

# KARST SCIENCE

- Ian Houshold

Ian Houshold at the Dismal Swamp sinkhole



Greetings from the incoming karst science officer. Like a grasshopper hitting a windscreen, a couple of things went through my mind when I was approached to stand for this job – firstly, what exactly are the terms of reference, and secondly how do you follow someone like Andy?

Starting with the second issue it struck me that for at least one reason out of twenty the transition may not be too demanding. Firstly, in the early days at least, Spatey taught me pretty much all I know – believe me the little five and ten cent piece carbonate molecules floating on the overhead projector have been around a lot longer than most people realise. So, if some of what you read from here on appears to have been a little cloned, don't be surprised. Our job descriptions have also been essentially similar – providing karst management advice for State government departments – and our responses to certain styles of upper echelon management may also have something in common (Andy's weapon of choice may have been a freshly made and tossed salad, but if anyone ever comes across our previous glorious Director Max Kitchell get him to relate the story of 'the Dunker' (or buy Clarkie a beer sometime). I don't think either of us has ever been very impressed by the line that a 'detached and objective scientist' shouldn't also provide a strongly held opinion on karst management.

What I have noticed though is that in some respects our approaches to karst science have always been just a tad 'opposite'. Whereas Andy has generally (and admirably) been a stickler for the tenets of strict empirical science as applied to currently active karst processes – my fascination has always been centred on variability in karst landscapes from the perspective of historical geomorphology and biogeography (not that we don't both dabble in a bit of the other from time to time). Either of these approaches is a valid base from which to integrate the multidisciplinary biophysical jigsaw that is karst.

I have been assured by Andy that the Spatements will continue to flow through ongoing Andysezs. What I will contribute is a series of articles about the development and management of karst *landscapes* that I have worked on, tramped over or crawled through around Australia, and an attempt

to draw some useful generalisations for karst managers – always being mindful of the special environmental (and social) context that constrains each system. Our bottom-up and top-down approaches to the science behind karst management should complement each other.

So, hopefully that has also answered the first question. If Andy and I can help with any problem, project or query that is puzzling or intriguing you, contact either of us and we will try and work it out together – from both ends of the spectrum.

As well as a series on karst landscape management I will also keep members up to date on the latest news from the disproportionately hollow landscape I call home. Fortunately, we also have a slowly expanding and increasingly experienced band of professional and amateur karst managers working at the State and local scale. They will be heaved from time to time to contribute as well.

Any State with a population less than Geelong, with as many federal senators as New South Wales, numerous local members and zillions of municipal councils obviously has an ongoing interest in the development of public policy (or spending public money!). In Tassie, some significant nature conservation and natural resource management issues orbit around the management of karst. Our tourist caves, like those everywhere, continue to be a fascinating focus for integrated management. Where professionally possible I will try to keep ACKMA up to speed on these as well.

Next issue I will begin a multidisciplinary look at some of the more fascinating karst landscapes in Tassie and beyond, gradually expanding northwards and outwards, looking at environmental variation and interesting features. There is a reason for starting in Tassie – the same geological age range that exists between the Precambrian dolomites of the Wooltana karst in the Flinders Ranges and the Permian limestones of the Macleay karsts in northern NSW (1400 km apart) may be traversed in the 10km or so between Hastings Caves and Southport Bluff. I have previously told Keith Vanderstaay, the Hastings Cave Manager, that the entire geological potential of Eastern Australian karst converges at Hastings, but being a modest fellow he doesn't spread that around too much. Suffice to say that geologically speaking at least, Southern Tasmania is at the antipodean apex of a massive geological 'fan' stretching northwards to the tropics, each fold revealing a karstic gem or two along the way. A fitting place to start.

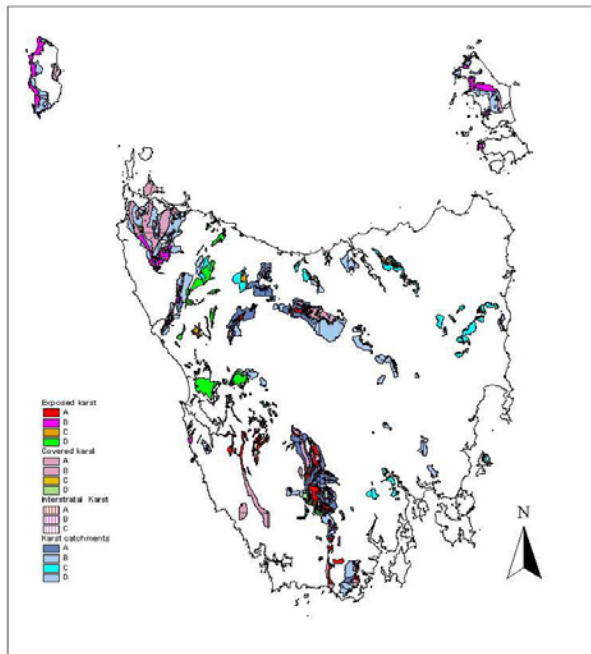
Hopefully this column will also generate a little professional controversy (perhaps some readers don't believe that southern Tasmania is the centre of the karstic world?). Please feel free to take anything up on the ACKMA list – a much under-utilised medium.

Cheers Ian

# TASMANIAN KARST UPDATE

- Ian Houshold

## Tasmanian karst areas



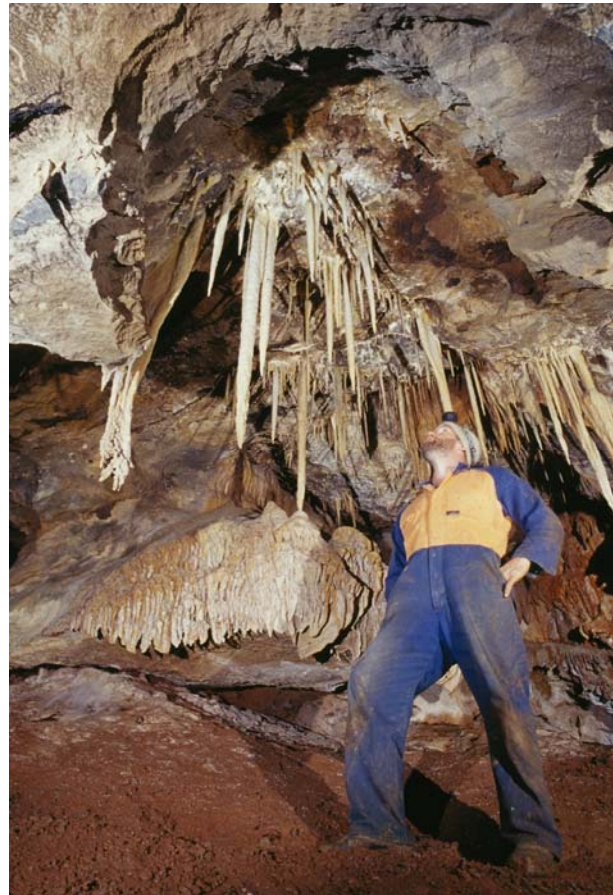
Tasmanian Digital Karst Atlas Extract

With the departure of Dr Kiernan from active land management to a role more focussed on the moulding of young karstic minds at the University of Tasmania (and hopefully a resurgence of environmental activism as promised in his last article!), not a lot of Tassie news has appeared in the journal. As Kevin's articles illustrated, there always seems to be something controversial going on over here – I suppose that is because we are still in the throes of sorting out appropriate land use and tenure classifications for our karst systems. This isn't always helped by the fact that we are still finding new, significant cave systems or areas of karst in potentially controversial contexts.

For some perverse reason many of our more significant karst systems are found immediately surrounding – rather than within – major conservation reserves and the Western Tasmanian World Heritage area. Many are in areas devoted to multiple use land management systems permitting production forestry, limestone mining or agricultural use. Caves, being what they are, often turn up in the most politically challenging locations – the karst gods no doubt view Tasmania as an ongoing source of novel entertainment – which I will share through the pages of the journal wherever I can.

And where I can't, there is no reason why ACKMA members shouldn't focus a healthy interest in the ongoing debates. It is unfortunate but true, that many of the more farsighted land management decisions taken here in the past few decades, whilst often generated within the State, have relied heavily on support from interstate or overseas for implementation.

Mark Houshold standing in Montagu Cave



Our karst tourism and recreational centres at Hastings, Mole Creek, Gunns Plains (and soon Dismal Swamp) are continuously developing their programs and approach to promotion and site management. Private wild cave tourism operators at Mole Creek, Ida Bay and Loongana continue to interact with colleagues in the publicly managed system. Where new approaches are tried or advice is required I will attempt to keep people updated through the Journal.

## STATEWIDE

Since Kevin's last update, karst inventory and management planning at the Statewide level has entered the digital age. The Tasmanian Karst Atlas, originally compiled and published on paper by Kevin is now an Arcview spatial database. Most of the 300 or so karst area boundaries and associated catchments are mapped at a scale of 1:25,000 – 1:50,000, each area associated with a dozen or so system descriptors in linked lookup tables. A series of documentation projects will now incorporate further information for individual karst areas such as Ida Bay, Mole Creek, Gunns Plains, Loongana, Hastings etc in detailed multi-layer GIS systems, to be used as the basis for land management by all authorities. Rolan Eberhard has completed the first detailed digital karst Atlas project at Mole Creek (see below). Sarah Joyce has also completed and passed her Honours year, documenting karst values and hydrology at Hastings, in a format suitable for inclusion in the Karst Atlas.

Jason Gardner water tracing at Hastings  
Stephen Blanden in Shooting Star Cave



Part of the latest work on the karst atlas was funded by the Statewide Conservation of Freshwater Ecosystems Values project, presently being carried out under the State's Water Development Plan. This plan proposes major water development projects such as irrigation dams and water diversions. CFEV assesses significant bio- and geoconservation issues related to water development – a major category for investigation being karst and groundwater dependent ecosystems.

As part of this project, karst areas were regionalised, and significant representative examples of a range of karst features and associated ecosystems were identified for protection. Individual features and areas of outstanding significance were also nominated. The project will now combine karst with other major categories – fluvial systems, wetlands, estuaries etc - to develop a system of freshwater reserves and tools for off-reserve management across the State. Comments from groups such as ACKMA will be sought when draft documents are produced – most likely towards the end of 2004.

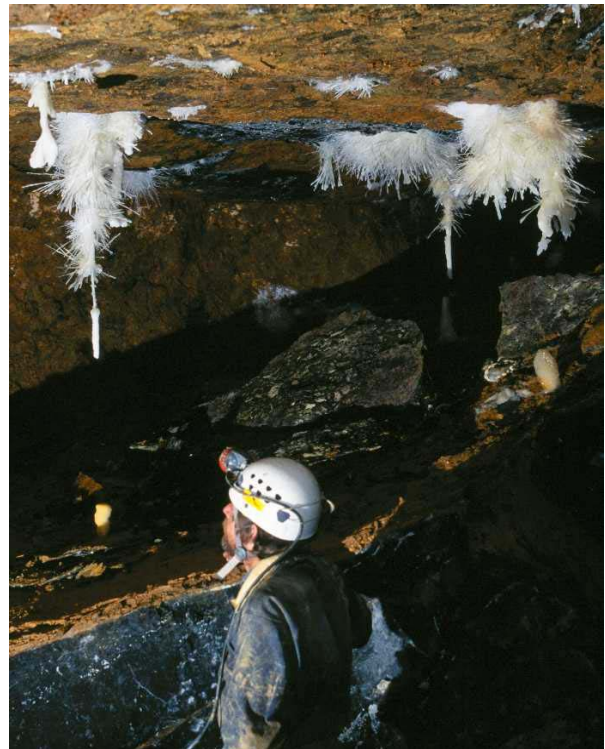
Following gazettal of prescriptions in the Mole Creek Karst National Park Management Plan, the State Cave and Karst Management Advisory Committee will be re-convened. Initially this group will comprise representatives from all tourist caves, regional managers of Parks and Wildlife Service (Department of Tourism, Parks, Heritage & the Arts), and scientific support from Nature Conservation Branch (Department of Primary Industries, Water & Environment). In future

representation may be extended to other relevant agencies such as the Forest Practices Board, Forestry Tasmania, Tourism Tasmania and Mineral Resources Tasmania. Representatives of agricultural and forestry interests, recreational cavers and private tourist operators will be invited to participate also.

### **HASTINGS CAVES AND STATE RESERVE**

Whilst karst was never accepted as a significant input into determination of land tenure under the Regional Forest Agreement, one of the more useful outcomes as far as Hastings was concerned was the additional reservation of land joining the existing State Reserve with the Southwest National Park and World Heritage Area. (Oddly, a significant area of karst remains as State Forest, managed by Forestry Tasmania in the Creekton catchment - with streamsinks likely to feed Newdegate Cave). Like so many other karst areas in Tasmania, integrated karst drainage systems are artificially split by two tenure systems, both with very different management philosophies attached.

More fortunately, a cave system has recently been discovered in the new reserve, in the upper reaches of Hot Springs Creek, where the contact between dolomite and overlying non-karst sediments was found to lie at a higher elevation than previously thought. This was described by Chris Sharples in a previous journal. The new cave - H5 - has now been reasonably thoroughly mapped, documented and routes stringlined by caving groups and Hastings staff. About 1 km of passage was recorded during a recent expedition by caves staff and SUSS.



Stephen Blanden in Shooting Star Cave

Access arrangements are now being negotiated with local cavers. I am tempted at this stage to ask for support from the caving community to gazette the cave and its catchment as a reference system. The entire catchment is pristine, having never

been mined or logged. It is covered with old growth mixed Eucalypt forest. There are some very interesting relationships with old glacial landforms. The cave has been visited six times. It is the only significant cave system in the Hastings dolomite which remains in an essentially excellent condition.

But what are the real advantages of classifying it a reference cave? In theory, it should act as a site to be used as a benchmark for comparison with other more heavily used caves in the area. But in reality, what is reasonable to measure in such a comparison? A simple photo-monitoring exercise might show obvious large scale change, but if karst processes are to be measured and compared, what justification do we have for comparison? Hydrologically and meteorologically the caves within the reserve are broadly similar (in that they are more similar to each other than, for example, to a cave in the Nullarbor) but looking at a more detailed level, there are many differences in the style of air and water flows, sediment flux and water chemistry between H5 and Newdegate. Where does the usefulness of a reference site begin and end, and when does dissimilarity reach a point where direct comparison of process becomes irrelevant? Any discussion on this would be most welcome.

Adventure Caving at Hastings is tentatively progressing, from small beginnings in King George V Cave (where visitation is currently restricted to 100 visitors/year) to a focus on Mystery Creek Cave and its glow-worms. Mick Williams' and Gerry Doherty's already popular night tours of Mystery Creek Cave have been joined now by daytime tours from PWS Hastings, with the aim of active cave management seen as equally important to development of the tourist product. The glow-worm colony in the cave is of world standard, yet potential effects of unmanaged visitation (ranging from over-excitement of glow-worms during firecracker and skyrocket displays, to the equivocal effects of marijuana smoke on glow-worm respiration) needed to be curtailed somewhat. We have installed a datalogged stage gauge on Mystery Creek above the cave entrance, and a logged tipping bucket rain gauge will soon be installed at an appropriate part of the catchment, to try and determine whether flood depths may be predicted from easily accessible rainfall data. This will aid in the OHS aspects of trip planning for both commercial and free-range visitors.

Environmental management in Newdegate Cave continues to progress, following installation of Neil Kell and Peter Bell's lighting system. Almost two years of service has proven the c-bus system to be reliable (other than a tendency for the lamp housings to 'droop' somewhat!), but from my perspective the most impressive outcome is the decrease in lampenflora growth, and hence a massive reduction in chemical use and off-track work by caves' staff. Having nearly all the lights accessible from the tourist path has also greatly decreased degradation and allayed OHS fears presently running like a rash through the Department. Pete Price, Jason Gardner, Deena Price and Matt Cracknell have recently and painstakingly removed the old wiring from the

cave, accentuating the natural appearance which is a hallmark of Neil's art.

Keith Vanderstaay and staff have designed a new raised walkway/sediment trap to allow clean access to Titania's Palace, after almost sixty years of trampling the rimstones leading to it. Funding has been allocated for its construction later this year - it will be interesting to monitor their rehabilitation. After almost ten years of scrounging for money following the production of the cave rehabilitation plan, works are almost complete. Installation of guttering and trackside barriers to allow path washdowns should complete the vision to make the tourist infrastructure here as environmentally sustainable as possible - Roger, Pete, Keith and I will write an article describing the plan and its implementation in a future journal.



L to R: Arthur Clarke, Ian Houshold and Rolan Eberhard at the entrance to H5

## MOLE CREEK

Mole Creek continues to provide challenges on a variety of fronts. This complex, multi-tenured karst continues to be a focus for environmental debate related to the effects of forestry, agricultural and urban land use. Rolan Eberhard has recently completed a three-year NHT funded project to document karst values, map cave systems and undertake water tracing experiments to determine underground flowpaths. This has built on the groundwork done by Kevin Kiernan in 1985. The product, an Arcview project comprising many layers of data, will be a continuously updatable spatial database to be used as the primary reference for land use planning by all authorities. Called the Mole Creek Karst Atlas, it fits into the Statewide Karst Atlas project (see above).

As well as publishing a paper on Mole Creek water quality, Rolan also produced an issues and options paper to be used as the basis for development of a karst management strategy for the area. As part of a policy to develop partnerships between State and local government, the Mole Creek Karst Partnership group was set up, comprising State and local government representatives, local farmers and business people in order to produce the strategy and talk through ongoing management issues. Based on Rolan's work the group is pursuing funds through the northern Natural Resource Management authority to develop the strategy, to produce a pilot whole farm management plan for a priority karst catchment at

Mole Creek (possibly the Mayberry catchment which includes Kubla Khan and Marakoopa Caves) and to continue karst hydrological work. This will be important as irrigation schemes based on the proposed Meander River dam may have effects on karst groundwater systems.

Over the past few years, the refusal of Private Timber Reserves on karst because of impacts on karst values has led to ongoing tension at Mole Creek (oddly, in Tasmania PTR's are private 'reserves' set aside to allow for future timber harvesting under the *Forest Practices Act* – a trap for many interstate internet purchasers who thought the land was reserved for conservation!). Whilst the Act provides for compensation to be paid to the landowner for loss of the available timber resource, the amount payable has at times not met landowners' expectations. Whilst a joint State/Commonwealth NHT program to purchase potentially affected blocks (overseen by Jenny Dyring) succeeded in purchasing and reserving land at Herberts Pot, Kubla Khan, Mersey Hill and White Rabbit caves, many potential issues remain unresolved.



Rolan Eberhard in a hole at Mole Creek

There is also a community expectation that restrictions on land use may become more widespread, if future PTR applications are refused, or if regulations are introduced to control unsustainable agricultural activities. Tensions have led to deliberate provocation of authorities by disgruntled landowners, such as alleged bulldozing of dolines and timber felling over valuable caves. Hopefully the karst partnership group may be used as a meaningful forum to effectively manage these issues. Rolan's work will be invaluable in providing for scientific discussion.

During the course of the project Rolan discovered and, with the aid of Jeff Butt, Luke Vanzino, Nathan Duhig and others mapped a magnificent cave system in the vicinity of Croesus Cave, which he called Shooting Star. This cave is the deepest at

Mole Creek, at over 230 metres, and contains what are probably the State's best developed calcite/aragonite anthodites and gypsum hair. The cave is integral to the Mill-Kansas drainage system, which is predominantly in land managed by Forestry Tasmania as 'Conditional Forest' – in other words a decision on future timber harvesting will be made when sufficient knowledge of natural values has been obtained for planning purposes. Rolan is presently working on a short project for FT Mersey district to develop options for future visitor access to caves on their patch, including the Mill-Kansas caves.

Until a visitor management policy is developed Shooting Star will remain gated and unavailable to visitors. Access to other caves in the area such as Croesus and Mill/Tailender are presently managed by Mole Creek PWS rangers on behalf of Forestry Tasmania.

As well as developing new tourism products such as a proposal for Adventure tourism in Marakoopa 1 and 2, PWS managers at Mole Creek and the Nature Conservation Branch karst specialists are presently developing a social and environmental monitoring program for priority cave and karst systems. The initial meeting of the group was held immediately following the recent ACKMA AGM at Mole Creek, so plenty of useful advice was at hand. We have now progressed to development of a hierarchical model of controls on natural processes in the catchment of Marakoopa Cave, and an inventory of natural and cultural values. A list of current and future management issues was then compared with the natural systems model, and priorities for monitoring produced. It was decided that not all of the monitoring system would be reactively based on perceived problems – we hope that a balance has been achieved between monitoring of key environmental drivers (whether or not they are currently affected by use of the karst) and a desire to quantify and redress current management issues. And if the World Heritage grant that we have applied for comes through, we'll actually be able to do it!

Cathie Plowman is currently heading various projects involving interpretation and development of tourism products at Cradle Mountain and Mole Creek caves. Whilst it now appears unlikely that the proposed tunnel through the end of King Solomons Cave will proceed, full commitment has been given to re-lighting King Solomons by Neil Kell. This work, which should commence soon, should raise King Solomons to the high aesthetic and environmental standards set by Hastings. No doubt Neil's use of the advances in LED and other lighting technology seen over the last couple of years will produce some surprises at King Sols as well.

## **GUNNS PLAINS**

In preparation for the takeover of the Gunns Plains tourist cave in the near future, structural work on substandard walkways and handrails is now progressing. Hopefully, when the Deers appear on the scene we can begin discussing rehabilitation of this cave, which is now showing undoubted signs of wear and tear over the years. Whilst the lighting is adequate, Gunns has always been a place where more adventurous styles of presentation would

probably succeed – small tour groups combined with a diverse stream cave combine to provide exciting possibilities not possible in the more frenetic environment of the major state-run systems.

**DISMAL SWAMP- SEVENTEEN MILE PLAIN**

We all wait with baited breath over the content and style of interpretation which will appear at Dismal Swamp. Following a general declination of offers to be involved in development of the project by karst professionals in the State it will be interesting to see what approach Forestry Tasmania will take, and whether the impacts of forestry operations in the spectacular polje and karst valleys of the Northwest will be presented in a fair and objective light in this development.

Flower’s Property Stream Rehabilitation



Not far from Dismal Swamp, in the adjacent Montagu River valley, the Montagu Caves area was recently purchased by the Crown under a joint Regional Forest Agreement/NHT National Reserve System program. Whilst neither program explicitly catered for karst values, the area contains one of

the State’s best remnants of Brookers Gum, a rare community which, under the RFA requires significant protection. The Montagu Caves are also one of the State’s most important megafauna bone deposits, containing many extinct species. At the base of one deposit part of a seal’s mandible attests either to the fearsome bush-bashing abilities of the said seal, or to the proximity of the last interglacial(?) shoreline to the cave (which is now approximately 20 km from the coast). The area is proposed to be declared a Nature Reserve, although this classification is opposed by mining interests who presumably see the area as a potential source of dolomite or, if mineralisation has taken place, of more valuable metals. Similar to Dismal Swamp, this part of the karst appears to be a highly integrated system where water tables fluctuate over a limited range between winter and summer.

If mining and de-watering were to take place, would engineers be able to control water table drawdown in the area to prevent sinkhole/cave sediment collapse and the drying of Brookers Gum communities? Does the area have any real prospectivity anyway? Are there alternative resources? Or would a stronger reserve classification that did not permit mining, and provide a better level of protection to the caves, their contents and surrounding forest communities be more appropriate here? These questions may be assessed through a professional investigation of the area’s potential mineral production value and its conservation value in order for a properly balanced decision to be taken.

Well, quite a list of things to catch up on, and I’m sure that’s not all. Hopefully future updates will be a lot more succinct, however quite a few gaps needed filling following Kevin’s redeployment. Catch you next issue!

**Mole Creek karst atlas March 2003**

