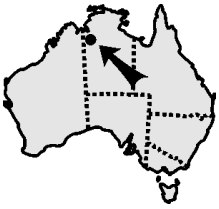
Introduction: The Judbarra / Gregory Karst

Ken G. Grimes

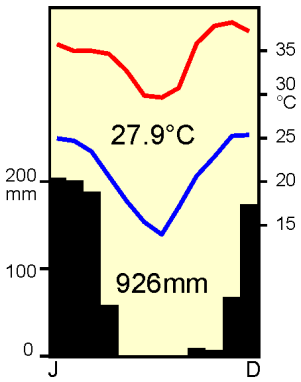


The Judbarra / Gregory Karst, lies within the Judbarra / Gregory National Park, in the Northern Territory of Australia. This area was previously known as the Gregory National Park (and Gregory Karst), but following its return to its Traditional Owners, it has been renamed Judbarra, pronounced '**jute**-brar'.

The region lies in the semi-arid monsoon tropics, with an open, savanna vegetation with some gallery forest along the major streams. Annual rainfall is 810 mm, with pronounced wet and dry seasons, and high temperatures.

The main karst belt has extensive karrenfields and shallow maze cave systems spread along a narrow outcrop of Proterozoic dolomitic limestone that is about 30 kilometres long, but generally only a few hundred metres wide.

This special issue of *Helictite* presents the results of 22 years of intensive cave exploration, mapping and scientific studies in the karst region.



Climate chart for Timber Creek, 50 km to the north of the Judbarra karst.

Monthly mean maximum & minimum temperature and monthly rainfalls are shown, with annual averages in figures.

Note the strong wet-dry seasonal contrast.

Data from Bureau of Meteorology, Australia.

History of Cave Exploration

The first paper is a summary by Bob Kershaw of the history of speleological studies in the region.

The caves and surface karst features were well known to the Traditional Owners, who incorporated them into their cultural heritage. They used the entrance areas and doubtless explored into some inner parts of the caves.

Early European cave visitation seems to have been minimal but there were brief inspections of some caves by geologists and the initial park rangers.

Systematic exploration of the caves began with the Operation Raleigh expedition in 1990. Initial exploration was by two clubs: the Top End Speleological Society (TESS), based in Darwin, and the Canberra Speleological Society (CSS); however the work soon became concentrated into a single two-week expedition each year involving members of many societies within the Australian Speleological Federation (ASF).

Exploring in the Spring Creek karst area. [A. Pryke]

A Boab tree, *Adansonia gregorii*, in open savanna woodland. [K. Grimes]

The Judbarra / Gregory Karst Research Special Interest Group was formed within the ASF in 2005 to formalise the activities of the group. The group's logo is inspired by the distinctive, deciduous Boab trees that grow above the maze cave systems.

The period has seen the progressive mapping of nearly 220 km of cave passages in the region, with the largest connected passage system being Bullita Cave at 122 km – making it the 15th longest in the world at the time of writing (http://www.caverbob.com/wlong.htm).

Introduction

Above: Karrenfield on the Mostly Harmless bluff, Spring Creek karst. [A. Pryke]
Below: Passage junction, The Frontyard, Bullita Cave system. [A. Pryke]

Karst Geology and Geomorphology

A group of three papers covers the physical karst of the region. Firstly, Grimes describes the surface karst, in particular the karrenfields and their evolution. He compares them with the tsingy of Madagascar, and the stone forests of China.

The main paper, by Martini & Grimes discusses the geology and development of the extensive maze cave systems, with particular reference to the large Bullita Cave System. The host rocks are Proterozoic, 1.6 billion years old, but the cave formation is much younger; being at shallow depth and occurring in step with the stripping and erosion of the surface karrenfield during the Quaternary. A shale bed beneath the main cave-forming unit played an important part in cave evolution; first perching the watertable close to the surface, and later being eroded to produce wide chambers which eventually collapsed to destroy both the older parts of the cave and the surface karrenfield. Near the major gorges, lower cave levels occur incised beneath the shale bed.

Although the maze caves are in carbonate rock and are continuing to form at present, Grimes describes collapse dolines in Proterozoic sandstones overlying the carbonate rocks, and linear bodies of brecciated sandstone which may be older paleokarst features.

Cave Biology

Moulds & Bannink document the invertebrate cave fauna. The numerous ceiling holes mean that most of the passages are well-ventilated and the twilight and transition zones are extensive. Humidities are commonly

Spiders on speleothems. [P. Bannink]

lower than in other tropical karsts of northern Australia, where humidity is saturated, or nearly so, within a few metres of cave entrances. However, high humidities do occur near the sumps. Numerous tree roots and pools left from the seasonal flooding provide additional habitat.

Sampling in the caves yielded 56 species, most of which did not exhibit any troglomorphisms and were found near cave entrances and in twilight zones. The highest diversity of species was from the transition zone, which forms most of the dark zone.

Seven potential troglobiontic and stygobiontic species were collected. This is a significant number, given the limited collecting, and systematic collecting will undoubtedly reveal additional species.

Survey Methods and Data Management

Kershaw discusses the procedures involved in mapping extensive and remote cave systems such as this.

Standardised data sheets are used within the cave, with a systematic numbering of survey stations and a coded classification of cross-sections. The survey data is processed with *Compass* software, which also closes the complex maze networks. The survey framework is then transferred to an *ArcGIS* system and the walls and annotations are added there. The larger caves are divided into a grid of map sheets which can be printed individually and taken back into the cave for navigation and for checking and additions.

Management and access

Entry to any of the cave systems requires a permit from the Park Management. **Beware:** the cave systems are complex and confusing mazes. Exit points are not obvious, and even experienced cavers, carrying detailed maps, can lose their way within them. The general public is advised to avoid entering the the caves.

Acknowledgements

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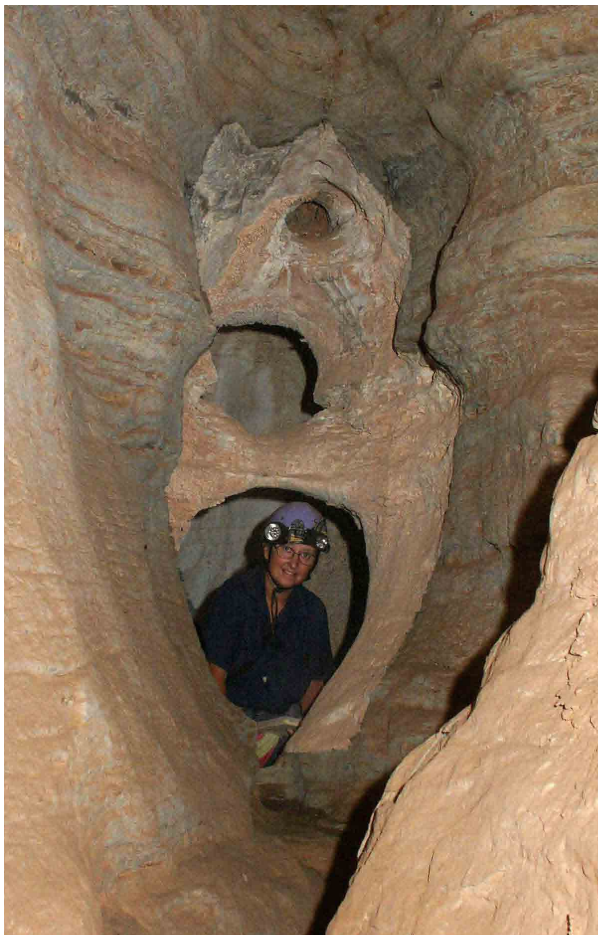
Daylight hole, Golden Arches, Bullita Cave. [A. Pryke]

Surveying in the Dingo Cave system, 1993. [G. Bannink]



Above: Phreatic sculpture, Frontyard, Bullita Cave. System. [K. Grimes]

Left: Dripstone and possible poolstone speleothems, Lost In Space Cave, Spring Creek. [A. Pryke]

Below: Shale-bed passage with tree roots, Hole-In-One Cave, Spring Creek. [A. Pryke]