POSTER ABSTRACTS

Underwater Rafting

Geoff Schurr

Norwest Adventures Ltd Underworld Rafting is a "Cave Tubing Adventure" which takes place in the large Metro Cave on the West Coast of the South Island of New Zealand. Visitors are dressed in wet suits and caving helmet for our activities, which combines a short walk amongst the luxurious rain forest of the Nile River Valley, with a walk through the dry upper levels of the Metro cave in the Paparoa National Park. There is a spectacular float through the wet glowworm grottos and a fun filled tube down the Nile River outside the cave to complete the experience. Norwest Adventures Ltd. is a small privately owned company which has five full-time and up to twelve part time staff. The principals of the company are, Geoff Schurr and Ray Moroney. Website: http://www.caverafting.com

Karstic groundwater ecosystems in the Murray Darling and Otway Groundwater Basins

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Small, impounded, karstic aquifers are found widely on the western fall of the Eastern Highlands. Many of the aquifers support highly significant, but little studied, invertebrate faunas. Little is known about ecosystems in the Murray Group limestones underlying the Late Miocene to Quaternary sediments in the lower parts of the Basin. Based on geological considerations, the Otway Groundwater Basin is part of the Murray Darling Groundwater Basin. In the Otway Basin, around Mount Gambier and to the southern coast, there are very many groundwater dependent ecosystems evident. This poster discusses aquatic karst ecosystems within the impounded karsts of the NSW portion of the Murray Darling Basin and the major karst province of the Otway Basin. The poster also briefly discusses the presence of hyporheic systems. Some potential threats to these ecosystems are identified and some potential research directions are canvassed.

Invertebrates in the Caves of New South Wales: A baseline for future conservation directions.

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Cave communities have been lost in New South Wales, whilst a great many more have been seriously degraded or are vulnerable to a range of threatening processes. As a result a number of cave communities in have become extinct, degraded or are vulnerable.

A reconnaissance of macro-invertebrate fauna of New South Wales was undertaken between 1993 – 1995, examining 138 caves in 48 cavernous karst areas in the state. The preliminary analyses of the results indicated that the New South Wales temperate karst areas are comparable with other localities in Australia, including the tropical regions, for species diversity as well as a diverse suite of highly specialised aquatic species (stygobionts). There is, in fact an extraordinary degree of endemism in the cave areas of New South Wales. Even with much of the material undescribed or only partially identified, it includes many exciting new species.

Cave dripwater process studies at Jenolan and Wombeyan Caves

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This research is looking at the flows of water and carbon dioxide in the surface skin of the limestone - the epikarst - which is the "engine house" for the karst solution process. Most of the carbon dioxide is generated in the root zone and soil due to bacterial activity, while rainwater is stored there and slowly released to feed the growth of cave formations.

We have been measuring stalactite drip rates, water chemistry and carbon dioxide concentrations in three caves - Michaelmas, Hennings (Jenolan) and Guineacor (Wombeyan). The measurements are made using data-loggers in the caves which record the processes every 30 minutes.

In addition, soil carbon dioxide and moisture, vegetation cover and temperatures are measured monthly. Three years data have been gathered and are now being analysed using lag correlation to look at the relationships between rainfall, drip rates and dripwater chemistry.

The results so far show that the drip rates in Michaelmas Cave respond to the daily cycle of plant respiration and evapotranspiration above the cave. There are significant seasonal differences in drip rates and chemistry, with some very high drip rates occurring within a few weeks of rainfall of around 400mm. After such heavy rain, pulses of chemically hard water are flushed from the surface limestone through fine fissures into the caves. This water has had a long residence time in the epikarst. Later, less hard water starts to percolate through. Thus the fine fissures in the epikarst are a very important reservoir for cave water, and any change in the conditions there – such as soil erosion, vegetation clearance or fire – may adversely affect the dripwater feeding the cave formations that over 250,000 visitors a year enjoy.

Karst of Christmas Island (Indian Ocean)

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Christmas Island is a tropical island (Latitude 10°30'S), in the Indian Ocean, northwest of Australia. This poster concentrates on the karst features and their management. A set of papers on the karst is in preparation for a future issue of *Helictite.*

The island is a basaltic volcano with a limestone capping. The interaction of uplift and old sea-levels has left terraces cut into the steep sides of the island. The central plateau is phosphate over a pinnacled epikarst limestone surface, with the crest of the volcanic surface about 30-40m down. The climate is tropical monsoonal with an annual rainfall of over 2000mm.

The coastal cliffs that circle most of the island have strong notches cut at sea-level, and well-developed hackly phytokarst sculpturing of the rocks. In one place spring-fed streams running across the Shore Terrace have cut narrow canyons, known locally as *The Dales*. Large subsoil pinnacles occur on the plateau and terraces and have been exposed by mining.

Most of the big caves are at sea level and entered from the base of the coastal cliffs. These are horizontal joint-controlled systems formed by mixing of fresh and saltwater bodies at sea level. The longest cave has 2.5 km of mapped passage with many unexplored leads. Most of these caves have strong outflows of fresh water. Higher up one finds uplifted systems that formed at past sea levels, and on the plateau there are some horizontal stream passages at the contact between the limestone and the basalt.

Management

The subterranean environment of Christmas Island is diverse and includes freshwater, marine, anchialine, and terrestrial habitats (Humphreys & Eberhard, *in prep*). The cave fauna is significant in an international context and is sensitive to disturbance from a number of threatening processes, including pollution, deforestation, mining, feral species and human visitors.

The phosphate mining will wind down in a few years, and alternative sources of income are needed. Tourism seems the best option, though there has been a proposal for a space port! The development of show caves is not considered appropriate at this stage. Only one cave would lend itself to this style of development, and apart from the dubious economics, there is a conflict with the current usage of that cave as a swiftlet breeding site. Some caves could be developed for "wild-cave" tours with a minimum of modification. Others need to be managed for recreational visits by addition of cautionary signage and track-marking. Reflectors have already been used to mark routes through one commonly-visited cave.

About 68% of the Island is currently a National Park. The management is concerned about risks associated with cave visitation, especially in the partly submerged coastal caves, which are tidal and have to be entered by swimming in from the sea. Unstable rockpiles and foul

air in the plateau caves could also be a hazard.

The island has a problem in obtaining water for the township at Flying Fish Cove and for mine operations. In spite of the high rainfall, there are few surface streams and most of the rainfall quickly disappears underground. Production is mainly from karst springs and from cave streams on the plateau. Water pumping from the plateau caves has involved the installation of pumps and sumps within one cave, together with access steps, an entrance gate and fencing of the doline.

KARST RE-ENGINEERING AT BUNGONIA STATE RECREATION AREA, NEW SOUTH WALES

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There are nearly 200 caves managed by the NSW National Parks and Wildlife Service at the Bungonia State Recreation Area. They are amongst the most heavily used "wild" caves in Australasia. The area also receives much non-cave related adventure-activity including bushwalking and abseiling as well as more passive car-based tourism. The heavy use, coupled with the topography, soils and climatic conditions, has led to very considerable degradation and instability of cave entrances, roads, walking tracks and lookouts. There have also been important public safety considerations.

This poster complements the paper *Hardening of Cave Entrances at Bungonia State Recreation Area, New South Wales* (Spate et al., this volume). It presents some before and after images and provides additional detail on some of the engineering options adopted. The poster concentrates on cave entrance repairs and an abseiling site.