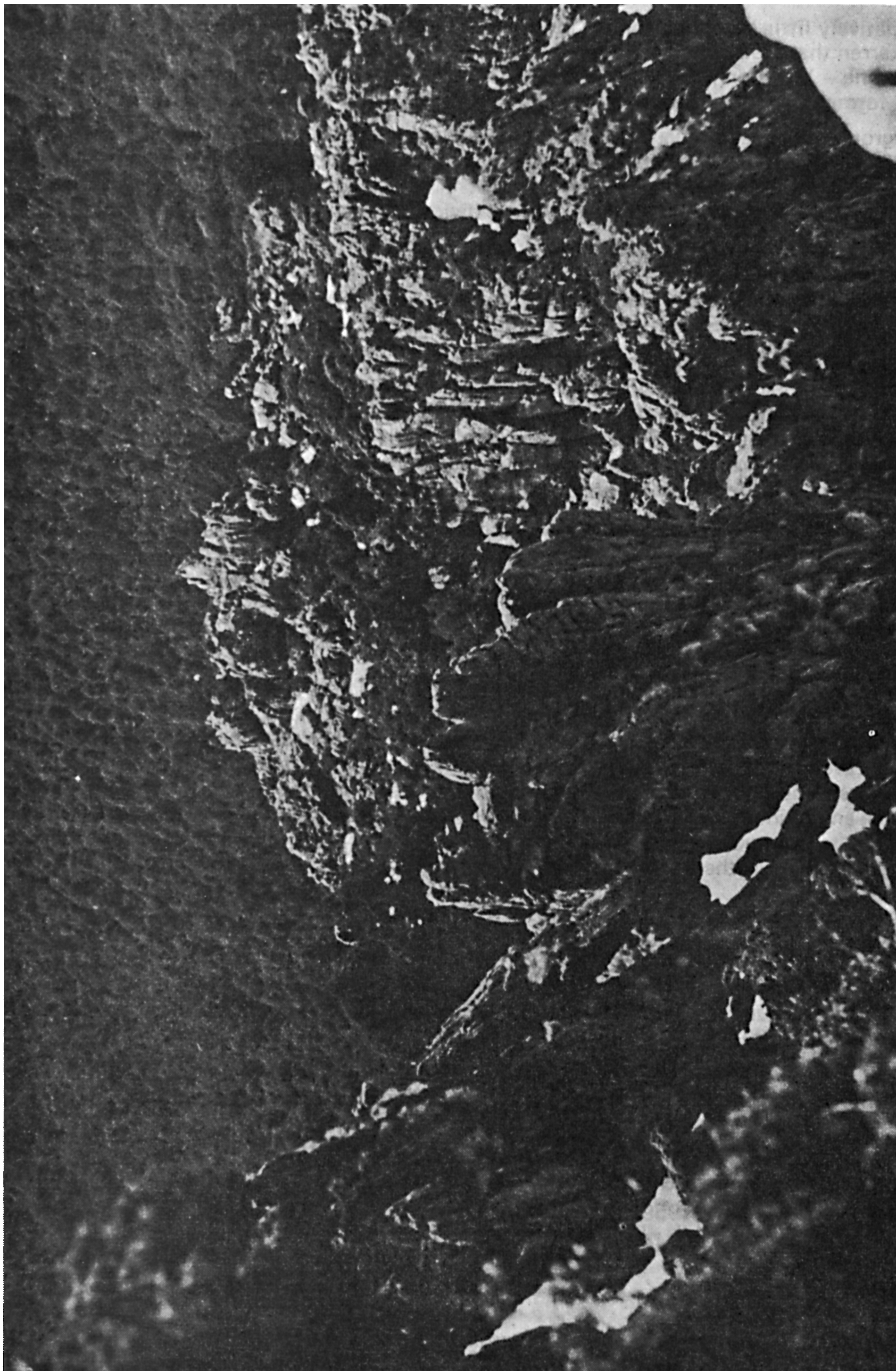

Plate 1 — View of portion of dolomite ridge north-east of Mt Anne looking east from vantage point above entrance to Kellers Cellar

by fifteen miles with this rock occupying a broad east-west trending synclinal trough. The limestone area is partially bisected by an anticlinal ridge of the underlying Moina Sandstone plunging towards the east. In comparison with most other Tasmanian karst areas the rainfall is relatively low from about 40 inches in the east to 60 in the west. Cave development is extensive and well over one hundred caves are known.

There is relatively little bare limestone at Mole Creek most of it being soil covered. The bare limestone features especially rillenkarren that are so characteristic of many areas in New South Wales – resulting from the direct impact of rain on the limestone – are poorly developed at Mole Creek. It is much more common here to get rundkarren – rounded solution grooves formed under a cover of soil or humus.

The underground drainage particularly around the headwaters of the Mole Creek is complex and water tracing has been carried out by J.N. Jennings and the Tasmanian caving clubs working under his guidance (Jennings and James, 1967; Jennings and Sweeting, 1959). The resulting pattern is very interesting and shows that at least some of the headwaters of the Mole Creek make a double crossing of the surface divide between the Mole Creek and the Lobster Rivulet.

Common features of many caves at Mole Creek are remnants of sand and gravel fills which were probably deposited during cold periods of the Pleistocene. As a result of considerable frost weathering and the supply of glacial outwash from the icecap located on the Central Plateau heavy bedloads were supplied to the headwaters of streams going underground at the foot of the Western Tiers. Cave deposits in Marakoopa Cave have been described in detail by Burns (1960).

Ida Bay. The area contrasts with Mole Creek in that the limestone is almost flat-lying while outcropping on the lower slopes of two prominent hills – Marble Hill and Lunes Sugarloaf. At the latter it is overlain at an elevation of approximately 400 feet by a sill of Jurassic dolerite. The only known cave in this hill is Loons Cave which has almost a mile of passages. A fault runs between Lunes Sugarloaf and Marble Hill and at Marble Hill the limestone outcrops at elevations of up to 950 feet where it is overlain by Permian tillites, mudstones and sandstones. Deep shafts are concentrated at or close to this contact and can sometimes be linked with horizontal cave systems at depth. Examples are Mini Martin and Midnight Hole which connect with Exit Cave and Mystery Creek Cave (Entrance Cave) respectively.

A spectacular breach of a major surface divide occurs at Marble Hill where Mystery Creek – once a tributary of the Lune River – has been captured by underground drainage (Goede, 1969). It now flows through the divide by way of Mystery Creek Cave and Exit Cave to join the D'Entrecasteaux River. In addition an anabranch of this river also goes underground and joins Mystery Creek in Exit Cave giving rise to a flooding problem in that section of the cave downstream from the junction.

Several features of Exit Cave are of interest to speleologists. There are at least two higher horizontal levels indicating early stages in the development of the system while another outstanding characteristic is the occurrence of numerous cylindrical or elliptical shafts (e.g. Devils Stovepipe) leading up towards the surface. Overseas such shafts are often referred to as avens or domepits. Gypsum is abundant in certain portions of the cave (Edies Treasure, Lost Squeeze) and appears to be associated with a thin bed of now deeply weathered shale. This bed may originally have been a pyritic shale and oxidation of pyrite may be the source of the gypsum. Gypsum crystals up to three feet long have been found and to our knowledge are unique in Australia. There is evidence that growth of gypsum crystals has locally caused considerable weathering of the limestone by flaking.

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DISCUSSION

Q *These vertical shafts – is there any particular reason why they are near the contact?*

A The contact obviously wasn't always where it is now. You would expect to find shafts further from the present contact which at one time or another carried water. The water would go underground as soon as it reached the sandstone-limestone contact and there are obviously shafts further out marking former positions of the sandstone cap but they are more difficult to locate and many have been filled in by rockfalls and debris, so that the most likely and easiest place to look is along the contact where most of the holes have been found.

Q *I noticed another cave in your earlier paper, Loons Cave in another hill. Has much work been done on that as far as a link with Exit is concerned?*

A No, it is in a different hill, Lunes Sugarloaf, which is the next hill to the east and the limestone only extends up about 400 ft and is then overlain by dolerite.

C *I noticed it was an efflux.*

A Yes.

Q *Any idea of source? What about extensions to the right hand side going into Exit? There are quite a lot of passages.*

A It's a long way from Exit. Loons Cave carries little water except after heavy rain and it's just local drainage coming off the dolerite and when you get far into the cave there are a lot of dolerite boulders which have come down through shafts in the limestone. The cave itself has about a mile of passages of fairly small dimensions. It has obviously never been a major underground drainage system.

Q *What is the cause of the difference in altitude of the limestone?*

A There is a fault between Marble Hill and Lunes Sugarloaf which downthrows limestone on the eastern side by about 500 ft.

Q *Has any work been done in this area? Has the faulting influenced any cave development?*

A There are no caves close to the fault. The geological mapping of this area is deplorable. There is one geological map available from the Mines Department and I suspect that the geologist who mapped it sat in a hut rather than go out into the field. There are very large areas shown as Permian which are in fact Gordon Limestone which is much more extensive than indicated by this map. The same applies to the Junee area which has also been very poorly mapped which is one of the reasons why some of the caves so long escaped detection.

C *Try and get the National Parks over there before the mining companies discover it is limestone and try to quarry it.*

A Which area are you most interested in protecting? Ida Bay is a problem because it is already covered, and has been for some time by leases from the Commonwealth Carbide Company. This company is in considerable financial difficulty at the moment. The Commonwealth Government has threatened to withdraw the tariff protection which it now enjoys unless it becomes a much more efficient operation, and I very much doubt whether it will be able to do so. Therefore quarrying at Ida Bay may cease in the near future. If it does I think it will be our chance to get some protection for this area. The Junee area is less of a problem because it is under control of the Australian Newsprint Mills and most of the swallets are in fact within the boundaries of the Mt Field National Park. There is no threat of damage to the caves at present.