

Water and Life in Caves

Understanding Subterranean Ecosystems and a Focus on the Threatened Ecological Communities in the South West of WA

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Abstract

It is well known that water plays a key role in the development of caves and karst. And, like in many other ecosystems, water is a significant contributor to life underground. Some individuals and communities are not aware that wetlands can exist underground. Often these wetlands are of great significance and require protection, conservation and appreciation. Subterranean cave and karst systems can provide natural underground wetlands and contain a number of special values. Caves and karst systems provide an environment for highly specialised fauna species. These fauna may have the following characteristics - be blind, lack pigment and have elongated antennae and legs. Many of these species are also local endemics, and may also be rare and endangered. This paper will focus on subterranean wetlands as a unique subterranean ecosystem and outline their significance and occurrence in the caves and karst of South West WA.

Subterranean ecosystems are important in the overall cave and karst system. As an interconnected system, their value is undefinable. Subterranean wetlands have not had the public profile of some other types of wetlands, and there is a need to educate and inform land owners and managers, as well as the community about the importance of these sites. This paper will provide an overview of the significant subterranean sites in South West WA.

Introduction

The South West of Western Australia is a well-known karst area. It is well known for its beautiful and fragile cave systems. However, the last 30 years have seen a steady decline in cave waters and a number of factors influence karst hydrology. Many people are not aware of the sites of significance in the Leeuwin-Naturaliste karst. This presentation and associated paper aims to raise awareness of key sites and associated issues. The Conference Theme of "Hydrology Management" and its associated tagline of "Water to Wine" inspired me, as the writer into action.

As a university student, I developed a passion for caves – meeting my husband in the local caving club, becoming a cave leader and active member of the Australian Speleological Federation. As a caver, with a strong interest in nature and the environment – I was naturally led to biospeleology and cave management. My developing interests led to further study in cave and karst management. Over the years, I have been involved in numerous advisory groups regarding caves and karst systems. This then led to my role as a Manager of significant tourist caves in the South West of WA. During this time I further deepened my interest in caves and environmental management. My husband and I led numerous speleological expeditions to karst sites, assisting researchers from the WA Museum to document subterranean fauna and cave habitats. So, over 25 years of visiting the caves of the South West, I thought it important to raise awareness of special karst sites.

Many people are familiar with the significance of caves within a karst system – as a humanly accessible natural environment with many special values. Caves and karst systems are well known for their close connection with water – indeed it is the "water" that connects with the limestone to create caves and other karst features. The limestone in "south" Western Australia is syngenetic karst – a unique limestone that has developed karst features during the development of the limestone itself. This limestone is really hardened sand dunes with different properties to older limestones in other parts of Australia and the World. This creates a unique environment with a more porous limestone that is also quite shallow. Water is a key creator for caves and also for special environments.

It is well known that caves are a significant habitat for specialised fauna, and it is often this feature of caves that leads to a caves protection. The role of water has further significance in its role as a habitat and in caves this is also significant. There are a number of tiny invertebrates that live in water, and associated habitats of tree roots and the banks of the water source. Subterranean wetlands are a unique cave ecosystem

and also recognised on an International level. Within Australia, the sites mentioned here are significant in that there are very few caves that contain water, and in this case, the sites are significant also because of the endemic fauna, which is now unfortunately not just “threatened” or “endangered” but many people believe are now “extinct”.

The Australian Government in conjunction with biologists and karst specialists had listed several significant cave and karst sites as “endangered”. These are located in the Leeuwin-Naturaliste National Park. There are 4 sites that this presentation will

discuss. Several other significant sites in WA are noted as being at Yanchep (Swan Coastal Plain, north of Perth, WA) and at Cape Range (Exmouth, WA). The Australian Government (Department of Environment and Energy) lists on its website the “Aquatic Root Mat Community in caves of the Leeuwin-Naturaliste Ridge”. The caves that contain the root mat communities occur in limestone on granitic-gneiss of the Leeuwin-Naturaliste Ridge. The caves occur within around 20km of the coastline on a Tamala (coastal) Limestone ridge that rises to 220m above sea level (Jasinska, 1997).



Figure 1: The Author examining the ground for tiny invertebrate fauna in Calgardup Cave (Photographer, Ross Anderson)

The sites in the Leeuwin-Naturaliste Ridge contain fine tree rootlets, microscopic fungi, aquatic invertebrates, cave pools and streams. The Government produced poster titled “Invertebrate Communities of Caves” outlines further information about these sites. Over the last 30 years, however, the hydrology of this area has changed significantly. When cavers visited caves in the 1950’s through to 1980’s many of these caves held significant water. A combination of factors has led to a significant decline in the water visible in these cave systems. A combination of land use impacts and climate variations are of significance. Some say the cleared

areas to the east of the local karst system are a large contributor. Others say the climate has been getting dryer, and rainfall diminishing. Others say the forest has not been burnt enough and that there are significant leaves and other vegetation on the forest floor that stops water sinking into the karst. Others say that plantations such as pine and eucalypt are stopping water getting to the karst, or taking water from the subterranean aquifer. Such is the complexity of the hydrology in karst systems.

Easter Cave

The “Aquatic Root Mat Community 1 in Caves of the Leeuwin-Naturaliste Ridge” ecological community occurs in Easter Cave and the root mats are produced by the roots of mature karri trees (*Eucalyptus diversicolor*). This cave is a significant cave, restricted in access and highly complex in its structure and hydrology. Over the last 50 years this cave has seen “huge” changes in water levels – to date there are only a few pools of water that are accessible and the status of the aquatic fauna is unknown. This cave has been well researched and its invertebrate fauna documented by a number of authors including Dr S Eberhard and Ms Stacey Chilcott.

The entrance of Easter Cave is located in a Class A Reserve 8438, Sussex Location 4174, which is vested in the Margaret River Busselton Tourism Association. The cave itself lies underneath the Cliff Spackman Reserve (Reserve 8438) that is part of the Leeuwin-Naturaliste National Park and is vested in the National Parks and Nature Conservation Authority for “Protection and Preservation of Caves and Flora and for Health and Pleasure Resort”. This cave has extensive passages and a complex hydrology all contained within the Leeuwin-Naturaliste National Park.



Figure 2: The Author looking at the evidence of water within Easter Cave (Photographer, Ross Anderson)

Strong's Cave

The “Aquatic Root Mat Community 2 in Caves of the Leeuwin-Naturaliste Ridge” ecological community occurs at Strong's Cave and the root mats are produced by karri (*Eucalyptus diversicolor*).

Strong's Cave is located in Class A Reserve 8437, which is vested in the Western Australian Museum for the purpose of “Protection and Preservation of Caves and Flora and for Pleasure Resort”.

This site is a restricted access cave – a significant stream cave with many beautiful decorations. When

the writer was first caving in the early 1990's, visitors to the cave would need to remove their boots and overalls for walking along the stream bed one would get wet up to the knees. Around 10 years later, the water in the stream was all but gone, with no aquatic fauna to be seen, only invertebrates such as isopods and amphipods active on the damp stream floors and in amongst the tree rootlets. Now, this cave is totally dry and speleologists wonder at the changes over the years.



Figure 3: The Author pointing out the granitic-gneiss protruding through the limestone within Strong's Cave (Photographer, Ross Anderson)

Kudjal Yolghah Cave

The “Aquatic Root Mat Community 3 in Caves of the Leeuwin-Naturaliste Ridge” ecological community occurs at Kudjal Yolghah cave and the root mats are produced by karri (*Eucalyptus diversicolor*) and peppermint (*Agonis flexuosa*).

Kudjal Yolghah cave is located in Class A Reserve 8434 – Leeuwin-Naturaliste National Park. The park is vested in the National Parks and Nature Conservation Authority for the purpose of “Protection and Preservation of Caves and Flora and for Health and Pleasure Resort”. This site is a restricted access cave – another significant stream cave that had some water flow during different parts of the year.

Calgardup Cave

The “Aquatic Root Mat Community 4 in Caves of the Leeuwin-Naturaliste Ridge” ecological community occurs at Calgardup cave and the root mats are produced by marri (*Eucalyptus calophylla*).

Calgardup cave is a publicly accessible “Tourist” or “Show” Cave that is located in Class A Reserve 8434 – Leeuwin-Naturaliste National Park. The park is vested in the National Parks and Nature Conservation Authority for the purpose of “Protection and Preservation of Caves and Flora and for Health and Pleasure Resort”. Calgardup Cave receives water from a sinking stream that originates in the east of the catchment – with a flow that is not constant during the year. At times of the year, the cave contains no water. The status of the aquatic invertebrate fauna is unknown.



Figure 4: The Lake in Calgardup Cave (Photographer, Ross Anderson)

Conclusion

As outlined, subterranean ecosystems are important in the overall cave and karst system. As an interconnected system, their value is undefinable. Subterranean wetlands in the South West of WA are significant and at significant threat. As such, there is a need to educate and inform land owners and

managers, as well as the community about the importance of these sites and the specialised fauna that relies on the cave and water. This presentation and paper provided an overview of the significant subterranean sites in South West WA.

Acknowledgements

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References

Jasinska, E.J.J. (1997). Aquatic root fauna in caves of southwestern Australia: origins and ecology. PhD Thesis submitted to the Zoology Department, University of Western Australia, Nedlands, Western Australia.

<http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=6>

<https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities/125-threatened-ecological-communities-posters>