CAVING POTENTIAL OF AUSTRALIAN AEOLIAN CALCARENITE

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Abstract

Although Australia is limited in karst areas by world standards, the extensive areas of aeolian calcarenite (dune limestone) are often ignored by cavers. This paper describes the distribution and characteristics of aeolian calcarenite karst in Australia and discusses its caving potential.

INTRODUCTION

Australia is often reported as having relatively scarce karst and cave resources (Jennings, 1965 and 1975), as shown by a comparison of maps of karst cave areas of Australia and the USA published by Jennings (1983). Attention of cavers is often focussed on better known localities which are similar to caving areas in Europe or America. Concentration by many cavers on the karst areas where the limestone is massive and well jointed and which have long, deep or vertical caves has meant that other areas of potential are ignored.

Australia has more areas of aeolian calcarenite or dune limestone than any other continent (Williams, 1978; Jennings, 1983). Jennings (1983) estimated between 50 and 100 000 km2, and this may be conservative (my unpublished observations). The Nullarbor Plain limestone, in comparison, is 200 000km2. Comparing known cave numbers, the Nullarbor limestone has about 225 known caves whereas there are about 250 aeolian calcarenite caves in SW Western Australia alone, and probably a number of 600 to 700 is a realistic total for the caves in aeolian calcarenite in Australia.

AEOLIAN CALCARENITE

Aeolian calcarenite is limestone composed of sand-sized fragments deposited by wind. It is often referred to as aeolianite or dune limestone, and can vary in its purity (that is, the amount of calcium carbonate present), often containing quite high amounts of insoluble material such as quartz. It is generally less compacted, more porous and more permeable than the well jointed, massive and compact limestones of the well known caving areas of Eastern Australia such as Tasmania or Buchan. It has few, if any joints and the water moves through the limestone along lines of primary permeability. Many of the differences in the karst forms are due to the differences in rock characteristics and many are the result of the length of time since the rock was deposited. Most aeolian calcarenites in Australia are Pleistocene in age (less than 3My BP) whereas most of the massive limestones of the karst barres of South Eastern Australia are of Palaeozoic age (older than 225My BP).

DISTRIBUTION

Many coastal areas of Australia have aeolian calcarenite deposits. As seen in Figure 1, such areas extend from Shark Bay in Western Australia to Wilsons Promontory and Flinders Island. Not all these deposits are known to have caves: some have many and others are known to have few or none. Areas known to have caves in aeolian calcarenite include:

Western Australia: Augusta, Cape Range, Eneabba, Jurien Bay, lower SW coast, Margaret River, Yallingup, Yanchep, Nullarbor.
South Australia: Eyre Peninsula, Kangaroo Island, lower SE, upper SE, Nullarbor.
Victoria: Bats Ridge, Cave Ridge, Glenelg, Kentbruk, Puralka, Strathdownie, Cave Hill, SW, Warrnambool, Cape Schank.
Tasmania: Cape Barren Island,King Island, Flinders Island.

The eastern coasts of Australia from Queensland to eastern Tasmania are characterized by quartz sand dunes (Jennings, 1967; Bird, 1967); aeolian calcarenite is found on the coasts characterized by calcareous sands - the southern and western coasts of the continent. The source of the calcareous sand is thought to be reworked Tertiary limestones now offshore (Kenley, 1971). Coral sand is of course found on the beaches of northern Queensland, but karst features have not been extensively reported.

CHARACTERISTICS OF AEOLIAN CALCARENITE KARST

The characteristic caves are shallow, linear systems with horizontal passages which have formed under ahardened cap rock or kankar layer in the dunes. Occasionally there are caves with more than one level but this is rare. Many of the caves are sinuous rather than straight and some are horizontal networks.

The cap rock is a cemented, relatively hard layer within the dune, formed as a result of the solution and re-deposition of calcium carbonate under subaerial conditions. Breakdown has been a significant aspect of most caves; many have colapse entrances and rock-pile floors. Passage and chamber shape has been extensively modified by collapse processes. The cave floors also show clastic sediments derived predominantly from the insoluble residues of the calcarenite host rock. The caves often contain a range of calcite speleothems - stalactites, stalagmites, straws, cavecoral, helictites and flowstone. Moonmilk is present in the caves in some areas. This is unusual as it is a much less common speleothem in many other karst areas than calcite flowstone deposits.

Solution pipes, roof avens and foibes are common. Karren forms are not common on the exposed limestone, but some examples, especialy of mottling, appear on areas of exposed cap rock. Exposures of the more cemented cap rock are generally restricted to the collapse cave entrances. Many of the areas show small collapse dolines as entrances to caves and some have interdune swales that have been modifies by solution.

Cave potential is, however, high. Jennings (1967, p.80) described the SW of Western Australia as having "such a great array of developed and potential 'tourist' caves". Areas in south western Victoria have a very high number and variety of caves in the aeolian calcarenite compared to the much more extensive Tertiary limestones. But cavers are lured by the conventional ideas of 'good' caving areas and often have ignored inteesting areas because the caves do not correspond to the ususal types. Most of the caves in these areas are small and horizontal but occasionally spectacular systems are found - Strongs Cave, Augusta, WA is an example.

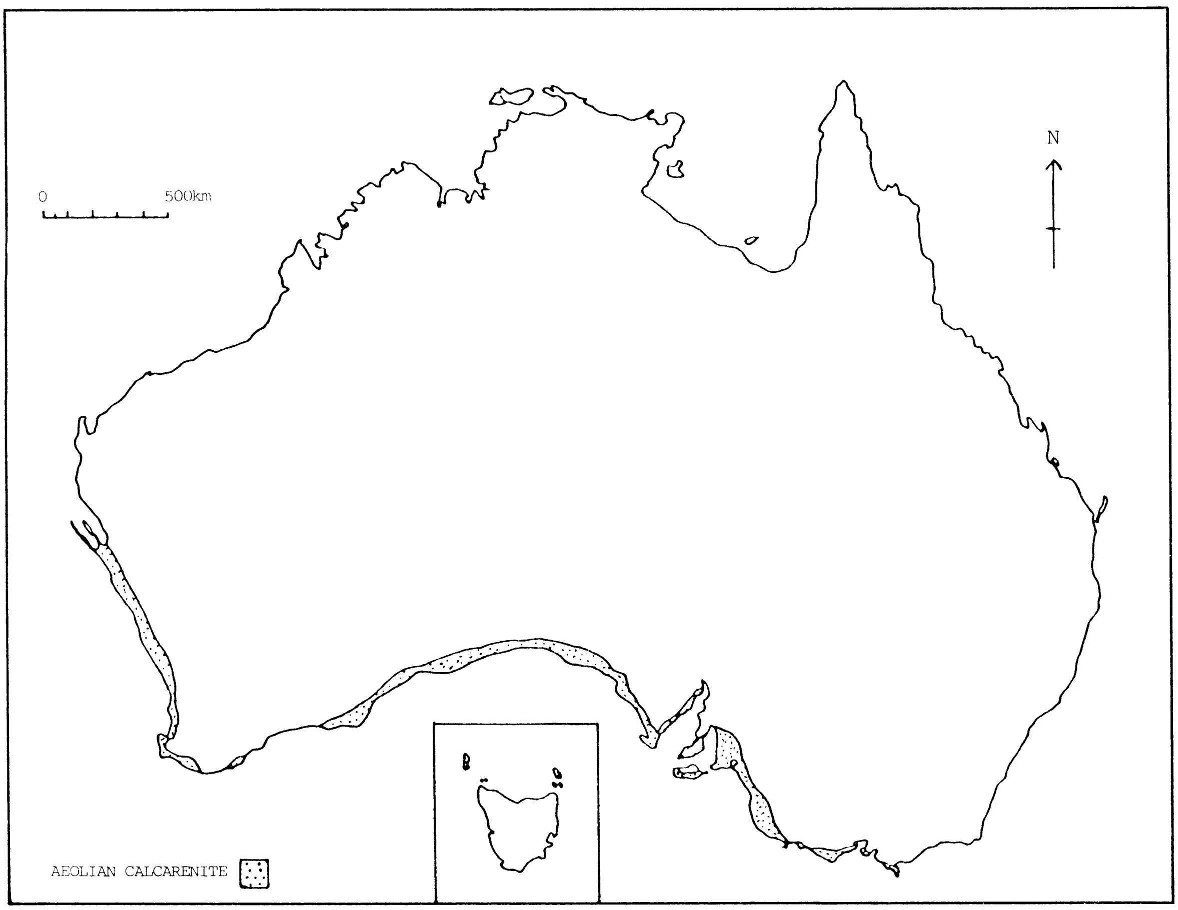

Figure 1. Distribution of aeolian calcarenite in Australia.

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WATER TUBE LEVELLING

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Abstract

Vertical relationships within predominantly horizontal cave systems have traditionally been determined by measuring vertical angles with a clinometer. However, this system can lead to large errors over long traverses. It is unsuitable for purposes such as determining relative levels in superimposed passage systems where there is no short connecting path.

The principle of levelling using a water-filled tube is well known - the water surfaces at the two ends of the tube will assume the same level when the tube is open to the atmosphere. A number of refinements to the apparatus are necessary to make the system practical for cave surveying. This paper described levelling equipment developed by the Cave Exploration Group of South Australia and reports on some practical experience gained with it in Mullamullang Cave, 6N-37.

(The full text of this paper is in Australian Caver No.109, pp 10-13.)