HYDROBIOLOGICAL MANAGEMENT STUDY OF LEEUWIN NATURALISTE CAVES AND KARST SYSTEMS

- Robyn McBeath

The Augusta Margaret River Tourism Association has undertaken an integrated Hydrobiological Management Study, which will investigate key hydrological and biological issues concerning the cave and karst resources on its tenure, and within connected catchment areas of the Leeuwin Naturaliste Ridge. The study will involve cooperative liaison with other stakeholders (e.g. CALM, Shire Councils, Water and Rivers Commission, Water Authority, private landholders, speleological groups and other cave users), ensuring sustainable management practices and the development of public education and interpretation. Stefan Eberhard has been appointed Research Officer for this three year project commencing 1st July 1999.

INTRODUCTION

There are a number of important issues confronting the management of caves and karst on the Leeuwin Naturaliste Ridge. The most crucial issues concern the continuing decline in cave water levels over the past 30 years, with the potential to affect karst system processes and the future viability of Lake Cave, Mammoth Cave, Jewel Cave and other caves as tourist attractions. As a result of the declining water levels the survival of unique communities of aquatic fauna is threatened – the communities in Easter Cave and other caves have recently been listed as 'Critically Endangered' by CALM.

Other management issues concern land use practices (e.g. land clearance, farming, viticulture, water abstraction, subdivision and resulting developments) within the cave catchments, which may be impacting upon the karst systems. In addition, there are direct impacts to the caves caused by infrastructure developments and human visitation by tourists and recreational cave-users. There is a need for improved visitor management, public education, interpretation, and community involvement in protecting the karst resources.

Resolving the hydrological and biological management issues is a long term project that will require detailed research and monitoring in order to develop effective strategies for sustainable management. This is because of:

- The paucity of existing baseline data;
- The need to monitor over a number of years to establish baseline variation and trends;
- The complexity of the karst system;
- The significance and scale of the issues, requiring integration of hydrology and biology with land management practices, management of visitors and interpretation.

SUMMARY OF MANAGEMENT ISSUES

- Documented decline in water levels over past 30 years – natural cycle or human induced (e.g. over pumping of groundwater)? Sustainable or not sustainable?
- Land use practices (water pumping, dam construction, land clearance, farming, viticulture, subdivision and developments) in the karst catchments which may be impacting upon karst system processes.
- Endangered aquatic fauna communities; terrestrial cave fauna.
- Visitor impacts, including tourists and other cave user groups. Potential impacts to sensitive cave values, including fauna (bats and invertebrates), vegetation (tree roots, and entrance/twilight zone flora), geological and geomorphic features (speleogens, speleothems, sediments), archaeological, palaeontological values.
- Public education, community involvement and interpretation.

SCOPE OF THE STUDY

The Leeuwin Naturaliste karst covers a large land area extending from Cape Naturaliste to Cape Leeuwin. There are more than 300 cave and karst features documented within this region, which encompasses a number of discrete catchment areas. The cave and karst catchment areas occur within a variety of land tenure and land usage contexts. Because of constraints in budget and resources the scope of the study will be focused primarily on the karst systems connected with, and adjoining, the caves situated on AMRTA tenure. The study will take a systemic catchment-based approach, which will involve consideration of adjoining caves, karst systems and catchment areas. The study will investigate other karst systems on the ridge as necessary, to place results within the broader context.

Focussing the research efforts on these few systems will result in a greater understanding of the processes involved which can then be more widely applied to other areas on the Leeuwin Naturaliste Ridge. Specialized input may need to be contracted on a short-term basis if the need arises (e.g. speleothem dating, geological mapping, water quality analysis, hydrological modeling, taxonomy, genetic analysis). Involvement and assistance will be sought from other interested parties and stakeholders (e.g. CALM, Water and Rivers Commission, Water Authority, speleological groups).

Outcomes

- Characterization and conceptual modeling of hydrologic processes and functioning of AMRTA caves and related karst systems;
- Facilitate recovery of endangered fauna communities; management of terrestrial fauna;
- Integrated hydrobiological management plan for AMRTA cave and karst systems;
- Assessment of other cave and karst resource values, classification and management prescriptions;
- Public Interpretation.

Benefits

- Improved understanding of karst hydrologic and ecosystem processes, which will have wider relevance and applicability to the Leeuwin Naturaliste Ridge.
- Improved protection and sustainable management of cave and karst resources.
- Improved interpretation, public education and community involvement.
- Improved relationships with other stakeholders, including CALM and cave-user groups.
- Involvement and support of external research and academic institutions to ensure scientifically robust and validated methods.

BACKGROUND TO THE STUDY

Hydrology

Over the past 30 years there has been a continuing decline in cave water levels. The decline has been well documented in speleological literature – water levels in Easter Cave have dropped more than 2 metres whilst pools and streams in other caves have completely dried up (e.g. Labyrinth Cave).

Over the same period the Leeuwin Naturaliste Ridge and catchment areas has seen increased human population, and development of intensive agricultural practices (e.g. viticulture) which has placed increased demand on water resources. It has been suggested that the human utilization of the water resources in the karst catchment areas may be responsible for the lowering of water levels in the caves. There is other evidence to suggest that the low water levels may be related to natural, long-term climatic changes as suggested by drowned speleothems and degree of corrosion to previously drowned speleothems.

To sustainably manage the water resources and maintain the karst hydrologic processes it is crucial to establish the relative impact, if any, of human utilization and modification to the hydrology in the karst catchment areas. The proposed study will address this question as well as examining the evidence for natural cyclical changes.

Biology

Previous studies of terrestrial cave invertebrates have been limited. No studies of the impacts of cave visitors on terrestrial invertebrates, bats, or sensitive habitats have been undertaken. Given the high levels of cave visitation and sensitivity of cave fauna and habitats to disturbance, there is clearly a need for management oriented studies to be undertaken.

Edyta Jasinska (University of WA) has studied the aquatic fauna associated with root mats in caves. She found that the survival of the communities was threatened by the lowering water levels. The communities in the caves including Easter Cave, were listed as 'Critically Endangered' and a recovery plan was prepared by CALM. Edyta's research and the recovery plan clearly indicate that further research and monitoring is required to safeguard the communities. One of the objectives of the AMRTA study will be to facilitate this process, and to build further on the original research.

The hydrological component of the proposed study will significantly enhance management and recovery planning for the endangered communities. Further research is required to determine the origins, evolutionary relationships and ecological requirements of both the aquatic and terrestrial fauna.