CAVES IN THE TASMANIAN WILDERNESS WORLD HERITAGE AREA EVALUATION 2004

- Greg Middleton

During 2004 the Tasmanian Parks and Wildlife Service (now part of the Department of Tourism, Parks, Heritage and the Arts) undertook an evaluation of its management of the Tasmanian Wilderness WHA against the provisions of the 1992-99 management plan (Parks and Wildlife Service 1992). The result of this wide-ranging and thorough review is *State of the Tasmanian Wilderness World Heritage Area: An evaluation of management effectiveness.* This is available as a 30 page summary (free, but postage $5 in Australia) or the full version – hard copy (222 pp.) ($65 + $10) – or on CD ($20 + $5).

The foreword unashamedly states that this first *State of TWWHA* report is "a landmark publication in the world of protected area management" – and this is undoubtedly true. Although prepared "in house", this report is frank and thorough. Its findings are based on the opinions of staff, independent specialists and the public/visitors and other "stakeholders".

Professor Jamie Kirkpatrick of Tas. Uni. School of Geography and Environmental Studies, who doesn't give out environmental bouquets lightly, wrote:
This rigorous, complete and totally honest evaluation of the implementation of the first Tasmanian Wilderness World Heritage Area Management Plan is to be highly commended. The scientific content is appropriate and accurate, and should inform future decision-making in relation to the many critical management issues covered by the second plan.

Although karst doesn't occupy large areas in the Tas. WHA, it is widespread through it, from Marakoopa (Mole Creek) in the north, through the valleys of the Gordon and Franklin rivers, Mount Anne, Ida Bay and Cracroft, to Precipitous Bluff in the far south. So, how do cave and karst management fare in this evaluation?

The Aboriginal-owned cave sites

Caves are first mentioned on p. 5 of the full report where, within the topic of management responsibility, it is mentioned that three cave sites (Kutikina, Wargata Mina – formerly Judds Cavern - and Ballawinne) were transferred to Aboriginal ownership in 1995. Legally, these sites became the responsibility of the Aboriginal Land Council of Tasmania and it transferred control to the Tasmanian Aboriginal Land Council. Because of their remoteness, relative lack of threats and other much higher priorities, TALC actually has little hands-on involvement with these caves – though the report says it manages them on a "day-to-day basis". One thing the report does not highlight is that, while there has been increased Aboriginal involvement in many aspects of the WHA, nothing appears to have been achieved towards integrated or joint management of these cave sites. Although it is reported that "interpretive signs at Kuti Kina … were developed with the assistance of the Aboriginal community" (p. 35). The report does say (a number of times):
… the Tasmanian Aboriginal Land Council reports that monitoring of Aboriginal cave sites (in particular Kuti Kina and Wargata Mina) show evidence of excessive human activity by cavers and bushwalkers. More detailed information on the condition of these sites is recorded in internal TALC reports which are not generally available. (p. 145)

A rather young Kevin Kiernan excavating in Kutikina Cave under the watchful eye of the late Prof. Rhys Jones – March 1981.

Photo: Greg Middleton.

Since there is no information concerning joint or other cooperative management of these areas it is not clear who is really responsible for this "excessive human activity". As they are Aboriginal lands, it would not appear that the Service can be held responsible for management problems except, perhaps to the extent that it has not negotiated a shared management regime.

Under "Legislation, law enforcement and compliance" (p. 20) it is mentioned that the *Aboriginal Lands Act 1995* transferred title to the three cave sites to the Aboriginal community.

The transfer of this land to Aboriginal ownership and management is again mentioned under "Land tenure, boundary and adjacent area management" (p. 28). Under the same heading it is noted that on 13 Nov. 1996 the Mole Creek Karst National Park was proclaimed, incorporating the Marakoopa Cave State Reserve. This reserve will thus be subject to both the WHA Management Plan and the management plan for the Mole Creek KNP.

Crystal Cave – unlawful removal of minerals

"Several incidents of unlawful removal of mineral specimens from sites of geoconservation significance" are reported (p. 23), including Crystal Cave (presumably this is a cave in the Mount Weld area). Charges were laid (in relation to this and other offences), one offender was given a warning and the others were issued with $50 fines.

Lune River Quarry – closure and rehabilitation

This is clearly regarded as an important issue as it recurs in a number of sections. It is first addressed under "Management of controversial issues" (p. 25) and more particularly under "Management or curtailment of pre-existing uses of the TWWHA" (p. 26). It is reported:
A major quarry for limestone at Lune River (Bender's Quarry) which was demonstrated to be causing damage to the significant limestone karst system at Ida Bay was closed as a result of a decision by the Commonwealth government (acting under the World Heritage Properties Conservation Act 1983) to prohibit, except with the consent of the Federal Minister in writing, operations for the mining of limestone within Mining Lease 69M/81 at Marble Hill. A major rehabilitation program has resulted in stabilisation and revegetation of the quarry site.

This is addressed again on p. 42 under "Performance evaluation and adaptive management" where the quarry is cited as an example of a specific monitoring project undertaken to "provide measured information about the performance of management". Clearly, the success of this project is seen as a major achievement on a number of levels. The project is cited again on p, 61 under "Cessation or reduction of damaging activities and practices", where it is stated, inter alia:
A major rehabilitation program stabilised the quarry benches and resulted in significant improvements in water quality of cave streams and an increase in the abundance of cave stream fauna.

A filter bund surrounding a cave entrance exposed by quarrying. The filters were built from heavy limestone blocks, various grades of crushed limestone, geotextile filter membrane and various organic mulches such as sterile streaw bales and Eucalyptus bark. These bunds prevented the ingress of bench sediments and applied topsoil to the cave system whilst vegetation was re-established.

Photo: Ian Houshold from *State of the Tasmanian Wilderness World Heritage Area: An evaluation of management effectiveness.*

Major treatment of this topic appears in Chapter 5 "Conservation and rehabilitation of the natural and cultural heritage". Under "Condition of geodiversity" (p. 125) it is noted that:
Improvements in the condition of geodiversity detected over the 1992 –1999 period included improvement in the biophysical condition of the Exit Cave area following closure and rehabilitation of the nearby major limestone quarry at Lune River (Bender's Quarry).

Under "Landscape quality", considering repair of degraded sites, the rehabilitation of the quarry is again cited as "one of the larger sites addressed during 1992-1999" (p. 143).

Substantive discussion of the project occurs under "Monitored condition of significant values (including degraded values)" on pp. 147-150. The section "Karst system at Lune River" gives a concise summary of the problem and its treatment:

ABOUT THE VALUE
The limestone karst system of Ida Bay was recognised as being of international scientific significance by the Helsham Commission in 1987. The Exit Cave system and its catchment fulfilled at least two of the criteria for inclusion on the World Heritage list. The system contains over 26 km of mapped passages, with dimensions exceeding 30 m x 30 m, with blind shafts reaching up over 200 m into the roof making it one of the largest caves in the southern hemisphere. It contains complex cave sediments and massive calcite and moonmilk deposits (some at least 350,000 years old) which reflect environmental changes across glacial/interglacial cycles. It also contains some of Australia's most spectacular gypsum speleothems, palaeontological deposits (including megafauna species), palaeokarst deposits of Devonian and Permian age, and a rich, highly endemic and rare terrestrial and aquatic fauna..

Environmental problems associated with the nearby Lune River limestone quarry (Bender's Quarry) were first identified in the mid-1980s but the focus narrowed in 1989 with the extension of the World Heritage Area to include the quarry area. Limestone quarrying directly impacted on karst values through removal of karst features, including palaeokarst, and indirect impacts included the re-solution of speleothems by acidified quarry drainage.

In 1991, exploration and water tracing experiments established links between the quarry and the Ida Bay karst system. Quarrying activities degraded water quality by increasing the turbidity of cave streams and increasing the sedimentation of cave passages. Quarrying was also associated with organic pollution (from oils and fuels) and other changes in the chemistry of karst waters (including changes in pH, conductivity and dissolved ion concentrations).

Quarrying was associated with a low abundance of indicator species in the passages draining the quarry, especially cave-adapted aquatic invertebrates such as Fluvidona *sp. (an aquatic snail that is very sensitive to sedimentation of its habitat). Low abundance of* Fluviodona *sp.*

indicated a significant reduction in water quality and ongoing effects on cave ecosystems.
Quarrying operations at Benders Quarry ceased in 1992. There was no baseline environmental information prior to the closure of the quarry.
OVERALL MANAGEMENT GOAL: To re-establish natural karst processes and associated ecosystems including re-establishment of natural erosion rates on quarry benches and in cave-streams, and re-establishment of vegetation cover on quarry benches.

MANAGEMENT ACTIONS AND SIGNIFICANT EVENTS OVER THE 1992 –1999 PERIOD [p. 148]
The following management actions and/or significant events occurred over the 1992 –1999 period.

- *In 1992 the impacts of the quarry were documented (see Houshold 1992 and the reference list in Houshold 1995).*
- *The Lune River limestone quarry was closed on 20 August 1992 by gazettal of regulations under the* World Heritage Properties Conservation Act 1983.
- *Between 1993 and 1996 active rehabilitation work was carried out on the quarry. This included: development of a rehabilitation plan; information gaps were filled; topographical/hydrological surveys were undertaken, soil mapping, karst mapping, and cave mapping were undertaken; dye tracing established drainage linkages; vegetation was surveyed. Drainage and bench configurations to stabilise the quarry were designed; clay was stabilised; exposed cave passages were treated; topsoil was extracted; filter systems were established; soil was spread, and seed and hand planting were undertaken over 3 years.*
- *Environmental monitoring programs were conducted for water quality, cave stream fauna and rehabilitation of the quarry benches.*

Results *Monitored condition indicators*

Condition indicators and monitoring methodology	***Targets for condition indicators (and how performance is assessed)***	***Change in condition indicators over the 1992 –1999 period***
WATER QUALITY: was monitored for 3 years (Aug1992 to Dec1995) following cessation of quarrying. Monitoring was conducted at an 'affected site' (Eastern Passage), a control or 'natural site' (Western Passage) and the main outflow stream. 'Affected' here means the site is located in the cave stream draining the quarry and has been affected by quarry runoff, sedimentation and acidification. 'Natural' here means unaffected by quarry runoff. The site is a separate stream known not to have been affected by quarry runoff. Parameters monitored: pH, conductivity; turbidity; depth; temperature; dissolved oxygen. Water quality monitoring was continuous.	*TARGET FOR WATER QUALITY: Re-establishment of natural water quality at affected sites (i.e. .no significant difference in water quality between affected and natural sites).* *ASSESSMENT OF PERFORMANCE: Ongoing event-based water sampling.*	*WATER QUALITY: The affected sites originally had significantly lower pH and over double the amount of suspended sediments as the natural sites. Following closure of the quarry, there was a gradual improvement and convergence of water quality between the affected and natural sites (as reflected by suspended sediments, dissolved ions and pH).* *Impacts have been significantly reduced, although affected sites still reflect impact at flood peak. Analysis of similar flood peaks indicates approximately 30% improvement in some variables.*
SPECIES DISTRIBUTION AND ABUNDANCE: The presence/absence of stream fauna macroinvertebrates and the abundance of the aquatic snail Fluviodona sp. in fixed quadrats was sampled twice yearly in 'natural' and 'affected' streams from 1993 to 1997.	*TARGET FOR SPECIES DISTRIBUTION AND ABUNDANCE: Re-establishment of natural species distribution and abundance i.e. no significant difference in species distribution and abundance between affected and natural sites.* *ASSESSMENT OF PERFORMANCE: Cave fauna quadrat analysis.*	*SPECIES DISTRIBUTION AND ABUNDANCE: At closure of the quarry, affected sites had between 1/4 and 1/3 the abundance of the natural sites (Eberhard, 1995).* *Within one year of closure, there was a large increase in the abundance of Fluviodona in the main impacted passage. By 1996, the numbers appeared to have stabilised, although the abundance of affected sites was still lower than in natural passages.*
SEDIMENT STABILITY AND VEGETATION SUCCESSION IN THE QUARRY: Photo-monitoring of the quarry has been carried out annually since July 1992 to track erosion and vegetation succession in the quarry.	*TARGET FOR SEDIMENT STABILITY AND VEGETATION SUCCESSION IN THE QUARRY: Re-establishment of natural erosion rates on quarry benches; and re-establishment of vegetation cover and succession on quarry benches* *ASSESSMENT OF PERFORMANCE: Photo-monitoring and vegetation quadrat analysis*	*SEDIMENT STABILITY AND VEGETATION SUCCESSION IN THE QUARRY: At quarry closure significant amounts of clay were mobile and entering cave systems. By 1996, the quarry benches were stable and/or improving in sediment stability, and vegetation had been established on quarry benches. By 2001, significant growth of vegetation had occurred and sediment stability has further increased.*

Commentary on management performance [p. 150]
The following commentary has been provided by specialist staff within the Nature Conservation Branch of DPIWE.

KEY FACTORS POSITIVELY CONTRIBUTING TO MANAGEMENT PERFORMANCE:

- *Closure of Benders Quarry.*
- *Development of new rehabilitation methods focussed on karst systems. This approach involved directing surface flows underground following filtration by various organic and inorganic media, as opposed to directing water off-site.*
- *Establishment of vegetation using minimal fertiliser so as to minimise the effects on cave water quality.*
- *Implementation and monitoring of rehabilitation.*

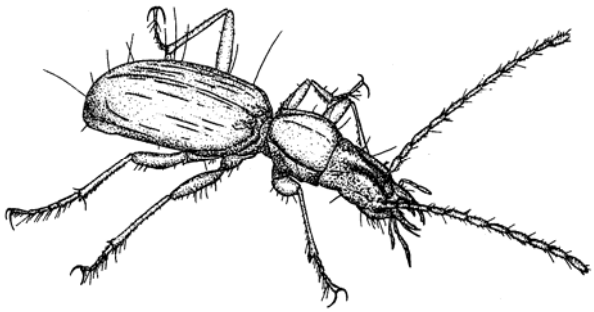
KEY FACTORS LIMITING OR THREATENING MANAGEMENT PERFORMANCE:

- *Extreme weather events (e.g. high intensity rainfall events may de-stabilise quarry faces, leading to further exposure of clay pockets to erosion processes).*
- *The potential still exists for mass failure (ie landslips, slumps etc) to produce ongoing high magnitude but low frequency impacts.*
- *Any future re-opening of the quarry.*
- *Wildfire and/or inappropriate operational response in the event of wildfire. Protection from wildfires is extremely important in karst areas. As well, operational responses to fire in karst areas requires a different approach from that normally used, involving less use of heavy machinery and avoiding disturbance to fragile surface solution features.*

SUGGESTIONS FOR IMPROVING MANAGEMENT EFFECTIVENESS
Specialist staff provided the following suggested actions for improving management of the karst system at Lune River.

- *The large-scale management activities associated with rehabilitation of the quarry are now complete. Ongoing management needs to be able to respond to major events such as mass movement. This would entail construction of further settling ponds, filtration systems etc. and revegetation of disturbed sites.*
- *Risks of wildfires in karst areas need to be carefully managed.*
- *There is an ongoing need to ensure that operational responses to wildfire in karst areas are managed appropriately to minimise impacts.*
- *Sediment stabilisation may be required in future.*
- *Ongoing visitor management through cave entry permits. The cave entry permit system restricts access to certain groups, with maximum party size and frequency. The permit system is administered by PWS District staff.*

SOURCES OF INFORMATION AND COMMENT
RMC Earth Science Section, Benders Quarry rehabilitation and monitoring, Ian Houshold, Geomorphologist, Ph. 6233 3868, Email: Ian.Houshold@dpiwe.tas.gov.au



The blind cave beetle *Goedetrechus mendumae,* by Karen Richards, from Eberhard, S. 1999 *Cave fauna management and monitoring at Ida Bay, Tas.* Parks & Wildlife Service, Tas.

Cave fauna

Under "Knowledge of the natural and cultural values" (p. 51) it is reported that":

An increase in knowledge about the distribution and abundance of several animal species listed under the Tasmanian Threatened Species Protection Act 1995 *led to them being de-listed or downgraded, including the pencil pine moth, the blind cave beetle (see Section 5.7.5), and the Mole Creek cave beetle.*
Under this heading Ida Bay gets a further mention:

> *Understanding of natural karst processes in Southwest Tasmania advanced through inventory, and through monitoring of karst water quality and landforms at Ida Bay.*

Under "Condition of biodiversity" – rare and threatened animals (p. 135) it is further noted that:

> *Several species were either de-listed (Pencil Pine Moth) or had their conservation status changed from vulnerable to rare (blind cave beetle, Mole Creek Cave Beetle) as a result of surveys organised by the managing agency that showed that they were more common than previously known.*
> and:
> *Three rare and threatened species (Mole Creek cave harvestman, pseudoscorpion and beetle) were found to occur in the TWWHA in 1999 as a result of surveys organised by the managing agency.*

Under "Genetic diversity and biogeographic integrity" (p. 136) it is noted that

> "The fauna of the TWWHA has strong affinities to fauna of Gondwana, including inter alia, cave spiders (Hickmaniidae)."

The blind cave beetle is discussed under "Vulnerable species" (p.158-159):

> *The blind cave beetle* (Goedetrechus mendumae) *was listed as vulnerable under the Tasmanian* Threatened Species Protection Act 1995. *The blind cave beetle was first described in 1972, when it was only known from a small section of passage (less than 150 m length) in Exit Cave. Exit Cave habitat was, at that time, under threat from a limestone quarry operation*

adjacent to the cave system, and from disturbance by recreational cavers. The blind cave beetle only occurs in caves, mostly in the deep cave zone. Because the species is so specialised in its habitat and has low numbers of populations, it is also vulnerable to extinction from random (stochastic) events.

OVERALL MANAGEMENT GOAL: to protect known sites and to identify further locations where the species occurs.

MANAGEMENT ACTIONS AND SIGNIFICANT EVENTS OVER THE 1992 – 1999 PERIOD

A three-month systematic survey of the Ida Bay Caves was undertaken in the summer of 1997 to locate live specimens of the blind cave beetle or the remains of dead specimens.

***Results** (p. 159)*

Monitored condition indicators outcomes

Condition indicators and monitoring methodology	**Targets for condition indicators** (and how performance is assessed)	**Change in condition indicators** over the 1992–1999 period
NUMBER OF KNOWN LOCALITIES FOR SPECIES: Established from survey records from the three-month survey in summer 1997 of the Ida Bay Caves.	TARGET FOR NUMBER OF KNOWN LOCALITIES FOR SPECIES: The original target of finding further locations where the blind cave beetle occurs has been met. No new targets have been set.	NUMBER OF KNOWN LOCALITIES FOR SPECIES: The 1997 survey found populations of the blind cave beetle in two new locations in Mystery Creek Cave. Indirect evidence (dead material) suggested the species is more widely distributed in Exit Cave. These findings mean that the threat of extinction of the beetle (e.g. through random events) is not as high as previously thought.

- *The distribution of the blind cave beetle is more widespread than previously known (although still restricted to one cave system), and consequently the threat of extinction of the beetle is not as high as previously considered.*

Commentary on management performance.
The following commentary has been provided by specialist staff within the Nature Conservation Branch of DPIWE.

KEY FACTORS POSITIVELY CONTRIBUTING TO MANAGEMENT PERFORMANCE:

- *Securing of WHA project funding to undertake surveys for the species.*
- *Surveys improved the knowledge base for the species.*
- *Closure of Benders limestone quarry in 1992.*
- *Voluntary avoidance by recreational cavers of the relevant small section of passage in Exit Cave (Kellers Squeeze).*

KEY FACTORS LIMITING OR THREATENING MANAGEMENT PERFORMANCE:

None identified.

SUGGESTIONS FOR IMPROVING MANAGEMENT EFFECTIVENESS
Specialist staff provided the following suggested actions for improving management of the blind cave beetle.

- *Continue protecting vulnerable habitat locations of the species in Ida Bay karst/caves e.g. maintain access restrictions to Kellers Squeeze (a small contained area where animals and their habitat could be affected by recreational caving).*
- *Monitor visitor numbers accessing known locations of blind cave beetles.*
- *Undertake further surveys for the blind cave beetle in Loons Cave, Bradley Chestermans Cave and Arthurs Folly.*
- *Undertake regular monitoring of species and habitat at selected sites, e.g. monitor populations of the blind cave beetle every 5 years by undertaking searches in known locations as well as other potential sites.*

Adequacy of knowledge for sound management

While knowledge required for sound management of the WHA is generally thought to be adequate —
… staff with specialist expertise in various fields considered that a lack of knowledge in the following areas was limiting or hampering sound management of the TWWHA:

- *Understanding of biophysical processes affecting peatlands; karst systems (e.g. at Marakoopa and Ida Bay); and river and lake systems (e.g. the effects of regulation of river flows by hydroelectric generation operations).*

Cessation or reduction of damaging activities and practices

The Ida Bay quarry closure is again mentioned under this topic (p. 61), and impacts of exotic plants and animals – and responses to them – are also covered. Weeds whose control is a priority include *Cotoneaster* spp. at Marakoopa Cave, Scotts Peak (and elsewhere).

Lune River Quarry rehabilitation with soils spread on benches and cave inflow filters installed, July 1993. Photo by Barry Batchelor – from the Evaluation Report

Exotic animals of concern include European wasps (parasitic wasps were released at Hastings Caves and Cockle Creek. However, these have not been effective to date) (p. 86) and lyrebirds which were released at Hastings Caves in the 1930s and 40s and have spread (p. 92).

Direct impacts on caves by users

Under "Tourism and visitor activities" (p. 97) it is noted that:

> *Visitor activity, use or even presence damages, disturbs or disrupts fragile or vulnerable life forms, features, sites, or natural processes. For example … cave visitors can accidentally break delicate cave formations or walk mud onto pristine crystalline surfaces which can result in dirt becoming embedded in the limestone formations.*

and further:

> *… use may exceed the ecologically sustainable levels for an activity or cause high levels of impact that are not readily reversible. For example … the number of visitors in a cave may give rise to high levels of carbon dioxide, which causes acidic solution of the limestone formations.*

Stakeholders assessments

Chapter 7 deals with "Stakeholders' assessments of management performance". These were obtained by asking a range of park users, managers and specialists to identify the key factors that had contributed positively to overall management performance for the TWWHA over the 1992-99 period.

Top of the list was the provision of federal funding, followed by public support and cooperation for management, with "good staff" as #3. Coming in at #6 was "good science", the primary example of which was "research and monitoring at Exit Cave" (p. 192).

Identification and conservation of values: Aspects of Management performance

Positive and negative aspects of management performance were evaluated. In relation to "identification of values", #1 (positive) rating went to "Increased knowledge of World Heritage and other values", of which the second example given was "identification of cave resources" (p. 210).

In relation to "Protection and conservation of values", rehabilitation of disturbed sites was rated positive aspect #7, with the primary example "management of Exit Cave area". On the negative side, "Inadequate management of sustainable visitor use" was rated #1, with the 6th example being: "the Aboriginal cave sites monitored by the TALC show evidence of excessive human activity by cavers and bush walkers. (p. 214). Given that these cave sites are not legally under PWS management, this hardly seems fair criticism.

ASSESSMENT OF ASSESSMENT

Overall, it appears that caves/karst management in the Tasmanian WHA by PWS comes out of this evaluation pretty well – especially thanks to the outstanding job done in relation to Exit Cave and the Lune River/Ida Bay quarry. Congratulations are due to Ian, Rolan and those who helped them.

This "assessment" or "evaluation" is, however, despite its innovative nature and frankness, still a fairly limited document. It is an attempt at determining the extent to which the managers achieved the goals they had been set, in the management plan.

This was not a review of the plan in the wider sense; it did not ask what the managers should have been doing or invite comments on the worth of what was done; it simply compared what the managers were supposed to do with what they did.

It was also not exhaustive, in that people were invited to give their impressions, which resulted in highlights (and low points) being given as examples, and thus emphasised.

This is why the Exit Cave-Lune River Quarry rehabilitation project crops up so often; it was clearly a major achievement, while the lack of effective management of the Aboriginal cave sites is clearly a significant failure, in some peoples' eyes.

This is not to denigrate the value of the review/evaluation which has been done. The other sort of review – the wide-ranging reconsideration of what management should be doing – will happen in the form of the next plan review.

The 1999 plan (Parks & Wildlife Service 1999) was due for a 'limited review' after five years (if that happened it was done quietly) and is due for a full review by 2009.

This will provide the opportunity for a full reconsideration of the plan; clearly, the 2004 assessment will better inform that reconsideration.

REFERENCES

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