KARST AND SUBTERRANEAN WETLANDS
– OPPORTUNITIES FOR RECOGNITION OF THESE ENVIRONMENTS IN AUSTRALIA

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PHOTO: ANNE WOOD

Part of the stream and root mats in WI9, WA.

ABSTRACT

The protection and conservation of the environment is an issue that has received a large amount of attention in recent years. As speleologists, we would consider that the karst environment also needs acknowledgement, recognition and protection. Some opportunities for recognition and environmental protection are found within a number of areas. The level of protection afforded by different international treaties and conventions varies. Likewise, the management of sites can allow for recognition under Australian legislation and policy. Each treaty or convention provides a different focus and a range of management tools.

There are a number of relevant international treaties and conventions. Of particular value are the Ramsar and World Heritage Conventions. There are also Australian National Heritage Lists. For example, there are new amendments to the Environment Protection and Biodiversity Conservation Act 1999. These will be briefly discussed, particularly in relation to how karst areas, or subterranean wetlands may fit into these categories.

There is often a lack of information and resources to obtain the data required. In some cases nominations and land management are made with minimal information. There is a need for more open communication between managers/planners and groups that have local knowledge. It is suggested that speleological organisations are in a position to provide useful input. Thus, Government collaboration with speleological groups is an important part of the nomination and management process.

This paper outlines the primary methods that can be utilized to recognize and protect unique environments such as karst systems. It is suggested that speleological groups and individuals with speleological knowledge and expertise consider the karst systems that they are familiar with. It would be excellent if a profile of significant karst systems and unique subterranean wetlands were to be developed. This could provide land managers and Australian Governments with a source of priority sites for listing and protection under international conventions or Australian methods.

INTRODUCTION

In October I attended the first International Workshop on Subterranean Wetlands, held in conjunction with the Limestone Coast 2004 Conference. This was held at Naracoorte in South Australia and there were many interesting papers presented. The delegates also participated in numerous field trips – looking at caves, cenotes, wetlands and other areas of karst in the region. My attendance and associated learning gave me enthusiasm and motivation to share what I discovered with other ASF members. I do not consider that I am a professional in this area, or someone with specialized expertise in this area – just a local speleologist with a passion for karst. Upon my return to Perth, I participated in a information workshop on the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the recent heritage amendments. This paper will briefly outline these and discuss the new changes. I hope that this paper presentation arouses your interest and stimulates you to take further action to benefit our Australian karst. I would like you to consider your karst area and assess how it is protected or how it can be protected through the methods that are outlined.

THE SIGNIFICANCE OF KARST ECOSYSTEMS

We know that caves and karst systems are significant. Research has shown that karst is a complex and dynamic system with connections. I like the three 'inter' words to describe karst: integrated, interactive and interrelationships. I hope that every caver is familiar with Yuan's (1988) paper that outlines the components of the karst environmental system. These being life, energy, water, gases, soils and bedrock. You would know that there are amazing 'connections' in karst systems and that water plays a special role. Williams (2004) outlined a number of lessons from science, principles that can be utilized to guide sustainable management of karst. The two that really made sense to me, particularly in relation to this paper, were about the importance of the epikarst (in controlling autogenic recharge) and how conventional groundwater models do not apply to karst (karst having 'triple porosity'). I have seen that karst is a vulnerable ecosystem – where both the 'water' and the 'rock' are considered a significant resource to humans.

So we know that karst environments, or karst systems, are special ecosystems – ones that also contain aquifers, cave ecosystems, aquatic ecosystems and groundwater dependent ecosystems. You will have seen that karst ecosystems contain both biodiversity and geodiversity. Yet water is a part of this relationship too. Indeed, *"water is the engine that drives karst processes in the karst environment, like blood in the body"* (undetermined source). Research has shown that groundwater divides and catchment boundaries in karst may not coincide with surface divides. So if we think again of connections in karst – where do surface wetlands and subsurface wetlands begin and end?

WETLANDS AND SUBTERRANEAN WETLANDS

I will not define 'What is a wetland?'. This has been documented by several authors (Worboys et al 2003, EDO 2001). I would like you to think of your definition. Then, visualize a wetland you are familiar with. Does it include water? Perhaps it is a lake, a swamp or a creek. Does it have fauna? What do the fauna depend on? Is it a significant wetland? How is it protected? Is it protected?

Now, think about the caves that you have visited. Think of a subterranean wetland. What do you see? How much water is there? Is the water always there? What are the characteristics of this place? Where is the cave life? What would affect the values of that area? Is it important? Is it protected? How can it be protected? Do you know?

Protecting karst is not just about preserving natural features that are beautiful or that have scientific value. The environmental implications in karst areas are comprehensive. In fact, real management of karst is an essential component of water resource management. Another document that I hope that all cavers are familiar with is the *IUCN Guidelines for cave and karst protection* (Watson et al 1997). Guideline 21 states that *"the establishment of protected areas is not, in itself, enough to ensure karst protection"* (1997:16) and that *"more than in any other landscape, a total catchment management regime must be adopted in karst areas"* (1997:20). You may be familiar with the term integrated management or integrated catchment management. As cavers and speleologists, we need to keep in mind that this is what's required for management of karst systems.

The key themes of this paper include: wetlands, karst and a combination of the two. Specifically we are discussing subterranean wetlands. Now that we have conceptualized them, the second part of this paper is about recognizing these environments as being significant and examining ways in which these environments can be protected.

INTERNATIONAL PROTECTION

First, let us look at the wetlands. Do you know how wetlands in your state, or more broadly, in Australia are protected? There is a range of policy and legislation regarding wetland protection (Anderson in press this volume). At an international level there are two related instruments:

(1) The Convention on Wetlands (Ramsar Convention 1971).

(2) The Convention for the Protection of the World's Cultural and Natural Heritage (World Heritage Convention 1972).

I encourage you to have a look at sites recognized by the World Heritage List and also the Ramsar Convention. Consider what karst systems are represented by these International Lists. And consider whether that site was nominated for the karst values or its other environmental values. I was certainly surprised! Particularly examine the Australian sites and note the lack of recognition of our unique karst environments. Hamilton-Smith is currently undertaking a review of these sites and would like further involvement of local speleologists in this process.

THE RAMSAR CONVENTION

The Convention on conservation and sustainability of wetlands was agreed in 1971 at a meeting in the Iranian town of Ramsar, and has since become generally known as the Ramsar Convention. It has worked to further the conservation and effective management of wetlands ever since.

The Ramsar Convention in particular is significant in that it was the first International Convention promoting sustainable development. This is referred to as the 'wise use' of wetlands (Phillips 1998). The broad aim of the Ramsar Convention is to *"halt the worldwide loss of wetlands and to conserve those that remain through wise use and management"*. (Phillips 1998). Are you aware that Australia was one of the first nations to become a 'contracting party' to the Ramsar Convention? Australia was

PHOTO: ROSS ANDERSON

Tim Moulds searching for fauna in the subterranean wetlands of a significant karst system at Cape Range, WA.

also the first nation to nominate a wetland to the Convention in May 1974 (Giblett and Webb 1996). As a contracting party, Australia has committed to protect wetlands, establish wetlands conservation in land use planning and to regularly report on national activity in relation to wetland conservation and management. Australia's National Wetland Policy was released in draft form at the 1996 Ramsar Convention (and later adopted in 1997). The 1996 Ramsar Convention is particularly significant for another reason.

Are you aware that the sixth International Conference of contracting parties to the Convention on Wetlands was held in Queensland in 1996? It recognized karst and acknowledged the significance of subterranean wetlands. It was decided that a special program should be set up to examine and advise upon the issues relating to karst and other subterranean wetlands. A small working group met in Slovenia in 1998 and prepared a series of recommendations for implementation of the subterranean wetlands program. These were accepted; the formal recognition of subterranean wetlands of international importance has since proceeded. In 1999, these specific guidelines were released.

The parties agreed to include subterranean karst wetlands as a specific wetland type under the Ramsar Wetland Classification System. It was recognized that some cave and karst systems are natural underground wetlands. These areas constitute a resource of ecological, scientific, cultural , aesthetic and recreational values. These karst wetlands also provide an environment that is habitat for specialized vertebrate and invertebrate species.

Cavers are aware (and the research supports this) that the subterranean environments form unique ecosystems. They provide habitat for a range of animals that are highly dependent on a specialized ecosystem and adapted to living underground.

Many of these special subterranean creatures are endemic species that are restricted to a single cave or karst area. As such, these special fauna may also be considered to be rare or endangered species (and can have some form of legislative protection).

There is currently one Australian karst site that is internationally listed as a Ramsar (subterranean) site – the internationally important karst systems of 'the Dales' at Christmas Island. I'm sure that you could think of the caves that you have seen that have subterranean wetlands. The Limestone Coast 2004 Conference (referred to in the introduction) discussed the importance of sites in South Australia such as Ewen Ponds, Piccaninnie Ponds and a number of significant cenotes.

You can find the specific criteria at www.ramsar.org. The Department of Environment and Heritage (DEH) has produced a 'subterranean wetlands' information sheet (DEH 2004). This information sheet outlines other highly significant subterranean wetlands as occurring in:

- Cape Range and Barrow Island – WA
- Calcrete aquifers of inland, central arid zone of WA and NT
- Limestone Coast – SA
- Wellington Caves - NSW
- Wombeyan Karst - NSW
- Ida Bay Karst – Tas
- Mole Creek Karst – Tas
- Junee-Florentine Karst – Tas

I would like to mention some specific sites in WA that need consideration and that I consider would fit the criteria for significant karst 'subterranean' wetlands.

(1) The Nullarbor karst system.

Specific sites include significant karst features on the Roe Plain (recent finds indicate further significant subterranean wetlands) and caves such as 6N46 and 6N2 with its microbial mantles.

(2) Cape Range.

The karst plain to the West of Cape Range has considerable subterranean biodiversity, particularly C215 and the Bundera Cenote. However the Canals and biodiversity of subterranean fauna in C163 are also significant. The blind cave gudgeon (*Milyeringa veritas*) and the blind cave eel (*Ophisternon candidum*) are protected as threatened species. These are Australia's only troglobitic (stygobitic) vertebrates.

(3)The Swan Coastal Plain.

At Yanchep and at Augusta-Margaret River, particularly the Leeuwin Naturaliste Area – between Augusta and Yallingup there are caves with streams such as WI63, WI49 and WI51 that contain significant subterranean wetlands. Other caves such as WI9 and AU14 are also significant. Some of these particular sites are protected as a 'threatened ecological community' under the EPBC Act. They contain aquatic root mat communities (No: 1,2,3,4), invertebrates and the communities are listed as 'critically endangered'.

(4) Kimberley region.

In the West Kimberley there are some caves that contain small streams and pools of water. In KN 109 and KN66 there are pools that are associated with roots, root mats and mud banks, which support a diversity of fauna. Caves such as KN1 have permanent pools of water that contain subterranean fauna. These areas need further research to determine their significance.

(5) Karst region north of Perth.

SH 21 is an example of a significant karst environmental system containing wetlands. Subterranean fauna are still being collected from this cave.

THE WORLD HERITAGE CONVENTION

The UNESCO (United Nations Educational, Scientific, and Cultural Organisation) is about protecting areas of outstanding universal value. The Convention for the Protec-

PHOTO: JAY ANDERSON

An example of a surface wetland, the Ramsar wetland of Bool Lagoon in SA.

tion of the World's Cultural and Natural Heritage is defined to be balanced, representative and credible. Thus, Natural Heritage and Cultural Heritage are recognized through this mechanism. For a site to be declared a World Heritage Site, the State Government needs to recommend this to the Australian Government. There are several karst sites in Australia which have been listed. However, they may not necessarily be recognized for their karst values. You may be aware that the WA Government is in the process of preparing a nomination regarding the Cape Range karst area (including the Ningaloo Reef). You can find out more information from www.whc.unesco.org

AUSTRALIAN LEGISLATION

There are a number of policy documents that relate to aspects of karst systems and their protection. Each state may have particularly relevant legislation – for example, protection for listed Threatened Species. However, In particular, there is protection at a National Level that is contained within the EPBC Act. This is the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*. It is a statutory mechanism that provides protection in matters of National environmental significance. Thus, important subterranean wetlands can be protected through this mechanism.

The main categories are significant and you need to be aware that "Matters of National Environmental Significance" are defined in a certain way. This includes:

(1) Declared World Heritage Properties and values.

There are about 788 World Heritage listed properties (611 cultural, 184 natural and 23 mixed). Australia has 16 sites. Of these there are several that contain karst. Hamilton-Smith (Wong et al. 2001) stated that the Mulu 2001 Asia Pacific Forum on Karst Ecosystems and the World Heritage "*made recommendations about karst systems that are of outstanding universal value."* Are you familiar with this document?

(2) The ecological character of declared Ramsar wetlands.

As discussed earlier, karst systems may have recognition for their (surface) wetlands systems. With the implementation of the "subterranean wetland" classification, the subsurface karst wetlands can also be declared Ramsar Wetlands. There are about 1400 sites on the Ramsar List of Wetlands of International importance.

(3) Listed Threatened Species and Threatened Ecological Communities.

There are several categories that are considered matters of national environmental significance. The EPBC Act has a register of critical habitat and this includes the Threatened Species and Threatened Ecological Communities.

MATTERS TO CONSIDER:

(1) The EPBC Act is administered by the DEH and it can only protect sites if they are already acknowledged – ie World heritage, National Heritage, Ramsar wetlands, Migratory Species and EPBC Act List (listed threatened species and threatened ecological communities).

(2) If something is on a 'State' list, ie the WA threatened species list, then that is not protected under the EPBC Act. You need to remember that the State List is different to the Commonwealth List.

(3) Find out what karst systems are on Commonwealth land – they are protected under the EPBC Act.

(4) The EPBC Act has 'heritage amendments'. Now there is a Commonwealth Heritage List (CHL) and a National Heritage List (NHL). You may be familiar with the Register of the National Estate (RNE). This is different from the CHL and NHL. The RNE was administered through the Australian Heritage Commission that has become the Australian Heritage Council.

(5) Look at the RNE sites listed, as an individual can nominate to the National Heritage List – the Commonwealth Government only transferred across sites on its own land.

There is an assessment and approvals regime in relation to the EPBC Act. In particular, Part 3 of the Act is in relation to the actions that will affect either Commonwealth land or matters of environmental significance (as defined earlier). It is important that speleological groups are familiar with this legislation and regularly look at the 'invitations for public comment' section on the DEH website (each case is open for ten days comment only).

The protected matters search tool is at deh.gov.au/erin/ert/epbc/index.html. The important point to note is that community groups can suggest conditions for the DEH to include in a 'manner specified' when the Government is making an assessment decision. The 'Register of the National Estate' is managed by the Australian Heritage Council. It used to be the Australian Heritage Commission (1976-2003). There are 13,000 sites of natural, cultural and historic significance.

National Heritage

Are you aware that a new National Heritage System started on the first of January, 2004? The following information is taken from the DEH fact sheets and the workshop by the World Wide Fund for Nature (WWF) (Kennedy 2004, pers. comm). The criteria for NHL are different from those of the RNE. There is no protection for places on the RNE unless the site is on Commonwealth land. Sites on Commonwealth land were automatically transferred to the NHL by the Australian Government. It is important that you are aware that a site needs to be on the NHL to be considered of outstanding heritage value.

Individuals can nominate to the NHL. The site's tenure is not a significant factor. There are criteria for natural, historic or indigenous places that are of 'outstanding heritage value'. They are sites that the community considers as being of outstanding significance.

Commonwealth Heritage

The Commonwealth Heritage List includes sites of *'significant heritage value'* that are leased or owned by the Aus-

tralian Government. A management plan is required for the sitebefore it can be listed. I am advised that it can be stated that a site meets the criteria, however further funding may be needed to undertake further research to obtain the *evidence*. There is funding for this process under the *Distinctly Australian program* for the purpose of *identifying, managing, promoting and conserving* places of significant heritage value.

If you would like more information there is a website and a number of fact sheets are provided by DEH. www.deh.gov.au

OTHER ASPECTS TO CONSIDER

I have found that in many circumstances, sites are acknowledged and protected for their biodiversity, but their geodiversity may get overlooked. In relation to karst systems of particular significance is that the NHL criteria allow for sites to be protected for geological reasons, as part of *natural history*. Thus geoconservation of karst can be included as a reason that a karst area has outstanding heritage value.

The final day of the Limestone Coast Conference (held at Naracoorte 2004) was a special workshop on Ramsar and Australian Subterranean wetlands. It was decided that principles needed to be developed regarding components of subterranean wetlands. Participants discussed the need for nominations of Australian karst systems to the Ramsar Convention.

The process for nomination is understood to be similar to that of the World Heritage Nomination, in that, the land manager needs to nominate an area. The State Government would also need to agree to the nomination. This would then have to be accepted by the Commonwealth Government who then notify the Ramsar Secretariat. The process itself has conditions, such as the need for consultation with the community and the existence of a management plan.

The aim in presenting this paper is to raise the awareness of ASF members to this new category of the Ramsar Convention and the EPBC Act Amendments. It is hoped that local speleologists and speleological groups could liaise with land managers, ASF and ACKMA to identify Australian sites of significance in karst systems. Generally there is a lack of information regarding karst areas. In many cases, information held by Government or land managers may not be full and complete. Some information about a karst area may be found in the local community (such as speleological groups) or it may not yet be in existence.

It is important that decision makers have access to all information about lands under their power/control/management. It is hoped that this will lead to better land management and protection of caves and karst systems. This is an ideal opportunity for speleologists to raise the awareness of the unique nature of karst systems and the particular significance of a local karst area with the local land manager and the state government. The management authorities (be it private landowner or government department) can utilize speleological knowledge, experience and expertise in best practice land management. It would be excellent to see more open communication and consultation regarding Australia's environment, particularly karst areas.

I would like you to think about what knowledge, and information you (and your speleological group) have about a particular karst area. You could consider appropriate ways of sharing that information with land management agencies to enable future protection of our cave and karst systems. We need to consider what we know, what we think is significant and document the significant karst values and aspects of a particular area. Those present at the Limestone Coast Conference subterranean workshop are interested in compiling an Australian list of significant karst systems. When there is a profile of potential sites and systems then a plan can be made to implement what is required for formal acknowledgement of karst systems.

PHOTO: ROSS ANDERSON

Some of the root material in a chamber in WI9, WA.

CONCLUSIONS

This paper aims to increase your knowledge on the importance of subterranean wetlands in karst systems. A number of methods and processes are outlined to assist in the recognition and protection of these unique environments. Think about what karst sites you consider to be significant and why. When you get home from this conference, please go and look at the websites that I have referred to. Think about your local karst area and caves sites that you are familiar with. Can you document the karst values of your local subterranean wetlands so that their importance is acknowledged and perhaps protected? Perhaps you could organize or facilitate an event in your local area to raise the awareness of the local community to karst and subterranean wetlands. Perhaps you could organize a display or seminar or information night for one of these events:

- World Wetlands Day – February 2
- National Threatened Species Day – September 7
- Science Week – August 13 to 21, 2005

One author stated that *"underground aquatic ecosystems and their novel fauna… should be given the highest level of protection"* (Hose 2004: 23). What are you doing to assist in protecting the ecosystems that are our karst systems? I heard a statement that *"caves are the books in the library of the history of the earth"*. As cavers we regularly visit a large number of these special libraries. We know where the books are and we often have documented in great detail the contents of each book.

However, in many cases the librarian does not know that a particular book exists or even how many books are on a bookshelf. The librarian may never have seen the book that we are so familiar with. They may not know the book's value or the important information that it contains. So let us go and talk to the librarian to make sure that these books do not get lost and that their value is protected for future generations. ■

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LIST OF RELEVANT WEB SITES

www.ramsar.org
www.whc.unesco.org
www.wwf.org.au/epbc
www.deh.gov.au/water/wetlands
www.ahc.gov.au/register/index.htmlS