

BONES, BLOCKADERS AND BOLTS: TASSIE STUFF

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The scope of this article is not representative of the full range of karst-related events over the winter period in Tasmania. Much has been happening: karst properties purchased for reservation under the Forest Conservation Fund, protection of the Vale of Belvoir secured by the Tasmanian Land Conservancy, a new karst schedule released under the Draft Meander Valley Planning Scheme, an upgraded show cave lighting system operating at Gunns Plains, progress on cave restoration works at Mole Creek and Gunns Plains under the Karstcare banner, and work commenced on a statutory management plan for reserved caves and karst in southern Tasmania. Here is a subjective selection of newsworthy items.



Karstcare in action: Alan Jackson trialing methods to remove pink fluorescent paint sprayed on rock surfaces in Growling Swallet

1. Bones

Near enough to 40 years ago some old bones were found in a remote cave in south-west Tasmania. This event was decisive in the campaign to save the Franklin River and underpinned the subsequent nomination of much of western Tasmanian as a World Heritage Area. These outcomes would not have been obvious at the time: the battle to save Lake Pedder had been lost, conservative politics were strong and much was uncertain.

Nevertheless, the bones were a very promising find, particularly when it was recognised that many of them had been split by prehistoric humans to extract the marrow. The cave was also littered with stone tools which the same humans had flaked from siliceous river cobbles. The site was known at that time as F34. It was later dubbed Fraser Cave, a possibly successful move to engender the dam debate with personal politics at the highest levels. Later still it was given the Aboriginal name Kutikina.

The prevailing wisdom was that south-west Tasmania had been uninhabited by Aborigines who had left unequivocal evidence of a thriving maritime economy in the form of massive middens on the coastal fringes. This view was

challenged when Goede & Murray (1977) discovered stone tools at Beginners Luck Cave in the Florentine Valley. These authors interpreted this as evidence that south-west Tasmania was occupied by humans in Pleistocene times. But Beginners Luck was problematic in that the cultural material was very sparse and had moved from its original location within a mass of sediment that had slumped deeper into the cave. In contrast to Beginners Luck, the cultural content of the sediments at Kutikina was dense and unequivocal. Moreover, the site was deep in the south-west rather than on the edge like Beginners Luck – a clincher by any standard. Kutikina is now regarded as one of Australia's richest archaeological finds.

The archaeological field investigation at Kutikina took place over barely a week in early 1981, within a couple of months of the discovery of the stone tools. Haste was necessary as the window of opportunity to halt the dam was rapidly closing. A 1m pit in the floor of the entrance chamber yielded an estimated 75,000 stone artefacts and 250,000 bone fragments (Kiernan et al. 1983).

A television crew visited by helicopter and in a short space of time the Gordon-below-Franklin dam, caves in south-west Tasmania and human history in the ice age were connected in very public and very political ways. Later expeditions found evidence of human occupation in other south-west caves dating back to 35,000 years BP, and the south-west is now considered one of Australia's most comprehensive regional Pleistocene archaeological assemblages.

This is old news but it provides the context for recent developments that underline the importance of caves as repositories of information about the environment and its human inhabitants over long periods of time. In Tasmania, cave deposits are the key to understanding how humans survived and maybe thrived in those rugged Pleistocene times. Until recently, surprisingly little detailed analysis has been published, considering the amount of archaeological research undertaken in the south-west of Tasmania.

A major factor was that some mainland universities holding cultural material obtained under permit in south-west Tasmania were required to return their collections to the State. This was ostensibly a dispute over permit conditions; fundamentally, the issue was about ownership and control of cultural heritage by the Tasmanian Aboriginal community. There was considerable bad feeling amongst some of the researchers.

Against this background, recent publications detailing the results of further work on south-west cave material is a promising development. Garvey (2006) analysed 41 kg of bone material recovered during the original excavation of Kutikina. She looked at the species represented, numbers of individual animals, proportions of

bones from different body parts and patterns of bone breakage. Wallabies and to a lesser extent wombats were the principal prey species. Garvey found that the number of wallaby leg bones was disproportionately high compared to other parts of the skeleton, suggesting that the legs were selected for consumption because of the higher meat content, after carcasses had been butchered outside the cave. In the case of wombats a higher percentage of cranial material suggests that the brain rather than the meat of this species was favoured. Interestingly, Garvey found that the minimum number of individuals that could account for all the wallaby bones was a mere 40 over the 5,000 year span of the sample.

The significance of this result must take account of the fact the sample is only a small proportion of the cultural deposit at Kutikina; also, a large amount of bone material could not be assigned to species because it was too fragmented or otherwise not readily identifiable. A separate paper on the Kutikina material described evidence of pathological conditions in some animals based on abnormalities in the bones (Garvey & Sandy 2008). These authors speculate that diseased animals may have been more susceptible to predation by humans.



Midnight Hole: rock abrasion caused by ropes on pull-through trips.

Bone material from Kutikina is also discussed by Pike-Tay et al. (in press), who used wallaby to investigate seasonal human land-use patterns in south-west Tasmania. Material from three other south-west caves was also examined: Bone Cave, Numamira and Wareen. It has been shown that mammal teeth show growth layers with characteristics that vary due to seasonal factors.

This means that the season of death of an animal can be inferred from its teeth. Results from the Tasmanian sites suggest that wallabies were hunted in autumn through to spring at Kutikina and Wareen, but only during summer at Bone Cave and Numamira. As Kutikina and Wareen are at lower altitude and closer to the coast than Bone Cave and Numamira, a seasonal pattern involving movement between higher altitude sites under milder summer conditions and lower altitude sites during colder conditions in autumn, winter and spring is suggested.

The hunting practices of Pleistocene humans is indirectly addressed in yet another study of cave bones, in this case an investigation into the

timing and causes of megafauna extinctions in Tasmania. Turney et al. (2008) dated the bones of extinct giant kangaroos from a natural cave pitfall at Mt Cripps in north-west Tasmania. Radiocarbon results suggest that the bones are about 41,000 years old. Based on evidence from cave deposits in south-west Tasmania, these authors suggest that humans arrived here between 43,000 and 40,000 years ago and therefore coexisted briefly with the megafauna. They also suggest that the climate was relatively stable at this time and that human hunters were therefore likely to be the cause of megafauna extinctions. The evidence that underpins this interpretation warrants close scrutiny but it is a thought-provoking scenario.

Tasmania's location at the southern extremity of Australia, its episodic isolation from the continent during sea level highs and the abundance of pitfall-type caves provides opportunities to test hypotheses concerning speciation, dispersal, extinction and other aspects of Australian's Pleistocene faunas. Further cave-based palaeontological studies can be expected. Interestingly, Goede and Murray (1977) had earlier suggested that giant kangaroos were still around when the Aborigines arrived, although this suggestion was retracted based on subsequent direct dating of the bones (Goede & Bada 1985).

2. Blockaders

The dichotomy between greenies and developers is a defining characteristic of Tasmanian identity and politics. It is true that the depth of polarisation within the community has ameliorated compared to the height of the Franklin campaign, when parading a 'No Dams' sticker in some west coast towns was seriously provocative. Nevertheless, the tension still simmers and readily flares up when fanned by rhetoric from community leaders. Some erstwhile green supporters have suggested that the green movement in Tasmania is suffering a crisis of relevance because all the big conservation battles have been won, but the clash of ideologies still makes headlines here on a regular basis. And, as in the past, more often than not there is a karst dimension.

The Upper Florentine is the latest battleground. The area in question is a substantial area of State forest sandwiched between the World Heritage Area to the south and long-standing production forests of the middle and lower Florentine Valley to the north. It is considered by some to be wilderness and a natural extension to the World Heritage Area. As yet the area has few roads and is largely free of forestry coupes.

In contrast, the Lower Florentine has been extensively logged for many decades, as a quasi-private estate managed by Australian Newsprint Mills under the concession system and more recently as multiple use forest managed by Forestry Tasmania. Whereas the Lower Florentine has substantial limestone relief and is extensively karstified with hundreds of recorded caves, the Upper Florentine has limited limestone relief and surficial sediments inhibit karstification over

much of the area. Nevertheless, the Upper Florentine does contain caves and karst, a fact that the opponents of logging have been keen to capitalise on.

Not so long ago a young man turned up at a meeting of a Hobart caving club asking for information on caves in the Upper Florentine. It transpired that he was involved in the campaign to protect the area and was keen to find a cave containing Aboriginal stencils, had in fact been actively searching for such a cave, which he wanted as heavy duty ammo against logging. It was pointed out that inexperienced people wandering about in essentially pristine caves are a more immediate threat to the integrity of the caves than logging within the catchment. The response was a blank face, which left room for speculation that the holder wasn't convinced that the ends didn't justify the means in this case. As far as I know none of the club cavers took up the invitation to assist.



Matchbox Squeeze – the connection between Midnight Hole and Mystery Creek Cave.

The campaign to stop logging in the Upper Florentine has been gearing up over a period of years. A group calling themselves Still Wild, Still Threatened established a camp on the Strathgordon Road beyond Maydena. Banners are strung up in trees and signs invite motorists to stop at an 'information booth'.

The infrastructure apparently includes a 55 m high platform for viewing and protesting: the 'World Heritage Watchtower'. The protestors have been successful in gaining media attention from time to time, for example when a gracefully attired young lady, the 'forest angel', suspended in the

forest canopy in the path of logging machinery was arrested and fined. The protestors have clearly had a measure of success in disrupting roading and logging operations, as indicated by the belligerent mood of affected contractors.

Things got really ugly in late October when police were called in to investigate a report that forest contractors had assaulted Still Wild, Still Threatened protestors at their camp. The events were videoed by another protestor and published on the internet. The footage is said to show men wielding a sledgehammer and yelling abuse while smashing the windows of a car containing two protestors. Forestry Tasmania initially denied that one of its employees had witnessed the alleged assault, but later retracted the denial.

FT's managing director Bob Gordon articulated the pro-logging view that provocation had been offered and that retaliation was justified when *The Mercury* newspaper quoted him describing the situation in the following terms: 'if you left a dog in a cage and kept on poking it with a stick, eventually the dog would bite'.

Headlines next day reported that three car-loads of men had arrived at the Still Wild, Still Threatened camp late at night and set alight to vehicles and huts. According to *The Mercury* Premier David Bartlett's response included a call for the protestors to 'take a good hard look at themselves'!

In the past, acts of violence against protestors have often preceded political intervention in favour of the conservationists. In the present political climate it seems likely that the Commonwealth will not step in and pay out a new Upper Florentine reserve. The campaign to halt logging in the Upper Florentine could well be long and bitter.

3. Bolts

The ethics of bolting – the use of more-or-less permanent anchors fixed in holes drilled in rock and used for vertical ropework – preoccupies the minds of rock climbers more than it does cavers. Rock climbing is arguably more competitive in that the *style* of an ascent is often considered as important or more important than the immediate goal of reaching the top.

At the cutting edge of the sport getting to the top in good style is everything. Cavers generally appear less concerned with such matters, possibly because technology can assist someone to successfully explore a cave, but motivation and fitness are often more important (ignoring highly technology-dependent forms of caving such as cave diving).

On the other hand, from time to time, practices such as blasting and bolting bring caving ethics to the fore. Warild (1986) complained about the plethora of bolts at the head of the final abseil in Dwarrowdelf, a popular vertical cave in the Junee-Florentine, suggesting that putting in a bolt was a displacement activity for cavers reticent to confront the intimidating shaft below. More recently emails were flying thick and fast

when some cavers mooted a proposal to ‘retro-bolt’ Serendipity, another Junee-Florentine classic. Opponents noted that to add Serendipity to the list of caves set up to suit a contemporary ‘clip-and-go’ style was an unwelcome homogenisation and therefore a retrograde step. The discussion was a caving analog for the dichotomy in climbing circles between sport routes and ‘trad’ routes. And although climbers are far from unanimous on any issue, in that sport there appears to be a level of acceptance that the first ascentionist (explorer) has the prerogative in matters of style.

Despite differences of opinion, it is fair to say that bolting is widely considered an acceptable practice in Tasmanian caving circles, particularly when applied during exploratory trips. And there is no doubt that bolts can significantly enhance the safety of trips to vertical caves. Midnight Hole – a vertical entrance to the popular Mystery Creek Cave – is a case in point. This cave comprises six back-to-back abseils with a combined vertical height of about 170 m, connecting to Mystery Creek Cave via the mildly infamous Matchbox Squeeze.

Midnight Hole is well known and patronised by local and interstate caving clubs and various other unaffiliated parties. There are few natural rigging points and for many years visitors have relied on the use of aging Loxins – a form of expansion bolt with a large welded eye – for rigging purposes.

By the late 1990s some cavers were questioning the safety of the Loxins. Moreover, the existing bolts had been installed when laddering was de rigueur. This meant that the bolts were located well back from the edge of the pitches in less than ideal configuration for roped descents, including canyoning-type pull-through trips that have become popular at Midnight Hole. The friction of ropes being pulled down on pull-through trips had worn obvious grooves in the rock on some pitches.

These considerations convinced local caver Jeff Butt that the bolts in Midnight Hole should be replaced with newer epoxy-based anchors known as P-hangers. He saw this as an opportunity to increase the safety of caving trips to Midnight Hole while reducing impacts on the cave environment.



Hilti tester in action at Midnight Hole.

This style of anchor is widely used in caves in the UK and has been the bolt of choice for some Tasmanian rock climbers since the 1990s. The P-hangers used in caves are typically 8 mm diameter stainless steel pins with a shaft about 90 mm long and a large eye at one end. The anchor is created by drilling a hole in the rock slightly deeper than the length of the bolt, filling the hole with fast-setting epoxy and then pushing the pointy end of the bolt into the epoxy-filled hole. A well-placed P-hanger presents as an eye, protruding flush with or slightly recessed into the rock face. The commitment in time and effort required to install P-hangers exceeds that of various alternative types of bolts, but they are resistant to corrosion and incredibly strong (Butt 1999).

Prior to bolting Midnight Hole, Jeff and others from the Southern Tasmanian Caverneers put in a bed of ten test bolts in Benders Quarry. This was an opportunity to trial installation techniques and bolt performance under a variety of conditions – for example some of the holes were filled with water prior to applying the epoxy and setting the anchor. A portable testing rig from the Hilti company was used to load these bolts to forces in excess of 14 kN, with no failures recorded.

In 2001 P-hangers were installed on all pitches in Midnight Hole. Under a protocol agreed between the cavers and the Parks and Wildlife Service, each bolt placement was tested by loading it to 5 kN for 5 minutes. The force was later increased to 7.5 kN for consistency with a relevant industry standard, and a standard procedure established for installing and testing the bolts (STC 2008). Southern Tasmanian Caverneers maintains a P-hanger register that documents installation dates, testing results and other relevant information.

The apparent success of the Midnight Hole P-hangers inspired cavers to place about one hundred P-hangers in a dozen other popular vertical caves. The discovery in 2005 that some of the Midnight Hole P-hangers showed signs of looseness was therefore quite disturbing. The initial response was to re-test all bolts in this cave – all sustained a direct outward force of 5 kN. Despite this, the two bolts on the last pitch were still considered suspect because the amount of movement exceeded that which could be attributed to normal flexing of the bolt under load.

During the testing process, one of these bolts was loaded to 12.5 kN. The bolt did not pull free at any time during the test, but at 9 kN cracks started radiating out from the bolt, indicating failure of the surrounding rock. The cause of the problem was still unclear, although it was thought possible that the epoxy had not properly bonded to the rock at the time of installation.

Additional support for this explanation came when the suspect bolts were removed for replacement. The removal procedure involves drilling out the epoxy and then rotating the bolt with a steel bar. In the drilling stage a pocket of gas trapped within the epoxy discharged forcefully into the face of the driller. This implied the

presence of a void, which could have reduced the strength of the bond between the epoxy and the rock, most likely due to insufficient epoxy being squirted into the hole during installation. This theory was blown out of the water when the replacement bolts were also reported to have become loose a few months later. Midnight Hole was immediately closed to caving trips and much head-scratching ensued.

In fact Midnight Hole was theoretically closed already by virtue of its connection with Mystery Creek Cave, which had been closed following a natural rockfall after flooding in 2005.

Further testing and assessment of the bolts benefited from input by Tim Chappell, who had recently been appointed as an engineer at the Parks and Wildlife Service. An alternative hypothesis for the failure of the bolts was proposed, based on the fact that unlike the majority of other bolted caves, Midnight Hole had been set up to cater for pull-through trips on double ropes.

To facilitate pulling down the ropes after each abseil, bolt pairs at the head of each pitch were vertically offset rather than aligned horizontally for equal loading, as described by Butt (2001). The practice when abseiling was to thread the rope directly through the P-hangers or attached rings, with a knot jammed against the lower anchor preventing the rope being pulled down by the weight of the person abseiling on the other end (generally backed up by a karabiner clipped in at the top, except for the last person down).

The rope is then brought down for the next abseil by pulling the end on the knot side of the anchors. This is a convenient set-up for pull-through trips but it has several undesirable consequences. Firstly, forces are not equally distributed between the P-hangers.

Secondly, the knot jammed against the head of the P-hanger results in a degree of torsion loading that the anchor is not designed to take. Thirdly, the position and alignment of the bolts is less

than ideal for trips using conventional single rope techniques. Although these problems were pertinent on each pitch in Midnight Hole, they were most acute on the final abseil, the longest pitch in the cave. There was no evidence of problems with P-hangers in caves other than Midnight Hole.



Hazard signage at Mystery Creek Cave.

A potential solution to these problems is now being trialed. This involves attaching chains and rings to the P-hangers to more evenly distribute the load between bolt pairs while alleviating torsional forces, an approach sometimes used by rock climbers for abseil points on cliffs.

The improvements at Midnight Hole have only just been implemented so it is too early to comment on the results, although a certain amount of optimism seems warranted. A footnote to this story is that upgrading the abseil anchors at Midnight Hole was completed in time for the reopening of Mystery Creek Cave to public access on 1st November 2008.

The P-hanger program was coordinated by a southern arm of the 'karstcare' movement – caver volunteers working within the framework of Wildcare Inc., which provides funding and insurance for programs utilising volunteers on reserved land.

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