

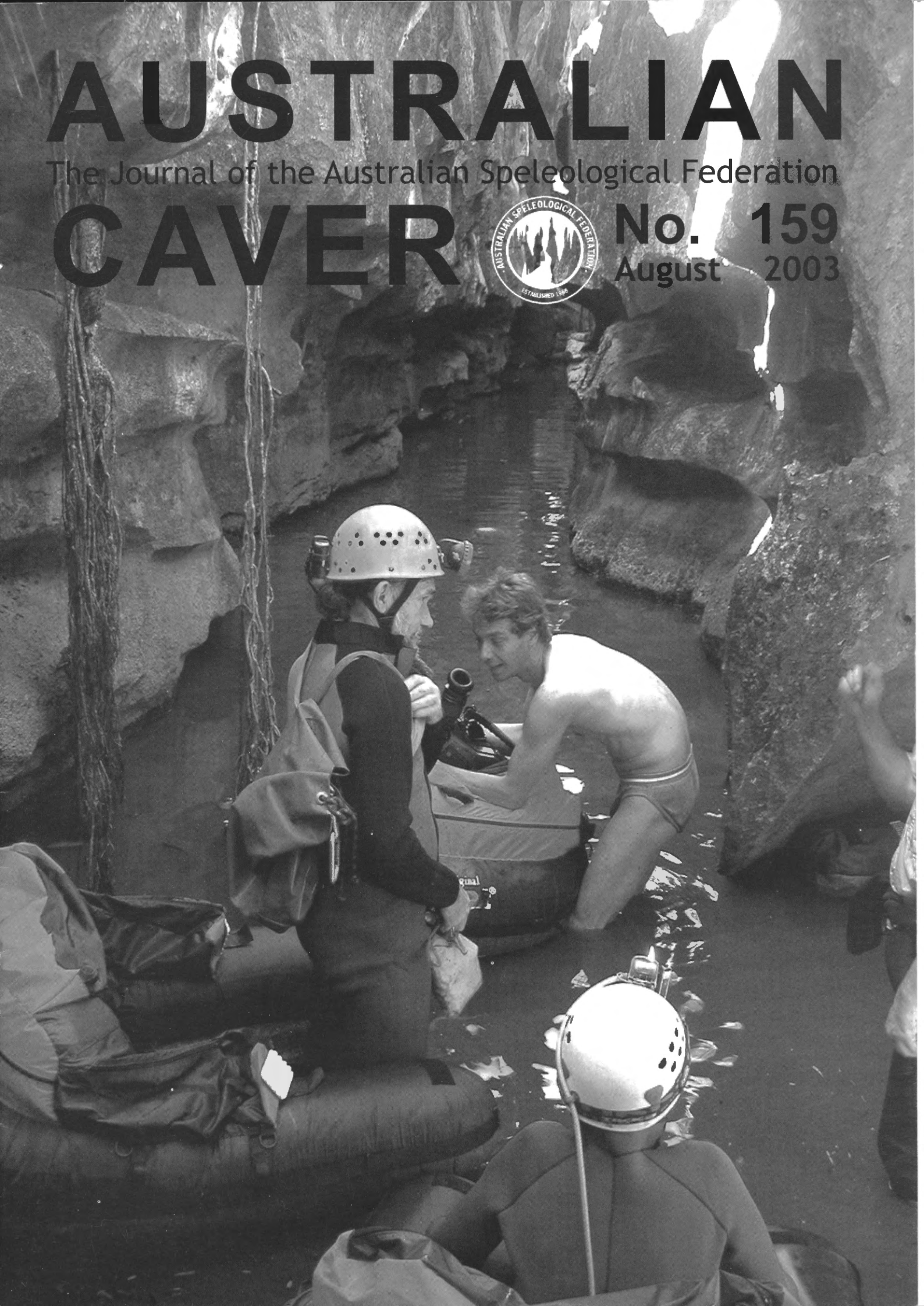
AUSTRALIAN

The Journal of the Australian Speleological Federation

CAVER



No. 159
August 2003



Coming Events

In particular, this list will cover events of special interest to cavers and others seriously interested in caves and karst. A similar list in the ACKMA Journal will give more attention to meetings of specialist scientific interest. Both of these lists will be just that: if you are interested in any listed events, contact Elery Hamilton-Smith on [REDACTED]. PLEASE ADVISE ADDITIONS FOR THE NEXT ISSUE OF AUSTRALIAN CAVER.

If you plan to visit North America or Europe, we can provide details of the many local-regional meetings which take place there.

2004

Jan 24-25	ASF Council Meeting, Venue TBA
May 1-2	ACKMA Annual General Meeting, Mole Creek.
May 12-21	11th International Vulcanological Conference, Azores, see www.multi.pt/speloeazores/
Sept 13-18	TRANS-KARST: First International meeting of the Vietnamese-Belgian Karst project Hanoi.
Oct 10-17	Limestone Coast 2004 : will include a meeting of ICGP448 Program and a workshop on RAMSAR Subterranean Wetlands. ASF is co-sponsoring this conference

And Looking Ahead:

2005: Jan 2 - 8	25 th ASF Conference, Dover, Tasmania (see separate note in this issue) Preliminary details: Arthur Clarke 03-6228-2099
2005: 10-17 April	ACKMA Conference, Westport, New Zealand.
2005: 21-28 August	14th International Congress of Speleology, Athens, Greece (see web.otenet.gr/ellspe)
2005: 17-19 April	3rd Symposium on Cave archeology and palentology, Greece (web.otenet.gr/ellspe)
2007: January	26th ASF Conference , South Australia, celebrating 50 years of the Australian Speleological Federation. Start planning now.

For further informaation on events go to :

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Front Cover

Arthur Clarke (in wetsuit & U-Boat) with crew on Madagascar assignment. See article on page 4. (photograph supplied by Arthur Clarke)

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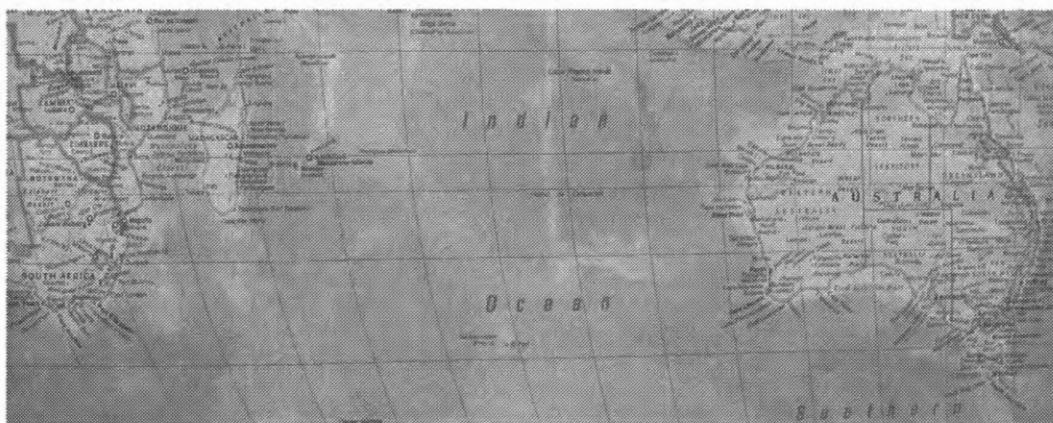
Sometimes it's not what you know or who you know, but it's about being in the right place at the right time; sometimes it's a combination of all three. In January 2002, David Merritt from the University of Queensland introduced me to a budding young French film director: Nicolas Gabriel (and his wife Nancy Lamour). They had arrived in southern Tasmania to film glow-worms: in *Mystery Creek Cave* at Ida Bay and in a rain-forest gully at Francistown (near Dover). As a cinematographer/ cameraman himself, Nicolas has been directing and producing wildlife documentaries in many remote parts of the world. One of his forthcoming projects was to film the flora and fauna associated with the remote Tsingy de Bemaraha karst in western Madagascar and he was looking for a knowledgeable cave biologist/karst consultant. Was I available? I certainly was... assuming I could be excused from TASUNI MSc studies!

So, now I have just returned from an all expenses paid 5 week trip to Madagascar, spending over four weeks of that time in the magnificent Tsingy de Bemaraha limestone pinnacle karst. I was engaged by the Paris-based Bonne Pioche Productions, as one of five or six consultant scientists to assist in the production of a wildlife documentary, scheduled for screening on European television in November 2003.

long and 570km wide and has a coastline in excess of 5000km. Its highest mountain is around 2880m. (Colonised by the French in 1896, it gained full independence in 1960.) As shown in Figure 1, the Tsingy de Bemaraha is located in central western Madagascar, around 18°S of the equator.

Getting there...

Now back to the beginning. After flying just over fourteen (14) hours from Sydney to Johannesburg (in South Africa) - one of the longest flights in the world - I spent a somewhat restless time trying to sleep on a warm night in a hotel near the Jo-Burg airport. The island of Madagascar was another three-and-half hours flying time, heading northeast from Johannesburg. In between feeling my stomach churn as we fell into occasional air pockets while flying over the island, I was photographing the reddish-orange coloured floodwaters of swollen rivers and the magnificent towering mushroom clouds, then overheard a fellow passenger saying that a cyclone was forecast. I arrived in Antananarivo (the capital of Madagascar) around 2.30pm on May 11th 2003. Stepping onto the airport tarmac reminded me of arriving at Cairns in Far North Queensland (for the 1988 ASF Tropicon Conference): it was my first impression of Madagascar... an extremely hot



Cropped map of Australia, South Africa and Madagascar. (Photo : Arthur Clarke)

While there, I was amazed at the number of people who didn't know where Australia was, let alone Tasmania, and now since returning, I am being asked: where is Madagascar? Also in the southern hemisphere, Madagascar is located 400km east of Mozambique (in Africa) and around 400km west of the small islands of Mauritius and Reunion. Situated between latitudes 12°S and 26°S, Madagascar is the fourth largest island of the world with a land surface area of 587,000 sq km; it is 1600km

day (by Tasmanian standards) in a sub-tropical climate with a cloudy sky and humid (sweat producing) conditions. My second impression after emerging from customs was the crowd of "welcoming" Malagasy people and the effort it took to exit the airport through this barrage of people clamouring to assist me - "would-be" luggage porters, money changers (offering 620,000 Malagasy francs for \$100 US dollars) and street kid beggars - all wanting money, a tip or commission for their services. (The word "Malagasy" is used to relate to the

"people of Madagascar" as well as being used varying as a descriptive noun or adjective describing their customs, monetary system and their language.)

Antananarivo (better known to locals as "Tana"), seems to have an unknown population of several million people: no one could tell me how many people lived there! We travelled from the airport at a snail's pace, held up by traffic jams on a Sunday afternoon: passing street side markets and slum housing with narrow roads congested by cars, trucks, buses, cyclists, zebu carts, ponies and pedestrians... where were they all going? From the outset you would have to say that Tana is an immensely crowded third world country city, where there are too many vehicles and not enough parking spaces! I spent my first night in Madagascar at the Relais des Pistards (a hotel for backpackers/ trekkers), situated opposite the botanical gardens and lemur park in the inner suburbs of Antananarivo where I experienced my first tropical cyclone... brilliant lightning flashes, almost ear shattering thunder claps, then the wind and torrential rain.... so heavy and forceful, it bent down the struts supporting the fabric of my umbrella. Cyclones must be common place in Tana, because next morning when the storm had passed - leaving its legacy of fallen branches and a litter of leaves - it was business as usual with everyone out on the streets again. Florent Colney - the proprietor of the Relais des Pistards - was also anxious to get moving; he was the organiser/ provedore for our filming expedition to the Tsingy de Bemaraha. After providing me with a set of kitchen scales to weigh myself, we breakfasted with bowls of hot coffee and bread, said our goodbyes to his wife Jocelyn and "enfants" then left early (0715am) heading back to the airport to meet the rest of the filming expedition who had just flown in direct from Paris.

After our respective body weights were noted along with a tally of our luggage weight and volumetric size, we were organised into different groups according to the carrying capacity of the varying modes of onward transport. I departed the airport at Tana by 4WD with



Mud-walled, grass roofed huts. (Photo : Arthur Clarke)

Bob Laborde (the driver, an ex-patriot Frenchman), in the company of Christian Holl (sound chaser and composer, producing the musical score for our film) and Francis Demange (a freelance photographer with three cameras taking photos for National Geographic magazine). We drove almost directly west for about 5 hours, covering a distance of about 240km along winding roads, passing vast sections of severely eroded landscapes and numerous villages with their mud-walled grass roof houses, arriving at Tsiroanomandidy. (Many towns in Madagascar have very

long names that are difficult to pronounce let alone to spell, so Tsiroanomandidy is now referred to as "Tsiro".) This is an old town with French colonial architecture and several ornately designed Catholic churches, situated at



Tsingy de Bemaraha (1998) National Park Plaque. (Photo : Arthur Clarke)

the end of sealed road west of Tana... in fact, there was very little bitumen in the centre of Tsiro, but a mass of potholes and water washed wheel ruts. When we arrived in Tsiro, I got my first real taste of the extreme dry heat of Madagascar... it was 42degrees and I was wilting. Sweat was pouring down my face when we sat down for a mid-afternoon lunch and I had my first Three Horses Beer and zebu steak... the beer was really great and possibly one of



Sharp edged narrow tsingy karren flutes. (Arthur Clarke)

the best beers I have ever tasted. An hour or so later, we caught the only plane that day for the 140km flight from Tsiro to Bekopaka... the village in western Madagascar used to access the southern reaches of the Tsingy de Bemaraha World Heritage Area national park. Seeing Francis with all his cameras and me snapping madly with my digital, our English-speaking Swiss pilot gave us a photographic treat: a detour to fly across some of the Grands Tsingy pinnacle karst, en route to our hilltop landing strip near Bekopaka. ("Bekopaka" is pronounced "Bee KOO Puck"; and as with many Malagasy town names, the accent is on the second syllable and you don't sound the last letter "a".) A few of the others flew direct to Bekopaka from Tana on that first day, while the rest travelled by slow bus to Tsiro, staying overnight before flying to Bekopaka next day (but without getting the fly-over across the Tsingy).

The Tsingy de Bemaraha National Park

The word "Tsingy" means "on the tip of the toes" in Malagasy, which is actually the way you have to walk on

the rare flat spots between sharp points or on the thin near razor edge crests of the jagged karren flutes of the karst pinnacles or plateau regions. However, there are many other meanings according to who translates this word to you. For example, I was also told that "tsingy" is a Malagasy word for the sound that the flutes of this sharp edged abrasive limestone makes when you walk over it. (As we later discovered, it was in fact perilously sharp with the extremely thin, often <1mm thick flesh cutting razor-like edges on both the vertical karren flutes and the ridge crests themselves.) In some of the few "flatter" plateau exposures of the Bemaraha Parc tsingy, you could occasionally avoid these sharp edges by stepping in *kamenitza* solution pans and smooth surface drainage channels, but where the severely eroded limestone formed as pinnacles and ridges, you had to gingerly clamber across the surface, with gloved hands often "on all fours". Although most Malagasy locals and Parc officials believe the tsingy's origin is due solely to the limestone purity, the heavy often torrential wet season downpours or wind-driven cyclonic rains are likely to be a more major contributing influence to the development of this sharp-edged and abrasive tsingy karren.

Although shown on the map as a continuous zone, the 152,000 hectare Tsingy de Bemaraha Parc essentially contains two separate areas of partially forest covered

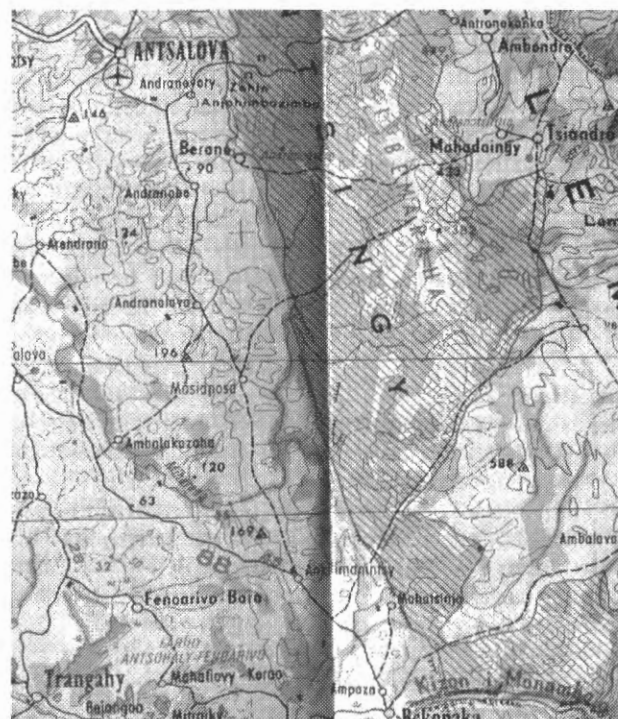


A zebu cart on a downhill run. (Photo : Arthur Clarke)

limestone: the more accessible smaller area of low relief Petits Tsingy in the south adjacent to the Manambolo River and the more extensive higher relief Grands Tsingy further north, where limestone pinnacles are reportedly in excess of 100m high. Surrounded by vast stretches of open savannah grassland, parts of the Tsingy de Bemaraha bear a distinct similarity to the sharply fluted outcrops of limestone in the Gregory National Park of Northern Territory.

Our filming expedition had deliberately chosen to arrive there in early May - at the end of the wet season - to maximise the possibility of documenting as many native plants and animals as possible, while deciduous plants were still in leaf and animals were active or thriving in the wild. However, on the down side of the equation, it was also a time when many roads were only accessible by walking or zebu cart. Most of my time away was spent in the Tsingy de Bemaraha Parc National (National Park) of western Madagascar - a world heritage area - where

sapling-stick walled, grass thatched roof houses north of the Manambolo River. Initially based at the Auberge des Tsingy de Bemaraha - a fairly basic, cheap type of hotel with poorly ventilated rooms - designed for back packers or trekkers... we had few if any comforts, no power, a squat hole above an open pit for the toilet and the shower was a bucket of cold water with a bowl to splash yourself. (Since it was still considered the wet season, when tourists or hotel patrons are very scarce, the hotel manager was absent). The Auberge was about 2.3km west from the Petits Tsingy - an area of dissected plateau karst with the eroded tsingy karren surface - lying adjacent to the Manambolo River, which in part runs through a



*Tsingy map (Antsalova to Bekopaka).
(Photo : Arthur Clarke)*

there is an extensive area of severely eroded limestone pinnacle karst with its own unique endemic flora and fauna. As shown in the accompanying map (Fig. 1), the limestone runs north from just south of the Manambolo River east of Bekopaka, extending 130km north towards Antsalova in a broad band up to 15km wide east-west. Although relatively flat bedded, the limestone has been structurally altered over time, as evidenced by the numerous faulted sections (uplifted massifs of limestone and grabens); it is also strongly jointed, giving rise to the presence of maze structures with many narrow fissures or canyons (referred to by the French as "diacalse/s") - many are considered as roofless cave passages - plus cave systems with their white walled maze passages and large chambers, sometimes containing thousands of bats.

Bekopaka and the Petits Tsingy

We started our filming programme in western Madagascar, based at Bekopaka - a small village of 50-60 mud or We We commenced the first part of filming for the documentary in the Petits Tsingy and after a long walk through the forested tsingy guided by an ex-patriot French speleologist (Jean-Claude Dobrilla), we came to our first cave: *Anjohy Manitsy* (Cold Cave). It was the only dry cave we visited and it was the first and only time I was asked to handle snakes. While being filmed in *Anjohy Manitsy*, I became quite agitated and upset when blood spurted from my fingers after being



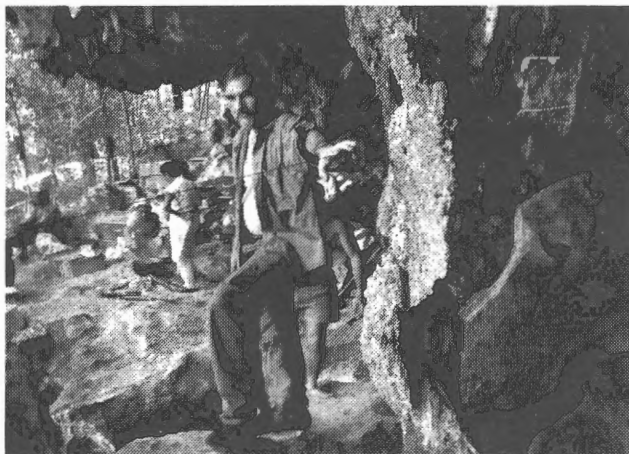
Steel-wheeled zebu cart leaving for Grands Tsingy.
(Photo : Arthur Clarke)

bitten by an aggressive male colubrid snake; I had been previously (wrongly) told it was venomous! For much of our remaining time at Bekopaka and in the Petits Tsingy, we experienced heavy rainstorms and spent time being filmed in our individually tailor made wet suits often sitting on inflatable U-Boats (See front cover photograph). Filming occurred in several locations: the flooded canyons of the *Circuit Touristique Tantely*, then amidst the calcite rafts in *Anjohy Rana Manga* (Blue Water Lake Cave) and on *Angidina Farihy* (Dragon Fly Lake) which is surrounded by very sharp and abrasive tsingy limestone. Although this latter setting was quite picturesque - and gave us our first view of lemurs gallivanting in the trees beyond the lake - it was quite uncomfortable, as the daytime temperature reached a scorching 44degrees.

In just the second week of May 2003, the wet season was still happening: there was no ferry service over the Manambolo River (you had to cross with dugout canoes) and most of the roads were still impassable to anything other than zebu carts. These zebus seem to be everywhere in Madagascar; they are their equivalent of our beef cattle, with a conspicuous hump on their back like Brahmins, but their broad and erect horns make them appear more akin to what we would call buffalos. Zebus are often harnessed to pull steel-wheeled, wooden framed carts which the French call "chariots", so apart from walking and carrying your own equipment, the only available transport north from Bekopaka to the Grands Tsingy (our next filming site) was via zebu carts. In order to avoid too much walking in the heat of the day, we were woken at 0445am for an early breakfast and our cavalcade of heavily laden zebu carts and 15 personnel on foot departed around 0600am, just before daybreak, with everyone walking except for our elderly entomologist: Andre Peyrieras. (Andre was the entomologist featured with his butterfly collection in the well known 1987 *National Geographic* article on Madagascar.) It took over five hours to reach the end of the zebu cart track: walking under forest, wading through rivers, passing small villages and worst of all traversing the open savannah grassland in the heat of the day, trying to ignore the pesky grass seeds that penetrated your socks and boots. Our eventual campsite was another 45 minutes walk further on and as we puffed and panted going up and down three steep limestone hills, I began to regret having lugged in my heavy laptop computer!

Filming our documentary in the Grands Tsingy of Bemaraha

Situated some 17-18km north of Bekopaka, our camp site was in a forested canyon, probably a fault graben (walled by outcrops of sharply fluted tsingy limestone). There was a small stream running through the flat-floored canyon which was sheltered to the point that only filtered sunlight could penetrate the tree canopy: also the route for several teams of lemurs that regularly traversed the area late every evening. The raucous sound of screeching lemurs was heard every night and often woke us up; in the daytime we constantly heard the melodious tones of the Tsingy Love Bird ("vorondreo" in Malagasy). All the film crew and scientists had individual tents; the Malagasy people including our Bemaraha Parc guides and the kitchen hands slept in shared tents. For ablutions, we had two separate 4 unit shower blocks (using bucket of water and bowl to splash yourself) and two proper toilet bowls



Arthur Clarke at cave campsite. (Photo : Arthur Clarke)

connected to a purpose built bush septic tank (flushed with a bucket of water). A naturally positioned smooth sloping slab of limestone in the stream bed acted as a convenient laundry/ clothes washing place.

On one side of this canyon, elevated above the forest floor, a semi-circular cave entrance overhang was converted to be our communal camp site. We ate our meals in a dining area complete with table and benches made of Malagasy mahogany that adjoined the food store area, a kitchen (with open fire and gas stove), an elaborate water filtering system, camp hardware, equipment store, a battery charging area and further along near the generator site: a filming laboratory. This campsite filming area was quite elaborate with a large sheet of laminated seven-ply bolted on to limestone blocks to form a level table base complete with flexible optic fibre lights, microscopes, endoscopes and elaborate macroscopic filming devices with joystick control, telescopic and swivel mounts, various clamping devices, aquariums, terrariums, plus preview monitors, editing monitors and associated filming facilities. Beyond here was the sound-muffled area where two petrol driven generators were housed beside another flat area where the odd duck, chook (chicken) or turkey lay in waiting (with their feet tied) feeding on kitchen scraps before going into the cook pot. We even had our own camp pig and produced our own bacon.

Zoe Ranaivo - a Malagasy lady from Tana - was our camp cook: (she is also a Professor of Language Studies and Communication in the Faculty of Letters at the University



Long-stemmed red flowers of *Euphorbia*.
(Photo : Arthur Clarke)

of Antananarivo.) Our diet at the new remote base camp site was initially very good with a range of vegetables and fruit brought in from Tana, together with locally derived supplements. At this dining /kitchen site, we were often visited by scantily clad local Malagasy people from nearby villages: the women carrying their infants and woven grass baskets; the men had spears, machetes or knives and honey pots. They were either trying to sell us their bush honey, assorted livestock, baskets of bananas and papayas, or bringing their children in for medical treatment. Like many rural communities in the world, it doesn't take long for the local "bush telegraph" to spread the word, in this case that our filming expedition included a doctor and a Malagasy nurse. After the rush of good living for the first week or two, the diet became less nutritious: degenerating to just rice or noodles with meat, but very few if any vegetables. However, we had a reasonable supply of papaya, bananas and very seedy green oranges from the nearby villages. During our third week at the Grands Tsingy campsite, the forest stream stopped running.

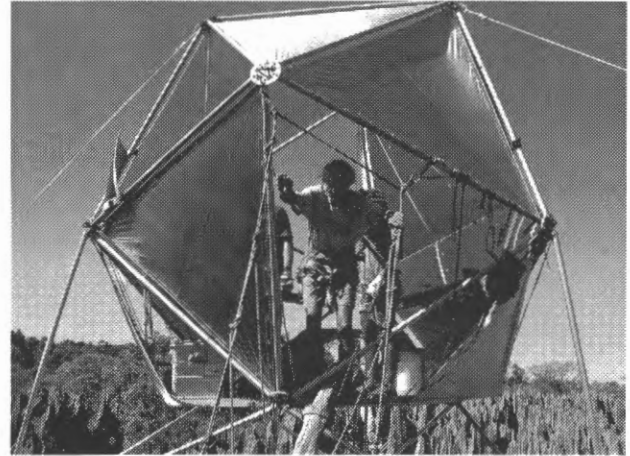
Although some Malagasy language was spoken by a few locals, most of the campsite conversation was in French, so this was the major disappointment for me about



Olivier in Paraglider with camera.
(Photo : Arthur Clarke)

our expedition, with so much French being spoken, I felt a bit ostracised, missing out on information and/or instructions, let alone what was happening for the next day's filming.

Madagascar is already known for its diversity of flora and fauna, where there are many unusual and endemic species in a variety of biogeographical regions. Although



Jean-Claude preparing to exit IKOS.
(Photo : Arthur Clarke)

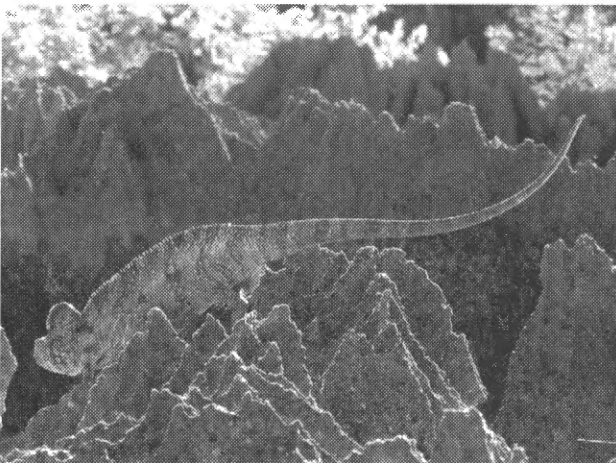
the rainforests of eastern Madagascar have been savagely depleted and the soil loss from erosion in deforested or agricultural areas is evident from the abundance of erosion gullies and the tan-orange coloured floodwaters of rivers and streams in the wet seasons, there are still a few near pristine areas with original flora and fauna. Some of the more pristine areas are located further away from major population centres, particularly in the more arid areas of southern and western Madagascar, including the tsingy limestone areas such as Ankarana (in the north) and Bemaraha which are virtually arid most of the year, particularly in the dry season. This was now winter in western Madagascar... the dry season, where many trees are losing their leaves, creeks start to stop flowing, roads and tracks revert to being muddy quagmires or hoof-holed, ankle-twisting hard crusty surfaces and the daily temperatures average between 35 and 44 degrees C. Though poorly funded and often not yet adequately researched, some of these more natural arid areas in Madagascar are now protected by a system of national parks and reserves. As shown in the Tsingy de Bemaraha, this "arid" flora typically includes cactiform succulents such as *Euphorbia* and *Cynanchua*, numerous bulbous stemmed plants or trees that hold water in their internal pith (e.g., *Pachypodium* and *Adenia*), the many thorned, narrow or spiny leafed xerophytic or xerophilous species (*Pandanus* and *Dracaena*) and the leafless plants such as *Conniphora* with photosynthesising trunks and branches.

Titled: "Voyage au Centre de la Pierre" (Journey to the Centre of the Stone), our documentary had its own storyline, including a number of pre-conceived notions, such as the use of a motorised paraglider to film the tsingy limestone, its canyons and flora from the air. Another novel aspect of our documentary was the "IKOS" - a specially designed, thermally insulated globe shaped structure, fabricated in the style of a geodesic dome that functioned as our field laboratory. Situated at a relatively exposed site with supporting struts and guy ropes anchored into the tsingy limestone, it was positioned in a manner to be suspended over a cave entrance (albeit a 35m deep and narrow grike). Three of us: our resident speleologist Jean-Claude Dobrilla



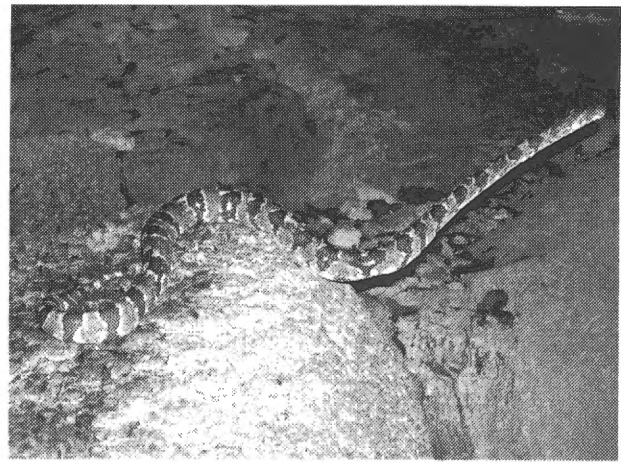
Head and forelimb of sedated Malagasy Mongoose.
(Photo : Arthur Clarke)

(who works at the Bemaraha Parc) and two scientists - a young herpetologist from Tana (Jasmin Randrianirina) and myself as cave biologist - were variously filmed abseiling from the IKOS and prussiking back up. The IKOS was designed to depict us as scientists operating in the field, conducting various experiments on the solubility of the limestone and chemistry of the groundwater, as well as filming some of the tsingy flora and fauna. (The IKOS could accommodate up to four people at a time, sleeping in hammocks where you were strapped in for extra safety, but it was very cold at night and was a popular place for mosquitoes!) In addition to our SRT activity, the three of us were joined by expedition botanist (Jean-Jacques Delavaux) and again with cameras rolling, we were filmed climbing sharp exposed limestone flutes and performing Tyrolean traverses on doubled ropes suspended between tsingy pinnacles across a 10-12m wide deep canyon with the "Belvedere" (Tsingy de Bemaraha high point) as a backdrop.



Chameleon(*furcifer oustaleti*) on tsingy.
(Photo : Arthur Clarke)

Our film director's brief was twofold: firstly looking at the evolution of the species living in Madagascar and more particularly in the Tsingy of Bemaraha and secondly, to study the relationships / oppositions between two ecosystems at the same location: the hot and dry desiccating environment at the surface and the fresh or moist to humid, more constant temperature region in the cavernous depths below. Given that the Tsingy de Bemaraha has a unique array of endemic flora and fauna, there were many species of plants and animals that were on our hit-list as a "must see". As specialists in our respective fields, we were requested to sample, capture or locate sites where various noteworthy plants



Boa *Madagascarensis* reaching out for a bat.
(Photo : Arthur Clarke)

and animals could be seen *in situ*, filmed in the IKOS or at the campsite filming laboratory, prior to release into the wild again. Some of these captured animals were sedated first to make them docile, so they could be filmed more easily before scampering off into the forest or across the tsingy. Amongst the four-legged animals that were caught in pre-baited cages or pitfall traps, we saw three types of mammals: the Ring-tailed Malagasy mongoose (*Galidia elegans occidentalis*); the smooth-haired (mouse-sized) insectivore (*Microgale* sp.) and the rarely seen Madagascar fosa (*Cryptoprocta ferox*). Not to be confused with the Malagasy civet or Fanaloka (*Fossa fossana*), this Madagascar fosa is an arboreal and ground-dwelling carnivore with a large vaguely cat-like body, but a dog-like face, long whiskers, very long tail, short legs and long claws. In the distant tree canopy, we saw and filmed at least three types of lemurs including the black-faced, white-bodied Sifaka, the western



Human remains with sapling and vine surrounds and honey pot. (Photo : Arthur Clarke)

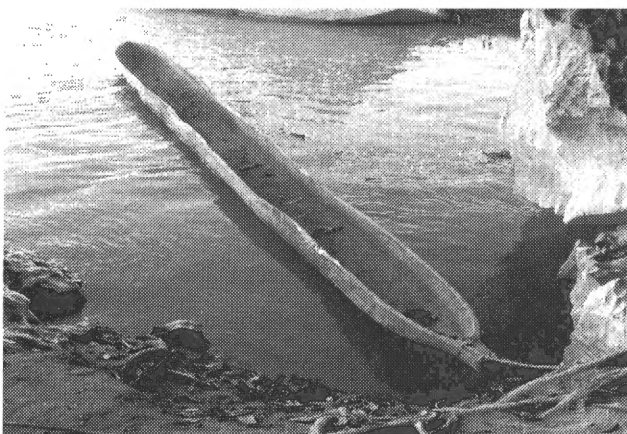
avahi (*Avahi occidentalis*) and the tiny nocturnal lemur (*Lepilemur edwardsi*). There were lots of chameleons including the endemic *Brookesia perarmata* and species of *Calumna* and *Furcifer*, one of which we saw swimming in a lake. Lizards (e.g., *Oplurus*), various *Mabuya* skinks and geckos (the miniature *Lygodactylus* and larger *Phelsuma* day geckos) were seen basking on limestone outcrops; various species of snakes (Boidae and Colubridae) were seen in the forest or in caves, where frogs (mantelids and ranids) were also common. A single turtle (*Pelomedusa subrufa*) was found near one of the very few Grands Tsingy perennial lakes. There were numerous invertebrates (too many to list here), on the surface and in the caves, where tiny insectivorous bats (microchiroptera) and a few giant fruit bats

(megachiroptera) were also observed.

From a brief overview of the very few caves actually visited in the Grands Tsingy, it appears that there were two main types of cave ecosystems in the Tsingy de Bemaraha. Firstly, those where the dominant source of energy (or nutrient) was derived from organic matter falling from the surface or washed in by streams and secondly, those caves with colonies of bats and their vast amounts of guano supporting a range of small guanophiles and larger invertebrates such as cave scorpions, spiders, centipedes and butterflies, plus a few frogs and snakes: e.g., *Boa madagascarensis*. There were quite different species assemblages in both types of cave ecosystems with harvestmen (Opiliones) and beetles (Coleopterans) being amongst the dominant small macro-invertebrate species in the stream caves and pseudoscorpions as the dominant small species in the bat guano caves.

As another of many highlights in the Grands Tsingy - which is now being developed for tourism - I was fortunate in being able to see and photograph a number of archaeological aspects such as the gigantic 10-15 litre capacity egg of the extinct Malagasy elephant bird: *Aepyornis* (a "cousin" of the extinct New Zealand *Moa*), the sub-fossil remains of a 1000-2000y.o. *Archeolemur* and several cultural sites with ancient fire hearths. I was extremely privileged to be invited to see a relatively pristine or undisturbed site with Vazimba "tombs" where the bodies of Tsingy forest honey gatherers had been laid to rest in a sheltered, dry and secluded cave overhang. Earlier in the day, we had also seen the remains of some old elevated bedding structures where poles had been lashed together with vines to form a frame on which slabs of bark had been placed. At the relatively inaccessible tomb site, Monsieur Ramilisonina - the film expedition ethno-archaeologist - estimated that the bodies were around 300-400 years old based on factors related to the condition and surface staining of skeletal material plus associated artefacts, and the degree of decay (or rot) of the coffin wood.

Some bodies had been laid to rest in simple coffins made from two hollowed tree trunks placed under and over each body; other bodies were simply wrapped in sticks or vines and supported by slabs of limestone. The adults had been laid to rest face up with honey pots beside their



Dugout canoe on Manambolo river.
(Photo : Arthur Clarke)

heads (skulls) and the children laid to rest (without honey pots), but with their heads on their side and a rock lying against their skull to simulate lying against a pillow. One adult was obviously a woman: she had been laid to rest with a copper bracelet still on her arm, a necklace made of small teeth and the bodies of three small (infant) children, including one that was probably a baby. No doubt this site

will not be open to tourists. Although still referred to as Vazimba people, there is some growing awareness in the villages that neighbour these "tomb" sites (e.g., Bekopaka) that the human remains in the burial sites are probably the ancestors of modern Malagasy people from that same general area... being villagers who simply went "bush" to escape life in the villages for whatever reason... maybe due to disputes with other villagers or to escape the wrath of feudal village chiefs or village bosses or whatever.

Back to Bekopaka and the Petits Tsingy

Our scheduled filming programme finished on the same day that our campsite stream dried up. We left the following day... another pre-dawn departure, leaving Florent and Zoe, plus some Malagasy villagers to dismantle the site that had been our home for the past three weeks. Returning to the Auberge at Bekopaka, where the manager was now resident and seat-less toilets were functioning, it became apparent that there were now actually more participants present than spaces on the departing plane, so I was given an option to stay a bit longer and see a bit more of Madagascar.

Following our wonderful experiences in the Grands Tsingy, I spent a few more days in the village of Bekopaka, waiting for the return of Florent and Zoe. Every day



Looking up at Baobab trees in Petits Tsingy.
(Photo : Arthur Clarke)

seemed to be market day, where villagers displayed their goods in street side stalls and there was an array of colourful traditionally decorated *lambas* (wrap-around cotton sheets) that are worn by both men and women. It was around the time of International Environment Day and the local school teachers were advertising the event to children and adults in a concrete grandstand at the village soccer ground, adjacent to the video (cinema) centre. The event was attended by local staff from the Bemaraha Parc (ANGAP) Programme and the administration centre for ANGAP (Association Nationale pour la Gestion des Aires Protégées). Translated as the National Association for the Management of Protected areas, it is an autonomous (non-governmental) Malagasy organisation established to administer the parks and reserves in Madagascar. On this occasion, the nearby Tsingy was being promoted as an example of a special environment that had to be protected and preserved by the villagers. To commemorate International Environment Day, some school children in Bekopaka were dressed up in "costumes" made from the dried stalks of maize plants and banana leaves.

Since the Petits Tsingy was close by to Bekopaka, I did one of the ANGAP Programme guided trips for tourists: the 5 hour long Manambolo River gorge trip via dugout canoe going upstream, then the return walk overland through the tsingy plateau. The park entry fee cost 50,000Fmg (Malagasy francs) - equivalent to \$13.30 AUD - and is valid for three days; the two dugout canoes (one for me and one for the guide) cost another 20,000Fmg (\$5.30) and the English-speaking Malagasy guide: 30,000Fmg (\$8.00). The guides have to wait all day at Parc reception, on the off chance that a punter (tourist) comes along, but they only get paid (once a month) for those guiding trips they are allocated. Once aboard our two *lakas* (dugout canoes) - both loosely tied together to give added stability - the guide detailed all the park rules, many of which were commonsense or designed to help maintain the near pristine state of the area. First and foremost amongst the rules, it was *fady* (taboo) to use your finger to point; you had to use the knuckle of your forefinger! Our canoe man was initially paddling, and then poling as we progressed upstream into the faster flowing, shallower waters of the Manambolo River where the sculptured white cliffs of limestone were a marked contrast to the tan-orange coloured river waters. In fact, "*manambolo*" means "having red colour" in Malagasy, and also means "that if you work here, you will have money". You leave the dugout canoes to visit two caves on the southern side of the river, and then further upstream the canoe stands idle for you to view a distant Vazimba tomb site in a cave overhang, where there are reportedly the skeletal remains of about 40 bodies in rotted coffins. (These caves and the tomb site had been previously explored and surveyed by Greg Middleton and others during a speleo-biology expedition here in 1995.) On the long walk ashore after departing our dugout canoe, I was guided up through a dense forest of palms and massive jungle vines to the Petits Tsingy limestone plateau, with a detour to the Manambolo Gorge lookout. The remaining walk takes you past more razor sharp tsingy limestone flutes, then over the inclined and dissected limestone plateau (stepping over *diacalse* canyon rifts) and into sections of forest... where I saw my first giant Baobab trees, the tiny nocturnal lemur and a smoked stained cave overhang with ancient fire hearths and charcoal pictograph drawings on the cave walls.

During this time at Bekopaka, I had discussions with the ANGAP Chief Conservatoire/ Botanist for Bemaraha (Monsieur Herilala), providing a detailed written explanation for the formation of karst and reasons for the development of the tsingy: the limestone chemistry and physical properties; limestone structure (bedding and tectonic alteration); the roles of soil cover, vegetation and solution processes; plus the significant effect of past and present climate, particularly rainfall. After describing aspects of the cave ecosystems in the Bemaraha Parc and the species diversity therein, Mr. Herilala expressed a keen interest for me to return in mid-April next year to do a more comprehensive cave fauna inventory. Although it will be possibly a good time for some cave animals, with the problems of access due to wet season (active stream levels and inaccessible roads), I am not convinced that it will be the best time for me, especially since it will be very hot and humid. However, it may be practical during that time further north - in the Berano area southeast of Antsalova, where there are better access roads and some larger more ventilated cave systems. I have also been tentatively invited to join a speleological / archaeological expedition around September 2004. Most tourists visiting the Petits Tsingy and southern reaches of Grands Tsingy, access the area from Morondava on the

west coast of Madagascar, located some 220km SSW of Bekopaka; you travel north via Belo in a hired 4WD vehicle with a tourist guide. (Incidentally, when you hire a 4WD or any other vehicle in Madagascar, you also hire the driver who may also act as your tourist guide.)

Return to Antananarivo via Belo and Morondava

When Florent and Zoe finally returned from our Tsingy campsite, this southern route to Morondava was the first leg of my long 900km journey back to Antananarivo. The film expedition equipment was loaded on to another cavalcade of zebu carts and our personal luggage was carried by porters; everything was taken up to the Manambolo River crossing, unloaded from the carts and placed on dugout canoes to cross the river... then transferred into the back of a 4WD Mercedes truck. It was a horrendous journey traversing some of the roughest roads I have ever experienced! The three of us (Florent the provedore, Zoe the cook and Arthur the Tassie tourist) sat awkwardly in the back of this truck (without a view) with our luggage and equipment swaying to and fro, falling around us, for the afternoon/evening drive to Belo, where we finally arrived at 10.45pm, finding the front gates of the Menabe Hotel had been bolted and locked up for the night! Our morning view showed Belo to be a picturesque town full of coconut palms and banana trees. It is evidently a very windy or cyclone prone area where corrugated iron rooftops are held down by large boulders and concrete blocks. After breakfasting on giant prawns washed down with black coffee and condensed milk, our truck was loaded on to a pontoon raft for the 3/4 hour trip upstream along the Tsiribihina River. Disembarking on the southern side at Tsimafana, we were met by Malagasy gendarmes before continuing south along somewhat better, but dusty and sandy roads eventually arriving in Morondava around mid-afternoon and just catching a glimpse of the magnificent trunks of Baobabs as we drove on the last section of sandy dirt road before the bitumen started.

Morondava is an attractive setting: a tropical paradise with coconut palms, bananas and papayas; however, the near pristine white sandy beaches are being heavily eroded by the sea and cyclonic storms - coming in from the Mozambique Channel. In Morondava we had to wait around for another truck to transport ourselves and equipment to Antananarivo. The first truck arrived next day, but there was only room for half the equipment, plus one person as a passenger, so Florent left us and Zoe and I waited... and waited for the next truck to arrive. One afternoon was spent in a hired 4WD going back out along the road towards Belo in the late afternoon to see the renowned twisted twin Baobab (in the Bemanonga Forest Reserve) and the "Avenue of Baobabs", to photograph the pictorially famous pink sunset colours on their trunks. Although it sounds luxurious being able to lie in a hammock under palms in a tropical paradise or sit around on deserted white sandy beaches watching Malagasy fishermen returning from the sea with their catch... it wasn't really my "cup of tea"... I was itching to see a bit more of Madagascar and spend some time in Tana (Antananarivo). Five days after arriving in Morondava, another truck with a forty foot container eventuated and the remaining equipment and our luggage was loaded, but the truck wasn't leaving until it was filled up! Combined with the fact that I was running out of money and had just lost some karabiners, some recently purchased wrap-

around *lambas* and a pair of unwashed slacks, when my caving sack was opened up somewhere between our hotel and the office reception of the downtown Hotel Continental... I decided it was definitely time to leave and headed for the bus station, situated rather inconveniently on the northern outskirts of Morondava. Leaving Zoe behind to fend for herself, I arrived in time for the scheduled midday taxi-brousse to Tana (a very small 12 seater van)... but I was the first passenger there and the taxi-brousse simply waited till it was full. The off-season bus fare was 90,000Fmg (\$24.00 AUD), some 50% more than I expected, based on the price quoted in the May 2001 edition of the Lonely Planet Guide. With luggage and freight tied down securely on the roof, the taxi-brousse eventually left around 2.15-2.30pm (with 14 passengers on board) for the 680km (15 hour) trip to Tana: with the same driver all the way, playing raucous pop music to keep himself awake!

Apart from the vast gaping potholes, the road east from Morondava to Mahabo and Malaimbandy (176km) was mostly sealed as we travelled at breakneck speeds, weaving around potholes, tail-gating other buses and careering past all manner of slower vehicles. Between Mahabo and Malaimbandy, there was an interesting contrast between the feral eucalypts along the roadside near villages and native cabbage-tree palm "look-a-likes" in the distant savannah. North from Malaimbandy, the road was generally unmade and bumpy for the 125km to Miandrivazo where we stopped in the town centre amidst rickshaws for a late evening snack. With loud music in the background and rough roads, it was a sleepless night for me in this cramped and uncomfortable taxi-brousse to Tana (obviously built for short-legged people). The next section from Miandrivazo took us 246km east on steep and winding roads to Antsirabe (with a "pitstop" on frost-covered roadside grass), then the final 133km north to Tana where we arrived in the shivering cold darkness around 5.00am at a bus station beside the bustling town market. On my first night in the capital, I was invited out to have a few beers in downtown Antananarivo with Dr. Richard Jenkins: a Scottish guy doing a post-doctorate study on the bats of western Madagascar. Richard was leaving next day for a 3month field trip, so despite my weariness, I was keen to catch up with him. But, unfortunately - perhaps because of tiredness - I did not take due care of myself and my pockets! After we emerged from our taxi in central Tana, we were mobbed by about 7 or 8 street kids, who formed a tight pressing enclosure around us; while two of them distracted us with their carry trays of chocolate and "bootleg" cigarettes, others had their hands in our pockets in a flash, so I lost some small money (equivalent to about \$4-\$5.00 AUD). Then later the same evening - while indulging in the local brew of Three Horses Beer in an up market bar (Buffet de la Jardin) - I was relieved of my wallet containing credit cards, money (I had just cashed my travellers cheques), licence, university ID card etc. and other valuables.

Without any money, credit cards or other ID (apart from my passport) and unable to pay my hotel bill, I only just got back to Australia by the skin of my teeth, courtesy of the Air Madagascar boss in Antananarivo, and subsequent magnificent response from Qantas and South African Airlines in Johannesburg who gave me an airport food voucher, plus a very comfortable and relaxing First Class seat (indeed, a bed!) for the flight back from Jo-Burg to Perth.

Footnote...

Aside from my mishap in Tana, I was probably somewhat at a disadvantage in Madagascar, because I could not speak neither the local Malagasy language nor French. Aside from that - as an overview - I have to say that as a third world developing country, Madagascar appears to be in a state of chaos, particularly in regard to much of its infrastructure, especially related to the general lack of communication means, organised transport and roads that you can be transported along. Life in Madagascar was generally a lot more basic and a lot less advanced than in SW China and the level of poverty was certainly more pronounced. I would like to have thought that my stolen wallet went to someone who was poor, but I suspect it was taken by professional thieves. In western Madagascar, there were no phones, no television, no computers of course, no digital watches, very little electricity (except for occasional personal generators) and no cold (or warm) beer!

Apart from capturing various images of the cultural aspects of village life and housing, with the Malagasy people of various ethnological backgrounds (the early Vazimba, or the later Indonesian, Malay, African, Arabian and Indian) in a few parts of Madagascar, this experience in the Tsingy de Bemaraha provided an unique opportunity to photograph or film aspects of a near pristine environment. I managed to take around 4,000 digital images and the cinematographers took 2200 minutes of film (55 x 40minute cassettes) which will be edited down to produce a one hour long documentary. I have been promised two copies of the film and look forward to screening it at the next ASF Conference happening at Dover, in southern Tasmania (January 2005).

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Slippery When Wet:

Cave Diving in New South Wales (part 1)

Jenolan
Keir Vaughn Taylor

(Introduction)

Cave diving by members of ASF over the years has reached new depths. Keir Vaughn-Taylor an ASF member and cave diver of SUSS sheds light on some exhilarating dives between 1995 and 2003. Over the next issues, Keir shares with us the excitement of finding new underwater passages and the heartache of leaving unexplored passages till next time.

Slippery When Wet

Cave diving in New South Wales

1. Jenolan - Mammoth cave, Slug Lake, Lower River - South of Grand Arch
2. Wombeyan caves
3. Yarrangabilly caves
4. Cooleman caves

Those on more than three trips:

Ron Allum, Dave Apperley, Paul Boler, Jason Cockayne, Ian Cooper, Mike Curtis, Jarn Hodson, Phil Maynard, Iain McCulloch, Rod O'Brien, Greg Ryan, Richard Taylor, Keir Vaughn-Taylor, Ian Vickary, Dave Walton. Alan Warild

1. Jenolan

Mammoth Cave
Slug Lake, Lower River

It's a trip that gives the beginners a challenge. So many times have we done the trip into Mammoth now and any innovation that might make the journey easier is being tried. We have tried running Tyrolean traverses down the main entrance cavern of Mammoth to the first squeeze at the jug handle. Going down with all the gear hung on pulleys is fast and justifies the set up time but hauling it is slow going back up. Although it is fun to play with ropes the effort is probably not worth it, unless there is lots and lots of gear such as when doing the helium dives.

When going to Slug Lake we rig another Tyroliennes to transport gear across the river and up in the top of the rift passage and on the other side. This rope trick saves heaps of time making the trip safer and also protects the cave from unnecessary wear and tear.

We now know that Lower River comes out in Slug Lake just under the surface at 6 metres depth. The water filled cavern right under Slug Lake is big and drops mysteriously over boulders and a silt floor in what might be a drowned inflow chute. At 30 metres depth it's definitely a phreatic tube with a flattener called the Portal, leading the way on and

taking the entire flow from Lower River. The Portal is wide enough but not very high and for the dives with numerous side-mounted tanks negotiating its confines becomes increasingly difficult with more tanks. The flattener opens into the side of a huge underwater body of water and this exploration is only just beginning because it is an immense task.

Rod made some rough sketch maps of the lake based on line lengths and rough compass bearing but so far the maps only show fragments of a perimeter that is starting to look very big. To the right of the Portal the bottom rises out of the lake to a fairly large air chamber that rises straight up into a passage that disappears into the roof. This chamber has been called Gargle chamber because it appears as though looking up a throat while floating in a stomach.

Despite making the journey to Slug Lake with full dive kit many times we have only just started to explore what is there. The lake extremities have many tunnels, some of which go very deep.

Ron Allum's dive to 95 meters in one chamber. At his greatest depth where the line is now tied off he was at the apex of a vaulted chamber and no sign of the bottom.

Dave Apperley has been trying to use mixed gas using a rebreather to explore this area. Rebreathers are light to carry, they give enormous advantages with mixed gases but come with a whole range of technical problems and potential dangers. Dave uses an Inspiration rebreather, which has a high profile when mounted on his back and Dave has so far been unable to pass the thirty metre deep squeeze with it. He has spent some time excavating the Portal but has talked about modifying the rebreather's construction to create a side-mounted version.

Al and Rod have made three of trips to Slug where Al has made climbing attempts on the smooth walls of Gargle Chamber. With climbing aids he has progressively made progress to places that seemed like they had leads going off to the side. There is one more climb needed in the chamber to investigate a potential tunnel in the roof.

Fate can intrude in when you least require a change in life style. Al being a keen cyclist had his enthusiasm diminished after a motor vehicle careered through a red light collided with a second vehicle and then jointly collided with Al as he stood on the pavement waiting

SLIPPERY

for the lights to change. His little project is waiting for his full recovery.

I have been on nearly every trip to Slug Lake and to be frank, I have lost some of my shine. Despite quiet excitement about the monster we have discovered I was attracted to in exploring easier possibilities. Lower River is one of the obstacles on the way to Slug Lake and is significantly less distance and holds a great promise also.

The source of Lower River is a mystery. Surface water sinks in McKeown's Valley three kilometres north but between where the water sinks and where it appears in the depths of Mammoth Cave nothing of it course is known. There is likely to be a great deal of cave between but so far no one has found it.

The SUSS yellow Mammoth Book speaks vaguely of a report from 1938 describing a drought where persons were able to make distance upstream in Lower River negotiating two low roofs and being stopped by a third. Campfire rumours tell of signatures left on the cave walls at this unreachable point. I have never, ever, seen Lower River stop flowing. While I doubt the truth of these stories, you can never be sure.

Lower River was first dived in 1952 by Dennis Burke. The dive was ahead of its time using primitive but innovative equipment. This equipment used a hand pump to supply a diver, air through a hose connected to a converted gas mask. It had been successfully used to pass the Imperial River Sumps but not without incident.

The prospect of diving into a small watery passageway would weigh heavily on the mind of anyone making an attempt as the bulky equipment was slotted and pushed through the climbs and boulder piles on their way to the dive site. The crowning achievement of the day was that in an "approach-avoidance" activity of Dennis' he climbed the scree/cliff on the other side of Lower River and found a way on that was to end at Slug Lake. The Lower River dive was aborted when beset with technical problems.

In 1973 Ron Allum and Allan Grundy squeezed against the current down a short "pitch" into a chamber. They were stopped at the end of this chamber by a further horizontal squeeze. Ron wrote that he was bombarded by gravel carried along in the high velocity water, which smashed into his facemask. As Allan Grundy was extruded back out of the squeeze he lost his facemask and I imagine, was somewhat chastened by the experience. I note that these days, Ron always carries two masks.

Al, Greg and I carried gear to Lower River where Al and Greg dug out the first squeeze underwater. The idea was to spend the entire dive making this squeeze safe. The water pressure was high and gravel spun off in all directions catapulted by the invisible water force.

A PVC scaling pole was pushed down the pitch and used to clear some rubble and help the divers progress against the current. The two worked in tandem bulldozing gravel backwards. There was lots of wombatting about and re-arranging to make the squeeze as safe as possible. The force of the water was too great to proceed wearing tanks so they were taken off and pushed ahead. If dry, the room beyond would be just walkable. Another

squeeze sited down the passage was left for another day.

Derek and Mick from the Sydney Uni Dive club joined us to see what we do. It may have been a novel experience for them to witness these bizarre goings on. Phil Maynard organised a day off and also joined us. We had enough person power to transport gear for 3 divers to Lower River. With the familiarity of this journey it now takes less than two hours to get there.

Iain McCulloch kitted up first. The water flows into a small chamber half filled with water that turns at 90 degrees into a steep gravel embankment held in place by water pressure. The squeeze between the gravel embankment and the roof is tight and made harder to negotiate against the strong upward welling water.

Iain took one of his tanks off and lay it to one side. He was able to push through into the room beyond where he then pulled his parked tank down into the hole. Off he went! As I waited the water would turn brown as Iain rummaged around in the top of the rift where a surface had formed. He was looking for signatures written on the wall but also wanted to make his way on. There was no sign of signatures but being task loaded with lots of wall to search a small pencil written signature could easily be missed.

Giving up on the muddy surface room Iain proceeded some distance down the tunnel, making tie offs and squeezing along a rift passage that is trended along a compass bearing of 320 degrees. Iain returned after thirty minutes cold and shivering. It was Al's turn.

He is a bit bigger than Iain and found that he couldn't penetrate the first squeeze against the water pressure. I crouched in the water just above the entrance squeeze endeavouring to clear the squeeze further by dragging rocks and pebbles up the slope with a portable shovel bent at ninety degrees. All too easily the stone all cascade back into the entrance. They behaved like a beanbag on heat.

Descending the squeeze passage with a tank as far as possible I found it possible to push river boulders into the room just beyond the pressure tube blockage. The whole slide of rocks would then clatter back up under the force of water. Rocks the size of grapefruits would float back to where you have just pushed them away. I was able to pass back a few good sized rocks clearing the way to some extent and then Al who is smaller than I had another go.

Passing the pressure squeeze is only possibly using one tank. Once in the room beyond Al pulled his second tank through using a rope that is tied between the two sides of the squeeze. He clipped his second tank on and proceeded across the chamber along the slotted passage and down a narrow rift

There was no obvious sign of signatures written on the wall but he only had a limited amount of time and wanted to make his way on.

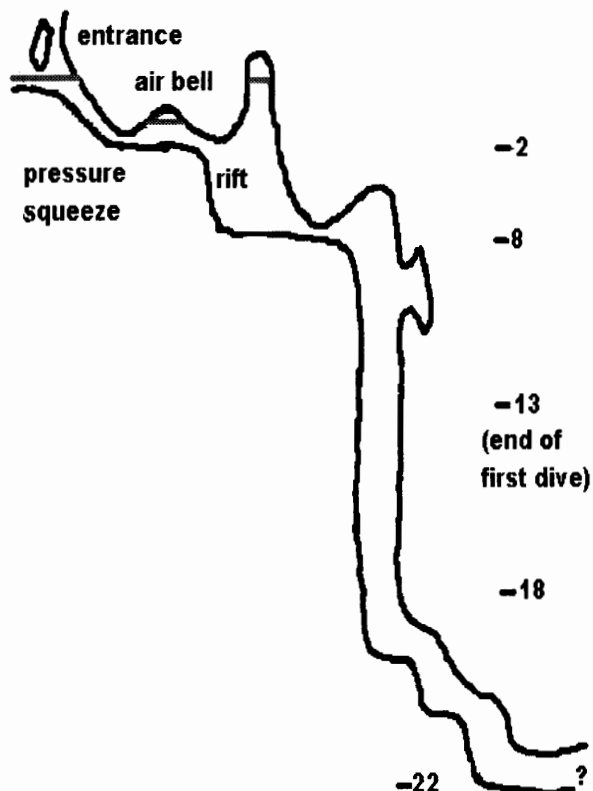
The rift is quite narrow but has a large extent in the horizontal plane. Iain had done quite well with his tie offs and seemed to have found the best route to

squeeze through some of the places where the rift walls squash against your chest and back. The rift's widest part springs open at its flat bottoms and in a horizontal swim through passage. The passage passes through a low arch in a room where a vertical tube spills water flow of formidable force.

The limestone at the vertical tubes edge is sharp and clean with nowhere to tie off.

Al dived headfirst down the passage but there is no room to turn round. The water pressure buffets tanks and gear. At one spot there is enough room to slide legs into a narrow horizontal offshoot and execute an ungraceful turn. This was good for Al, having found the turbulence of the water disconcerting. His tanks were banged about and onward progress was literally an underwater climb.

Some distance down the shaft, the undesirability of a water powered return journey while upside-down was becoming important consideration in Al's mind. He descended to 14.2 meters depth where he decided to reaffirm his confidence of getting back, by tying off and getting back.



I was to go next but being bigger than Al and Iain, I also could not get through the squeeze. Even with further clearing, I could not quite squeeze through the entrance hole. As I squeezed my back against the roof and chest against the rocks I would be forced back. A dump valve on the back of my buoyancy compensator was jamming against the roof and getting caught. On this occasion I could not get through. There were many hours in the water by all, we were all cold and we were to return another day.

On a later trip with just Al and myself we started intending to go to Slug Lake. Being on our own, the gear transport was slow because the human chain gear passing was just too short. As the time slipped by we

realised that a trip to Slug would take too long so instead we made another attempt at making further distance in Lower River. We had given up using diving fins in the tight passages and the techniques of getting through the water pressure squeeze were well in hand. I was able to penetrate the pressure squeeze and get as far as the top of the shaft. The line down the shaft was cut through and had to be relayed. The dive was amazing but being my first time I spent the time thinking about the tight and difficult exit. It was for Al to push the envelope down the vertical tube in reverse. Again the powerful flow of water in the shaft was intimidating and the view forwards non-existent. Al made it to a depth of 14 meters where the shaft promises to bottom out but the way on is still tight and difficult and insert the wrong way round it is difficult to say what is just ahead. So in review!

How good it would have been to surface to find a nice walk along cascading river passage but Jenolan does not surrender secrets easily.

As the drought bit later in the season we tried again. In theory the water pressure would be lower and the problem of that vertical shaft should be lessened. We put all our money on Rod who is one of the most experienced divers in our group. With this cave dive he was a first timer and this is somewhat challenging exercise. He made the same distance as Al before deciding to return and check his ability in the return squeeze.

We have placed 50 meters of line upstream and the lead is still a good. We have thought about rigging a rope down the shaft to improve control on any ascent but mostly our plan rest on waiting for when the river is down during a dry period. During this time we achieved one dive but the rains now appear to be returning. In essence we have to be able to do this job in normal water flow conditions.

We have searched the wall in the early part s of the dive and made some crude maps from our measurements. The first chamber has an airspace accumulating from air expelled from our tanks but other than this there is no airspace. We can say with some certainty that the story/legend telling of adventurers making it upstream during a drought is false.

Jenolan South of the Grand Arch.

We have connected all the main pools throughout the Southern labyrinths from the Mud Tunnel beneath the Temple of Baal along the main river and out through the resurgences coming out into the Blue Lake. This cave dive from the pools beneath the Temple of Baal through the main drainage to the outside world is a classic.

The path of the River is not the path mapped and shown by sage geologist of last century, Oliver Trickett. He must have puzzled over seemingly isolated pools that rose and fell in some coded sympathy with the main flowing river. We have mapped the whole system except for a few small portions. Phil Maynard coordinated the mapping data and drew up the final map. I was able to present this map for the first time at the Oz Tech diving conference.

The secret of the actual position of the main river

relative to these pools is no longer hidden and indicates new rivers once emerging from under the Lucas Cave.

The last known appearance of the main drain from the South is in a pit off the tourist track in the Mud Tunnels area. When the muddy pool at the bottom was found to be one of the classic dive sites we called it Lethe, one of the other rivers in Greek/Roman legends that flows in the underworld. When first followed the dive ended in two joined chambers. A sloping floor and gravel squeeze marked the lowest point in the floor and blocked the way on.



*Diver following guideline in underwater tunnel.
(Photo Kier Vaughn-Taylor)*

During many dives to this spot we excavated a slot through the loose gravel, down and then up into another chamber beyond. The view of an excavation beginning is awesome. Waiting in the water filled chamber as the lead diver begins sliding gravel to one side gives an impression of a cataclysm. The crystal clear water becomes host to an expanding pyroclastic cloud, growing rapidly appearing like a solid wall about to slam innocent bystanders. Everything goes black and the guideline is once again a divers finest ally.

After wriggling through the squeeze, Lethe connects first into a large room and then onto a long passage that exits into air filled walking passage that is known as the Styx River

The passage at this other end was known as "The Long Low Horrible Flat Thing". Some half-hearted explorations of this passage had been done but no one had ever really tried hard to pass the constrictions.

Previously it was thought the Styx more or less followed the line of the waters adjacent to the Lucas Cave, in the tourist section called River Cave. This is represented by a pool of water in Lucas, a pool under the Minaret, the Styx Pool and the Pool of Reflections. The water feeding the Pool of Reflections is not Styx at all but another smaller river, a tributary to Styx that joins into Styx/Lethe at the big room on the other side of the squeeze. Lethe can now be dived all the way to Blue Lake passing through the Pool of Cerberus.

Considering the opposite direction, upstream and back into the mountain the starting pit in the Mud Tunnels, leads most likely to unknown caverns. The bits at one end are too small for a diver.

Heading upstream, passage is comfortable snaking left and right. It then turns downwards pinching out blocked in part by a natural arch. There is some small space on either side of the arch.

To my mind this lead is too daunting to push underwater but undaunted Iain McCullough manoeuvred his wraith like body down there. He had to take off both air bottles to get around the obstruction passing through with a regulator in his mouth and the hose going back to his bottle. Once through he retrieved them from his partner once on the other side.

Iain made his way into somewhere beyond. A limited victory however because his wriggling to get past the natural bridge destroyed the visibility and so little progress could be made finding a way on. My opinion is that there are better leads to investigate.

Beyond that natural arc the water flows through unknown cave to the South and is not seen again until the water makes a brief but dramatic appearance at the most northern extent of the Barralong. Here waters feed an overflowing lake from the mysterious Southern Limestone. The distance of the unknown hydrological connection from Mud Tunnels to this lake more than doubles the southern extent of the caves from the Grand Arch.

It is not quite true that the water is not seen at all between these two points since there are a few well like shafts that might connect in to the main river. We poked divers into numerous holes hoping to connect into the elusive river. Dave Apperley made two or three splendid efforts diving into a sump at the back of Syringe Passage. The small passages remained small and refuse to yield a passable way on.

Barralong is the ultimate southern extent of the tourist cave system. At its far end is a healthy river emerging from an archetype underground lake feeding a river that passes through a picturesque tunnel and disappearing into the not so desirable rockpile breakdown.

The journey through Barralong is quite long. At its modest beginnings in small side passage departing the Mud Tunnels area the cave is with the way on milestoned with a series of squeezes, climbs and crawls separating by standup chamber with remnant phreatic passage. The cave passage gets bigger and more and more decorated. The formations are so highly valued that trips to this cave are highly restricted.

I dived at the most southerly end of Barralong with Patrick Larkin, Simon and Judy McCartney years ago. On that occasion, being the last diver in the foursome I saw nothing because the three previous divers had turned the water to custard. We were wearing back mounted tanks in those days. The dive is quite long and may have side passages, I don't know. The last section of the dive is an upward vertical rift. It was tight in this rift with back mounts. Patrick pretty much gave up cave diving after this trip.

The rift surfaces in a shallow lake and a small river

feeds the lake from an incoming passage. There is more crawling through river passage and the last sump silts out as soon as you put your foot in it. At the time of this trip I was very fit. While Simon made the final push in the furthest sump I took my gear off and climbed every aven and tunnel there was. It was particularly muddy and slippery but I can say with certainty that all leads were explored. Simon returned from his sump having found a system of rift passages all apparently silty and tight. We were all exhausted and felt we had done all we were ever going to do with this cave. Times have changed however and now the trip would be much easier.

We need to revisit the furthest point of exploration again. Side mounts would change a great deal. The containerisation of dive gear into cave packs would make the journey to the back more efficient and cave friendly as well.

Dave Walton regularly travels from Brisbane to join the Jenolan project. Interested in locating the missing parts of the Barralong river course we set off to dive Bluetongue. This lake is a small body of water at the beginning of the Barralong cave before it breaks out into the decorated areas. We believe this water represents the next known appearance of the southern streamway that is called Lethe. Having not been to Barralong cave for many years we made a reconnaissance without dive gear. The entrance to Barralong is to the left of the abandoned tourist track just before the steps cut through flowstone ascending into the "Red Room".

The passage in the early stage of Barralong is almost standing passage but quickly tapers off and does not continue. The way on is on the left through a rock-pile. Once having negotiated a short sequence of squeezes a tunnel descends rapidly almost blocked at the bottom by



*Ian Cooper shows where to transport dive gear in the Barralong Rock-pile.
(Photo by Kier Vaughn-Taylor)*

a squeeze. Through the squeeze is a short passage that opens up. On the left is the body of water we wanted to dive. On this occasion a stream was flowing along the canyon from a fissure in the end of the canyon across the passage and into the water body. A dive line apparently placed by Ron Allum some twenty years ago runs into the water.

Dave won the toss to dive and we returned to the outside world for his diving gear. He entered the water but returned quickly wanting to replace the existing line because it was frayed and likely to break. He set out

again using his own reel but now the water was highly silted making progress difficult. The passage continued at the end of Ron's line but how far was impossible to tell. Without visibility it was not possible to continue or replace the old line. Dave returned and we left the cave. We would have to try this dive again with the sole purpose of replacing the old line.

The trip time was very short, being out and packed up by 2:00pm that afternoon. We took the opportunity to walk to the end of the Southern Limestone and returned along the Lucas Rocks Ridge.

I felt sure this puddle had more to offer and resolved to try again. On the next trip to Bluetongue, we carried Rod O'Brien's gear to the water. Rod has an affinity for tight horrible conditions and sure enough he made progress as we waited in the stream passage for well over an hour.

He had wriggled down a fissure in the bottom of the pond excavating loose gravel off to the sides of a wide but narrow phreatic loop. He emerged in a stream canyon about 15m long and silted from one end to the other. Although the way on should have been at the other end of the canyon it was difficult to find a going route with the water all stirred up.

This passage should be part of a route going both upstream towards the end of Barralong but also passage heading back towards unknown streamway not seen again until the Mud Tunnels.

After this trip we concentrated on survey work correcting dodgy survey points and joining disconnected sections of survey.

Last week Phil Maynard completed the first of our underwater maps showing the entire path of the Southern Main drain from Mud Tunnels through to the opening at Blue Lake. Looking back over the trip reports the map is the result of ten years of underwater mapping. It's a slow business.

Although I appreciate the importance of surveys I also know surveys are born from lying underwater in semi-darkness holding a measuring tape against disintegrating survey features. This is a significant achievement worthy of publication in Australian Caver however local loyalty being what it is the presentation of the map is reserved for the SUSS Bulletin

The discoveries at Jenolan were also slowed by our increasing interest in the potential at Wombeyan.

Australian Caver No 160 will contain the continuation of this article, taking in Wombeyan, Yarrangabilly and Cooleman caves.

BOOK REVIEW

Title : 'BENEATH THE SURFACE : A NATURAL HISTORY OF AUSTRALIAN CAVES.'

Edited by : Brian Finlayson and Elery Hamilton-Smith.

Published by : UNSW PRESS.

Forenote.

This book aims to present an up-to-date picture of the state of speleological investigation in Australia. It is pitched at the "Robin Williams ABC Science Show constituency" - a scientifically curious, educated but non-specialist audience - and indeed it carries Robin's endorsement. Often referred to during its lengthy gestation as the Jennings book, it is also a tribute to the legacy and writing style of that great pioneer of Australian speleology, Joe Jennings, and has roots reaching back more than 35 years to the ground-breaking Speleo Handbook, published by ASF in 1968.

John Dunkley; President, Australian Speleological Federation.

'BENEATH THE SURFACE' is an excellent introduction not only to caves and caving as a sport and pastime but also to some of those people who have had a major influence on caving and cave exploration in Australia. Each author has brought their own perspective on the subject and have demonstrated the need to explore caves and preserve as much as possible of the unique ecology each cave system supports.

We are fortunate in Australia that we have organisations for which Cave and Karst management is a primary concern. We are a relatively young caving community and therefore have the opportunity to educate cavers to respect the fragile environment they are entering.

'BENEATH THE SURFACE' provides a wealth of information for those who cave actively or from their armchair. I believe that the various facets of this fascinating pursuit covered in the book will provide the impetus for growth in the caving community and the desire to preserve this wonderful heritage of many millennia with which we are entrusted.

The appendices provide a starting point for prospective cavers searching for ways to become involved as well as a list of Show Caves by state. For those whose interest cannot be satisfied by personal visit there is also an excellent 'further reading' and 'reference list'.

The overall impression is of enthusiasm for caving in all its various aspects. Above all the underlying theme is preservation and maintenance of a natural resource in the best possible condition so that future generations may experience the same enjoyment of the whole cave ecosystem that we are privileged to know.

Geoff Crossley: Editor, Australian Caver Magazine.

(note: To complement publication of this book, issue 161 of *Australian Caver* will celebrate the contribution of Joe Jennings to caving in Australia, with personal recollections, reminiscences and photos. Andy Spate is guest editing this issue and is seeking contributions. If you have not done so already, please contact Andy on andyspate@aliencamel.com).

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comprehensive maps and cave descriptions, 45pp.

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The Management of Soluble Rock Landscapes: An Australian Perspective (Kevin Kiernan). 61pp. The only text on cave and karst management in Australia, this book is part of the required reading for the Karst Management course at Charles Sturt University.

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Proceedings of 23rd ASF Conference, Bathurst (ed. Cathy Brown, 2002) 200 pages, over 80 photos and maps, free CD if you ask nicely

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A Bibliography of Jenolan Caves Pt 1: Speleological Literature (postage \$1)

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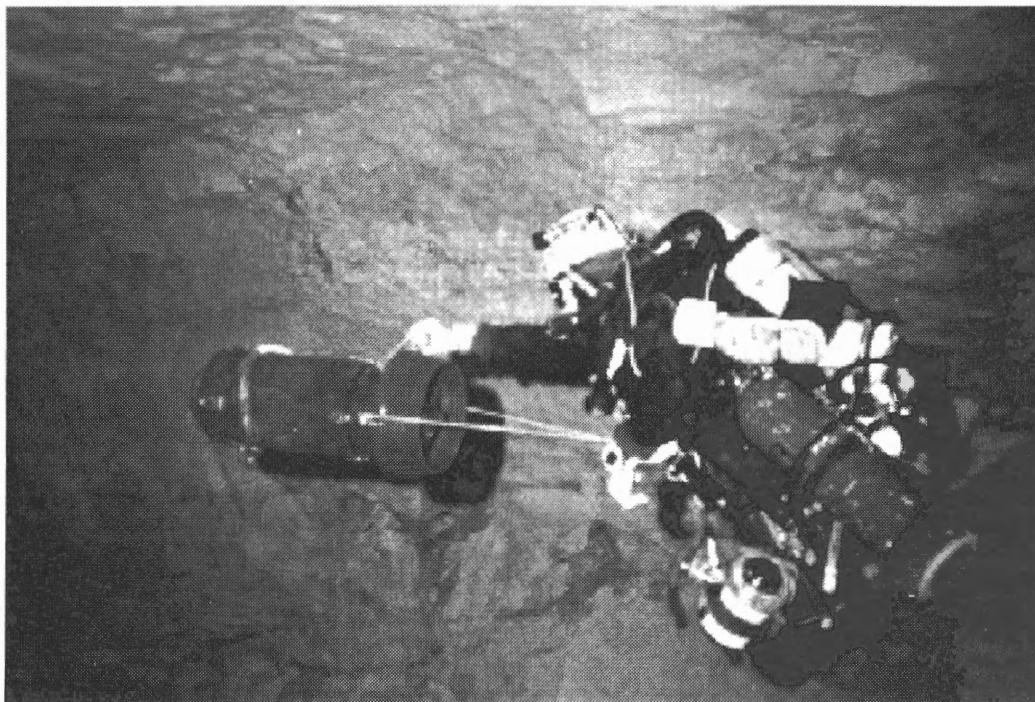
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Cocklebidy Cave

To the end, past it, and discoveries on the way.

Dave Apperley



Paul Boler returning from Toad Hall. (Photo by Paul Hosie)

Introduction: Below is a summary of the main dives carried out between July 12-19 in Cocklebidy Cave, Nullarbor plains, Western Australia. This report has been written by Dave Apperley.

This expedition involved the combination of three different groups of divers, all with different goals but the ability and willingness to assist in the goals of each other.



Cocklebidy camp 2003. (Photo by Dave Apperley)

The first group or pair, were Karl Hall and Craig Challen. These two guys are the leaders in deep/ long cave diving on rebreathers at this point in time. They have completed an unassisted dive to the end of Australia's second longest underwater cave (3.5km?) on rebreathers and also have extensively explored many deep mines of W.A down to approx depths of 100m. Karl and Craig's goal was set some 8-12mths ago when they decided they would like to scooter to the end of Cocklebidy to see the size of the passage there and know for themselves if there was potential for further

exploration. This expedition would be set up similar to their famous 3.5km "Alpine" dive. That is, minimum fuss. 2 divers would conduct a series of set up dives, followed by a push dive, followed by a clean up dive. Total time spent on site would be approx 1 week. Personally, I admired this mentality: small organised pair of divers working hard to achieve what has taken large teams of others.

The second group, under a different permit to Karl and Craig consisted of Paul Boler (NHVSS) Paul Hosie (WASG) and Rod O'Brien (SUSS). This Permit was organised via NHVSS in Newcastle.

Paul Hosie, as just about everybody should be aware, is chiefly responsible for the database of cave info on the trimixdivers website. Paul has explored more virgin passage on the Nullarbor over the past 5yrs than anyone else over the past 15yrs! Paul's recent findings in Mullamullang cave prompted his goals for this trip, exploring side passage wherever possible along the main Cocklebidy conduit. His reason being that if Mullamullang, a 10km long dry cave could have extensive side passages such as the "Easter Extension" and the like, then Cocklebidy could quite possibly have similar type systems, only under water. Passages like these might add 2-3km of maze passage to Cocklebidy. Definitely enough reasons to have a look, Paul would've thought.

Paul Boler, it seems, is Paul H's "partner in

COCKLEBIDDY

crime" for recent Nullarbor trips. While Paul H has the knowledge and uncanny ability to find virgin passage, Paul Boler too has the ability to document many of these caves on video. Paul has been responsible for many pictures on the trimixdivers site and never ceases to amaze his peers with quality video from, more often than not, very difficult and remote u/w locations.

Rod O'Brien would recently have to be called NSW's most active cave diver. Rod is responsible for nearly all the survey data of NSW caves on "trimix" site with weekly trips to NSW's top cave locations. Many of us look at Rod as "the machine". Very rarely will he come back from virgin passage without accurate survey data from the initial dive (most of us usually claim a second dive is needed for survey stuff).

As you can probably deduce from the above descriptions of this team, the main goals for these three guys were to;

- 1: explore side passages
- 2: document with video
- 3: completely survey all new leads

The third and final group was that of a team of divers led by myself. Our goal for this trip was primarily to assist Karl and Craig if they wanted assistance. My intention of assisting came about when looking at the objectives and goals of other groups. Two divers were pushing the end, bugger! Meant I couldn't do that job. Three guys were



*Equipment being lowered to start of flying fox.
(Photo by Dave Apperley).*

exploring side passages and recording the event, Oh well, couldn't really offer much assistance there. So, where would my group and I be of most benefit to the others? The answer was fairly obvious... Sherpas. As much as I would have loved to be swimming with Karl and Craig up the final length of passage I have realised recently that without good support many explorations fall in a heap due to too many "push" or lead divers wanting to pursue their own personal goals. The rest of my group were some relatively new cave divers and really keen to be a part of a big event like this. They were Gordon Harris, Dean Slater, Alan Polini, Glenn Bailey and Hua-Hsiang Kuo (Davey). These guys discovered the meaning of playing a support role at an early stage and threw themselves at the challenge intensely. You could tell by their enthusiasm that each one will make a good contribution to cave diving over the next decade.

Sun 13th July: The first challenge for the day was to move an enormous amount of equipment to waters edge in the cave. The water table on the Nullarbor is approx 90m

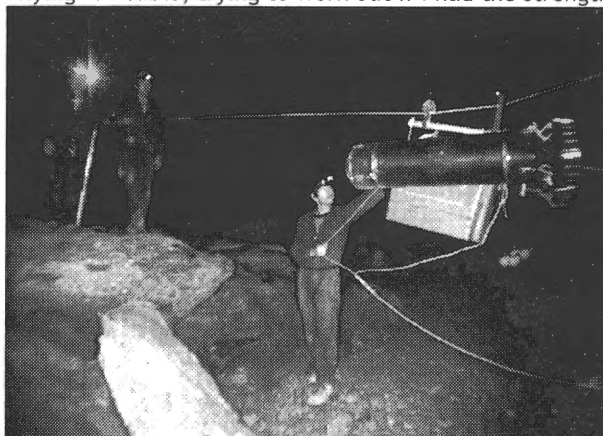
below the surface so Cocklebidy, as with other caves, needed a 300 odd metres traverse across boulderous rock on a slight decline to the entrance lake. Time taken for a person to manually carry out a set of twin tanks to surface would take approx 30mins. We required to move incredible amounts of gear for this dive, the list will give an idea of the mountain of equipment required for 2 divers to dive to the end of the cave, and 4 divers to support at Toad Hall.

Bear in mind this does not include the half dozen people involved in diving to the first rockpile for pleasure and to support.

- 5 x CCR Rebreathers
- 12 x 90cf cylinders (for push divers bailout)
- 12 x 90cf cylinders (for 3 x support bailout)
- 8 x 120cf cylinders (O/C support diver)
- 2 x Long body scooters (for push divers to travel entrance to Toad hall: approx 60kgs ea.)
- 2 x short body scooters (for push divers to travel from Toad hall to end: approx 35kg ea.)
- Adequate battery packs to supply each of the 6 divers with minimum 10hrs light u/w
- Numerous dry tubes filled with extra CO2 absorbent for rebreathers, food, water, warm clothes etc.
- Drysuits, wetsuits, fin masks, helmets etc.
- Battery chargers for scooters, lights and other electrical devices.

As you can see this amount of equipment would take at least two days to walk into the cave, so the morning's objective was to rig a 220m long flying fox from entrance to lake! This contraption took approx 4 hrs to set up and secure and was a work of art. Karl had fabricated an A-frame for the top anchor point and rigged a "turf winch" to tension the cable. If you had any thoughts that this was an "essentials only" camping trip you would be mistaken. The Boys had brought a 5.5kva generator to run all equipment. Karl pulled out the trusty Kanga drill and set some anchor points into the rock with dyna bolts and glue.

With the flying fox humming away perfectly a few of the team retired for lunch. A major hiccup in the operation occurred shortly after. When pulling the flying fox bucket back up to surface it managed to jump off its wheels and become wedged on the cable and on the roof of the cave. So approx 10mtrs off the floor and 70mtrs from the top end of the fox was where the bucket lay. The question, how do we get to it to unjam it?? I was thinking along the lines of prussiking down the flying fox cable, trying to work out if I had the strength



*Transporting gear via the flying fox.
(Photo by Rod O'Brien).*

and ability to get there. Rod O came up with the right idea.

We would connect a caving ladder to the flying fox, slide it down to the bucket and someone could climb up. I drew the short straw. Paul B had secured the bottom of the ladder to a boulder so if the top moved I wouldn't end up sliding all the way down the flying fox and slamming face first into the end (thanks Paul). So up I went, tied myself into the cable once there and managed after a bit of grunting and groaning to free the bucket. Sure enough!! The top of the ladder on which I was standing started sliding down the cable. Only a metre or so thanks goodness, certainly got the adrenaline going however! I managed to climb back down the ladder (on the wrong side of course, as it was laid out at about 45 deg angle) and we retrieved the bucket to surface. A few minor alterations to the fox cable and all travelled smoothly for the remainder of the day. At approx 8.00p.m that night all equipment, 240v power and high pressure air for cylinders was secured down to water level.

A very productive day indeed!

And if you still thought this was a small operation, we returned to the camp to see Craig Campbell cutting up firewood with a 2500watt power saw!!!

Mon 14th: Objectives today were numerous. Firstly- STAY

WARM!!! Nullarbor nights and early mornings at this time of year are brisk to say the least. Someone noted the temp as 2 deg celsius at 10.00pm last night, so God knows what it was at 4.00-5.00am this morning!!

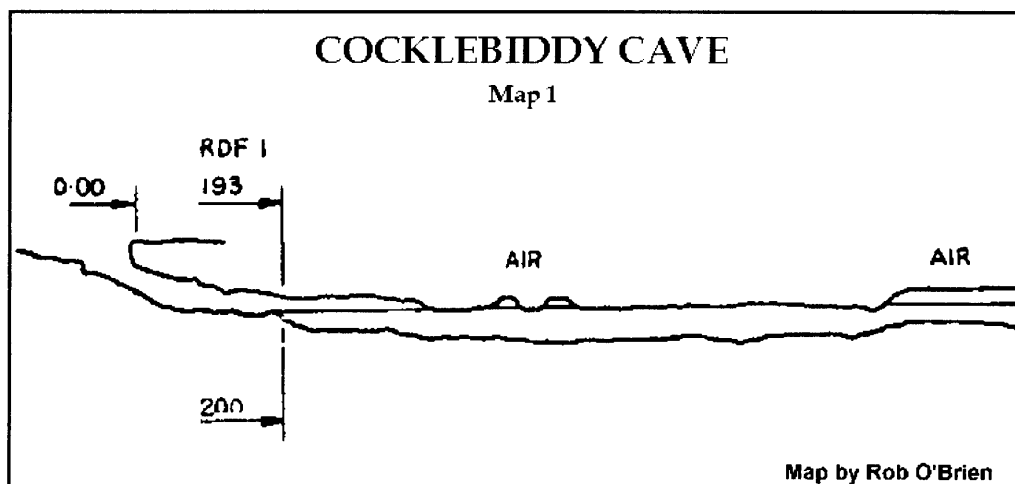
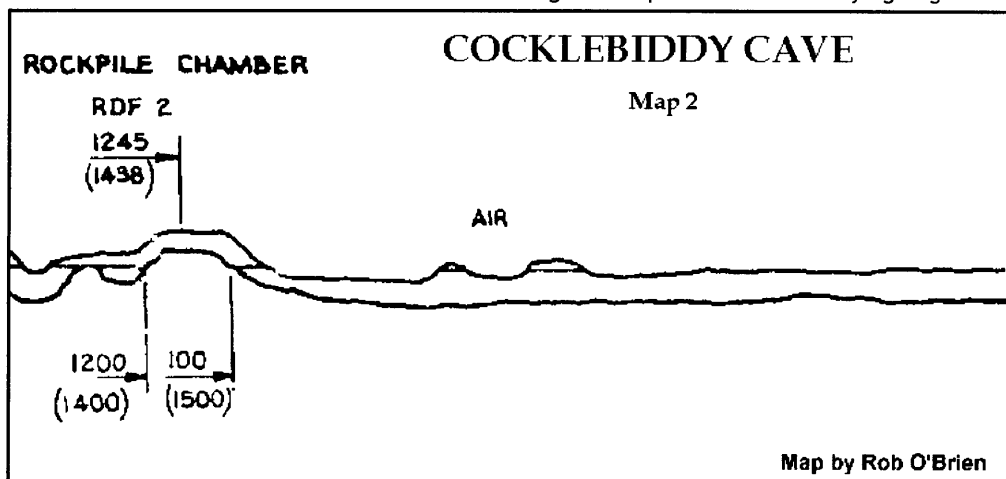
Team objectives today:

Karl /Craig. Dive to first rockpile with spare cylinders and big scooters, carry all this over and proceed to dive to Toad Hall to drop off staged gas.

Paul B/Paul H/ Rod O- dive to first rockpile and stage bailout cylinders for themselves for the big days dive, also use as a shakedown dive to iron out any configuration problems.

over rockpile. Shake down dive as well. It's great to have objectives but very disappointing when they aren't fully achieved. I ventured off for my dive with Gordo first so we could be ready for Karl/Craig when they arrived. Gordo had been suffering from a wicked flu for the past 10 days and was not fully over it. By the time we reached the end of the 300m long entrance lake, he was "shot". It was decided he should sit this one out and try to recover fully for the big days ahead. I continued with the plan and arrived at the rockpile about 10mins before Karl and Craig. For the next 2hrs we lugged cylinders, scooter batteries, scooters and rebreathers across what is realistically a small rockpile. This little chamber rises about 15-20m vertically and is about 50m horizontally.

By this stage Karl and Craig began to reassess their intention to go to Toad Hall today. It was approx 6.00p.m. If they went it meant they wouldn't be back (to the rockpile) until at least 9.00p.m. They would then have to lug the big scooters over the rockpile by themselves (another 1-2hrs), then swim out from there to the entrance. Probably meant they weren't going to be at camp until around 1.00am. They reassessed and decided to keep the fully charged scooters for tomorrow, take a drop tank each and swim in approx 1.2km to drop them as bailout gas. This plan meant no carrying of gear



Dean S/Al P- Dive to first rockpile with spare cylinders for Karl / Craig

GlennB/Davy- Dive to first rockpile and render any assistance possible to other groups.

Dave.A /Gordo: Dive to first rockpile with spare cylinders for Karl / Craig, Assist in transporting Karl / Craig's gear

over the rockpile late at night and meant they were comfortably home by 11.00pm that evening.

Paul H, Paul B and Rod O started their dive later in the afternoon and managed to get all their equipment to the rockpile as planned. Rod did, however, return to the entrance lake early and begin to reconfigure his equipment. Being on O/C Rod had to carry a massive amount of gas and at this point was having trouble with stability in his rig. With 4 cylinders back mounted and 2 side slung he needed to be perfectly trimmed. He would work on this over the next 24hrs.

Both Paul H and Paul B returned (Paul B having to bailout to O/C from his rebreather due to a configuration fault which meant he could not add gas to his rebreather).

Both commented on being fairly fatigued after this dive, Paul B in particular. The rockpile is approx 1.2km swim from entrance. This is a fairly hefty swim to do first up, but the plan being to go to Toad Hall, the guys needed to ensure they were capable of making the shorter distances first, before attempting the 4klm to Toad Hall.

Dean S and Al P's dive was uneventful except that I had not briefed them properly on the cave layout. This meant they reached their thirds at the air chamber that begins the rockpile. They were unsure as to how far the rockpile was so correctly dumped the cylinders they had brought in and returned to the entrance. To their dismay they heard later they were only 100mtrs surface swim from the rockpile. (Sorry guys, better brief next time) Glenn B and Davy found the extra cylinders and transported them to the rockpile and aided us in transport.

A good day had on the whole, however initial objectives



Craig arriving at first Rockpile. (Photo by Rod O'Brien.)

needed to be modified as the day progressed. Also Paul B would probably agree, in retrospect, that his condition today after such a small dive should have indicated what might follow when he attempted a bigger dive.

Tues 15th: Another set up dive day was planned for Karl and Craig. They would swim to the rockpile, jump on the scooters that were already there and charge off to Toad Hall. There was no support necessary as they had all their equipment in the cave. From all reports they had a great dive. Both commented on the clarity of the water once over the rockpile, also twisting/ "z" type nature of the passage and the lack of side tunnels (see tomorrow's report, obviously a disadvantage of riding scooters is you may not see all). Support for the guys was required once they returned to the rockpile as the big scooters needed to return to the entrance lake for recharging for the big dive. Two of the team decided on a pleasure swim in and timed it well to assist the boys with the heavy gear. Well done guys, another late night with all the group not getting back to camp until about 9.00pm.

I had spent the day setting up my gear, relaxing, all in preparation for tomorrow's dive. I had planned this day to be a rest one as we had been caving/hauling gear/diving for about 8 days straight now (I had been teaching a course in Weebubbie Cave for the previous week). Everything was ready, and I was fully psyched for the big swim.

While I was filling a couple of cylinders along with a glass of Red, Karl came up to me with a quiet comment or two. "You ready for tomorrow Dave?"....

"Yep, itching to go" I replied "It's a bloody long way, Dave" was Karl's response. This took me a bit by surprise as he had scooted the distance today so if he thought it was long then what the hell would I think after swimming it?? "I'm quietly confident, I did a practice swim or two back home and have been training fairly hard this year" I replied. It was a matter of pacing yourself, I thought, go at it too hard and you would burn out, go too slow and you may run into scrubber (CO2 absorbent) duration issues. "I'll go when you guys are ready" I said, "First thing in the morning isn't it?" There had been a change



*Setting up gear before toad hall dive.
(Photo by Dave Apperley.)*

of plan Karl mentioned. Both the Pauls wanted to delay the dive until Thursday morning, Karl and Craig wanted to go on schedule but came to a compromise and it was decided 5-6.00pm Wednesday night would be departure time.

While it was good to make the decision in the best interests of the team, it had seemed to be forgotten that we were there to play a support role on the big dive, our goals could have been accomplished on a later day (when people were rested). We should have ensured we didn't inhibit the guys in their preparation. As many people had probably also forgotten, Karl and Craig had always planned to do this "Alpine" (minimum fuss) style. We were simply there as an added bonus if we could help. To be a hindrance would be totally counterproductive.

Wed 16th: We had decided that the free swimming guys should leave around 2.30p.m so as to gain the necessary head start for us all to arrive at Toad Hall approx the same time. I was the first to head off down the ever silt increasing first sump. Silt from divers gearing up in the entrance lake managed to roll down the first 300m of cave over the past few days. I was having fairly major buoyancy issues throughout this first sump and did not enjoy this part of the dive at all. A simple, yet fundamental mistake was that on previous dives my dry tube had been nearly empty. Today, it was filled with CO2 absorbent, food, clothes etc, making it almost neutral. Because of this I was probably about 5kgs overweighted. Once at the rockpile I managed to ditch approx 4kgs of trim weights from my rebreather to aid in equalising this situation.

However, before I arrived at the rockpile I had a rather nasty scare. The air chamber at the rockpile is approx 100m long, so upon surfacing I tended to swim on my back using cracks in the roof as reference as to which way to

swim. Hmmm, one of the cracks led me straight into the wall and with the long strong fin kicks I was using, I crashed into the wall rebreather first. I obviously sat straight upright in the water and unbeknown to me a large amount of gas vented from my dry suit. Due to the almost instant negative buoyancy I thought "Shit, I've ripped a hole in one or both of the breathers!" Finning to keep the top of the loop above water level I inflated the wing to regain a little composure. Breathed off each rebreather cautiously and found both were intact and void of water ingress. Upon reaching the rockpile I also discovered it would have been next to impossible for the loop to tear as my cylinders took the brunt of the crash. Not exactly the relaxing start to the dive I had hoped for.

Rod and I were diving as a team, our goal to mark with reflective floats, any side passages on the right hand side. Paul H and Paul B were to do the same on the left. Rod discovered a major fault with one of his regulators on a side mount tank and just as we'd recalculated that he still should make it to Toad Hall before reaching thirds, he also discovered that one of his untouched back tanks had drained to only 100bar (½ a tank). This meant Rod could make it to Toad Hall but with NO reserve. He made the obvious decision that he would have to abort the dive early. A bitter disappointment, however as we both joked "the cave will still be here next year...and it's only getting bigger!"

We all set off and in the first 100m Rod spotted a side tunnel. This was big enough for him to enter with all 4 cylinders on, indicating a fairly large passage. He signalled to me to mark the area and we moved on. Our system was that Rod would investigate the passage, signal to me if it was worth marking, then I would do so and he would move on. This continued with 2 other passages marked up to approx the 900m mark. Rod had unfortunately reached thirds with his remaining gas and signalled he was going home. I continued along the right hand wall marking passages as I saw fit. Probably the most exciting lead is around the 1.3 - 1.5km mark. A big undercut at approx 12m opened into a room approx 10m deep x 20m wide x 2m high. The floor was covered with fantastic crystals giving the "white cauliflower" effect (see Paul H trip report Easter Lake Mullamullang 2002 for scientific name and description). In 3 or 4 directions small passages darted off like fingers, all small side mount stuff but definitely passable. Obviously I marked this passage and continued up the tunnel in

Toad Hall. The passage twisted left and right and back again. There would not have been more than 100m of straight passage in this whole 2.4km section.

Finally I saw lights up ahead, Paul H and Paul B were just exiting from a previously discovered side passage of major significance. Paul H had dived to the end of this passage and surveyed it, revealing it was approx 200m long and easily big enough for rebreathers. I did not ask Paul if there were any side leads off this passage but imagine he would have mentioned it if there were. The other significance of this passage was that it meant we were only 300mt from Toad Hall. After 3hrs and 30mins we all surfaced in the lake of Toad hall. Feeling a sense of achievement, I thought about how far we'd swum and, nervously, how far we had to swim back.

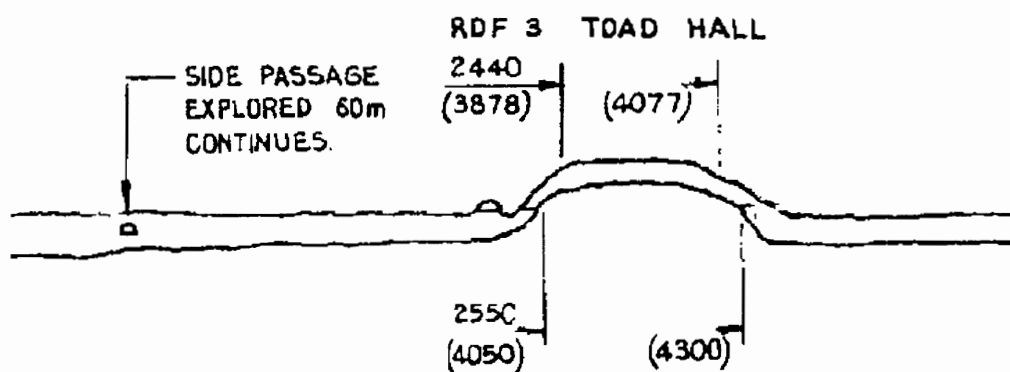
Karl and Craig arrived shortly after (about 15mins) so timing was perfect. Paul B was in "a world of hurt" saying he felt like he was about to throw up, was physically exhausted etc. The best solution for Paul was rest. It slowly occurred to me as I looked at him curled up in the space blanket, that if he could not get himself out of the cave then it would be a rescue. That is, the main dive plan would need to be canned and all equipment/ resources used to move him 4km u/w, out of the cave. This in itself would be a challenge. Paul, if nauseous would not be able to use his rebreather as they are not as suitable to throwing up through as normal scuba. This would mean using the bailout gas staged in the cave for himself.

Obviously, this would not be an ideal situation for Paul B as it would mean he would be down to his last "life support system" (O/C scuba) and would have to be fit and relaxed to get out of the cave on this gas. Likewise, Karl and Craig's scrubber duration was long enough for them to do the dive to the end of the cave with some swimming. If Paul B needed a scooter it would severely push the limits of the Prism scrubbers.

This was generally NOT a good picture. Paul B was told he should rest and not participate in moving equipment across the Toad Hall Rockpile. To make matters worse Karl and Craig had to ration their supply of water as Paul and Paul had somehow managed to leave theirs at the first rockpile. This was a rather large error. Obviously we all make mistakes, but it was beginning to show that a few small mistakes could have the potential to form one big one.

COCKLEBIDDY CAVE

Map 3



pursuit of more. Karl and Craig were right, whoever said Cocklebidy is just straight and boring has never been to

Time now was approx 9.00p.m and for the next 5hrs we dismantled, lugged and reassembled equipment across Toad Hall Rockpile. This rockpile is a bitch!! At first it didn't look that bad at it rose up probably about 30mtrs vertically on a 45 deg angle. Once at the top however the sherpa spent 15-20mins rock hopping up slight piles and then down into valleys, only to be greeted by another "little" hill soon after. Eventually it dropped to a gin clear lake about the same size as the

one we'd come through.

2.00am: Karl and Craig were "smashed". I was assisting them in the gear up process. Karl was laid out on his stomach with his eyes closed between every movement to put his suit on. Craig stood in waist deep water staring at his gloves, assuming they would put themselves on! In retrospect maybe they should have settled in for some sleep before this final push, but I kept talking to them, suggesting which piece of equipment to put on next and test, until finally the two were fully kitted and ready to move.

A quick signal to me and they were off... about 2m only!! Karl flashed his light at Craig to stop and once he'd surfaced Karl said "Your scrubber is full of water" This was about the worst thing that could have happened. Perhaps it was knocked coming over the rockpile and thus leaked. Anyway, C2 material in it would be ruined, the whole gear down process, stripping and reassembly would take at least 2hrs. Not what the guys needed. "Hang on, I'll have another look" Karl suggested. "Oh, it's dry, just minimal condensation, must've been a reflection.... Sorry false alarm" I had to smile at this, the look on Craig's face and the comment "Are you sure this time??" was priceless. "Yeah, it's OK" replied Karl, oblivious to any mockery that was occurring.

2.15a.m: Second attempt the boys were off. "GRRRRRRRRRRR" That certainly didn't sound like a healthy scooter I thought. The boys stopped again. Karl's propeller on his scooter had worked its way loose during transport (this Toad Hall is harsh on gear!!). Fear not, he simply tightened it with a trusty Leatherman and the guys were ready for 'Take 3'.

2.20a.m: Finally they disappeared out of sight, Thank god I thought, the two Pauls had been sound asleep, Paul H wandering over just as the boys left. He said he could "hold the fort" for the time being. I was desperately in need of sleep so returned to crash for a while.

An hour was all I needed to replenish the system and now set about repacking my scrubber for the trip home. With the Dual rebreather set up I didn't need to do this but seeing I had brought some to push any large side tunnels, I thought I may as well use it.

over and see if the guys had returned. Finally at 8.00am they surfaced from an epic 5hr dive. The scooters had failed early and both had decided to swim the 2km to the end of the cave where Karl could commence a push. His description was "F#%ing tight" and he managed with the no-mount O/C system to reach the end of Chris Brown's line, tie on a reel and move in another 10m or so and leave a present for the next diver who gets there. Upon returning to Craig and his rebreather, Karl had severely chewed into his gas reserves (getting out was more difficult than he had imagined). Meanwhile Craig was having his own dilemmas. The suspected leak in the rebreather had manifested into a full scrubber flood and Craig instantly felt the effects of CO2 poisoning as the scrubber began to shut down. Swapping to O/C was the only option he had. Unfortunately Craig now had the uncomfortable realisation that he needed to begin his exit out of the cave in bailout O/C mode. Only problem he had was that Karl could not get into his rebreather on his own (this was part of the plan, that the two help each other). Should Craig leave now and know definitely that he'd have enough gas and leave Karl to look after himself? Or should he stay and begin to push his reserves to ensure Karl a smooth trip home? The decision was made to stay and I'm pretty sure Craig was happy to have Karl back in his rebreather and the two of them on their way home.

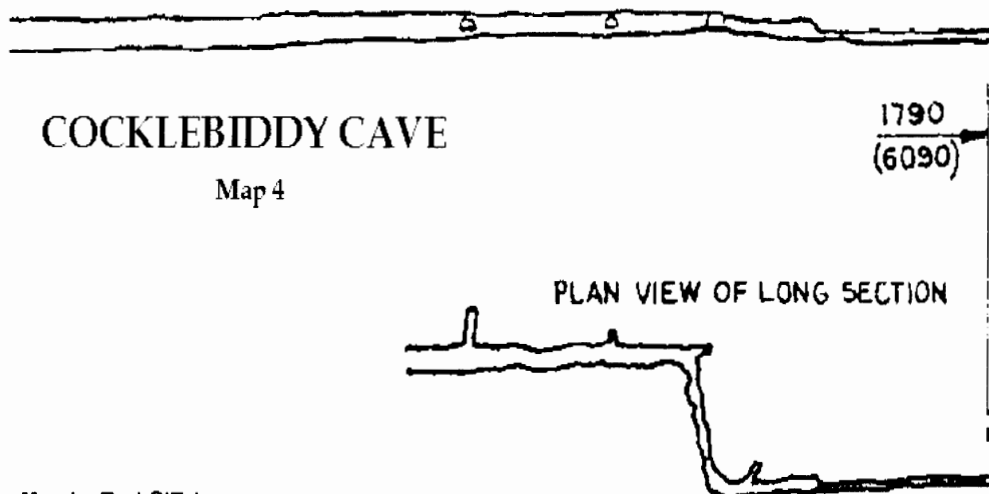
It should be noted here that the above story epitomises the Karl and Craig team. Whereas many people go with the motto "look after no.1". These guys work together in every part of their expeditions. It's a team effort between the two, and I'm sure it's Karl and Craig who went past the end of the line in the world's longest u/w cave, NOT just Karl.

Well, it was the sherpas' (us) turn to kick into action again. The next 5hrs was spent doing what we'd already done but in reverse. Paul B thought he was fit enough to help out but found one trip put him back in the blanket he'd just crawled out of. Things panned out quite well with the scooters. The boys were able to fix the short scooters that had just failed so it meant Paul B could ride the scooter at least half way back to the Rockpile. Paul H was happy to take the second scooter as I felt fairly strong still and really wanted to achieve the personal goal that I had set for myself, that is; to swim to Toad Hall and back.

Time had become irrelevant at this point as we'd been in the cave for approx 27hrs. It was around 4-5 o'clock Thursday afternoon when we headed off from Toad Hall. It's funny how things become relative. After spending that long hauling equipment to and fro over the Toad Hall rockpile, and watching Karl and Craig disappear off to dive a further 2km into the cave and back, 4km from home did not seem that far after all.

I managed to swim

Continued on page 27



Map by Rod O'Brien

The next 2-3hrs disappeared quite quickly and at approx 7.00a.m Paul H and I thought it was time to wander back

Cave Rights Revisited

Norman Poulter OAM

Speleological Research Group Western Australia Inc.

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During a SRGWA fauna survey to the Nullarbor Plain in 1987 with Dr. Mike Gray [arachnologist] of the Australian Museum, he made the suggestion that entry to the Dome chamber of Mulla Mullang Cave [6N-37] should be limited or banned in order to give the resident troglobitic fauna populations of the spider *Tartarus mullamullangensis* and cockroach *Trogloblattella nullarborensis* a chance to recover their numbers - if that was possible. He was of the opinion that their evident population decline in the Dome chamber could be due to habitat disturbance by cavers, given that this chamber was a major goal for most visiting caving groups. The spider had not been seen in the Dome since the early 1970's and its presumed food source, the cockroach, since the mid-1980's. It should be remembered that the Dome chamber was first entered during 1965 so that the decline in the Dome spider population since its discovery in 1969 could be reasonably correlated with the increasing visitation and disturbance over the subsequent decade. At that time *T. mullamullangensis* was the sole member of its genus and the Dome was its only known habitat - reason enough to be concerned about the future of this spider.

The reasons for such concern are many. Such relictual cave species are important biodiversity icons because of their unique morphology and behaviour, their role in fragile cave ecosystems, their limited distributions, and for the invaluable insights they give about evolution and biogeography in areas like the Nullarbor Plain. For example, research has shown that *T. mullamullangensis* has surface dwelling relatives in forest habitats in south western and south eastern Australia, indicating that similar ancestral surface species once lived in the Nullarbor region. It can be inferred that this occurred under milder, moister climatic conditions with more widespread eucalypt woodland than are seen today and that the surface populations probably contracted into cave doline or karst crevice refuges as the climate subsequently dried [Gray 1981, 1993].

Dr. Gray's suggestion ultimately led to my paper entitled "Cave Rights For Troglobites" delivered at the 18th. ASF Conference [Cave Leeuwin 1991] and resulted in a successful voluntary non-entry ban [to the Dome of Mulla Mullang] resolution from the ASF council meeting a day later [Poulter 1991a]. Rather than centre solely on the plight of the fauna of Mulla Mullang, the paper was meant to draw attention to the broad spectrum of troglobitic fauna, their supporting food chains and speleologist's obligation to protect them and their habitats.

Within a week of the Dome resolution being accepted as ASF policy, that determination was callously disregarded during the course of a post-conference recreational field trip, on the grounds that the resolution was "... absurd", based on "... bogus logic" and "... should be flaunted out of hand". [Bunton 1990] I believe that the quoted author, who attended neither the paper's presentation or the subsequent council discussions completely missed the

point of the whole exercise. Given that we know next to nothing about the biology of any of these Nullarbor troglobites, the point was to raise awareness of the often fragile existence of troglobitic fauna in ALL caves, but using the plight of the Dome's fauna [and others] as a prime example, to emphasize the possible effect visitors have upon them, thus making them think before entering fauna regions, that their actions may degrade the habitat and put the fauna's continued survival at risk. To make them think that perhaps they should respect the "rights" of the fauna to exist and therefore conduct their activities elsewhere in any given cave.

Now, twelve years since the publication of the "Cave Rights for Troglobites" paper and adoption of the "Dome" resolution - what, if anything has changed? Has visitation to the Dome of Mulla Mullang been curtailed? Has the Dome's spider and cockroach populations recovered? Has the caving community's attitudes towards all cave fauna and habitats changed - for the better, worse, or remained much the same?

Overall, I believe that as a combined result of the "Cave Rights" paper, subsequent ASF resolution and signage within the cave, visitation to the Dome has declined but while there has been a recovery of the cockroach population with the last reported sighting in January 2002, there is no evidence to suggest that the spider has made a similar recovery [Poulter 2002], leading to renewed speculation that the spider is indeed, at least locally, extinct. Should the voluntary non-entry resolution be therefore lifted and signage removed? I don't believe so. While it was long expected that the spider would be found in other parts of Mulla Mullang, and may yet be, the fact remains the Dome chamber population is the only one discovered in the cave. *Tartarus mullamullangensis* is now listed on the ANZECC list of threatened species and in Schedule 1: Protected Fish and Invertebrates under the Nature Conservation Act 1980. Despite the discovery of other species of the *Tartarus* genus in other caves from 1985 onwards, the Dome chamber in Mulla Mullang Cave remains the only known location for *T. mullamullangensis*. The hope is that this population will yet recover or that others will be found in Mulla Mullang. But the spider's endangered status and, more worryingly, continued absence in the cave give us an obligation to maintain protection of its Dome habitat by restricting visitation and/or by educating and trusting cavers to confine their visit to a well marked out path. If indeed the spider is extinct from its "birthplace" due to our intervention, it will be a sad indictment of a lack of caring, and one that should reinforce our resolve to better protect other cave species and habitats in future.

Has the general caver's attitude towards caves, cave fauna and habitats changed? Cavers once looked upon caves as their own personal playground where they could go anywhere and do anything they pleased without any consideration for the cave, let alone resident fauna. In some sectors of the caving community, this perception probably still exists today, although hopefully not nearly as much as it did say twenty or thirty years ago. It is the obligation - if not the duty - of the older generation

of cavers to educate the middle order of caving club members [in addition to society at large] that caves are not playgrounds. It is not enough to merely say "don't touch or walk on decoration". Few caves are "dead" and even those that are may have special faunal or other significance that needs protection. For the most part, caves are dynamic living entities that can be quickly and easily disrupted or destroyed by ill-informed visitation.

Open areas of cave floors are especially vulnerable to indiscriminate, repetitive trampling which can degrade or destroy animal habitations such as webs or burrows and the open structure of moonmilk, guano [whether active or decaying] and litter or soil/clay sediments to form hard compact substrates in which nothing can live. It is in areas such as these where narrow trails [marked or otherwise] need to be carefully established so as to cause minimal disturbance within the region, even to the point of walking in previous visitor's footsteps.

Another point to consider is the case of "modified" caves. Caves that have had their entrances or passages enlarged to permit human access will, as a result, suddenly have their meteorological and habitat dynamics changed, which may be detrimental to any resident fauna. Where this has occurred in tourist areas, some managers have attempted restoration of the original environmental conditions by the installation of sealable doors - do speleological societies attempt comparable measures following their similar activities?

Of even greater concern however, is where an entire cave has been opened by digging, possibly exposing a previously sealed ecosystem to the whole range of surface intrusion [predators, competitors and displacing animals] as well as total disruption of the cave's meteorological parameters. While it can be argued that during a cave's geological lifespan, an entrance may open or close many times, and - over a surprisingly short period, when opened by caving activities, the diggers should have an obligation to protect the cave's fauna, habitats and atmospheric environment [all inter-related], even to the extent of re-sealing the cave between visits or, by the fitment of an environmental gate.

Land managers, both public and private, are today taking a more active role in their speleological responsibilities. This is to be encouraged, but there is also need for vigilance from the speleological community and improvement on both sides. Where once, citing ignorance or lack of expertise, land managers happily absolved themselves from karst management in favour of speleological societies, which encouraged the elitist and "playground mentality" amongst some clubs - today, those same land managers are appointing their own specialists/consultants or drawing up their own regulations and management plans for regions or specific caves. This is where the speleological community can be of assistance, to help prevent or minimise bureaucratic or ill-informed policies being enacted, especially in relation to fauna and habitat protection.

Another aspect of concern is where a cave has no apparent land manager protection whatsoever. Numerous faunal caves on the Western Australian side of the Nullarbor Plain occur on Vacant Crown Land [VCL] under the jurisdiction of the Department of Land Administration [DOLA] who openly admit that they are administrators, not managers. One such cave is 6N-46,

with seven confirmed troglobite species ranging from aquatic amphipods to Tartarus spiders, and is arguably one of the most important and diverse faunal caves on the Nullarbor with probably the highest human [public and speleological] visitation due to its proximity to the Eyre Highway and nearby roadhouse, despite the fact that private leasehold property must be crossed in order to access the area containing the cave. Apart from the scenic attributes of its confining phreatic passages, the cave has numerous inter-connecting shallow lakes with a clarity similar to that of 6N-2 [another DOLA responsibility]. It was with a certain amount of dismay in recent times to learn that the Cave Diving Association of Australia has been periodically promoting the idea of 6N-46 becoming a sporting dive site, such a promotion should be discouraged in the interests of both the cave and troglobitic [both terrestrial and aquatic] fauna protection. But with no active land manager, how can such activities be stopped? In addition and as has been reported elsewhere, diving equipment easily transports contaminating organisms from one water body to another. "We can only hope that cave divers develop a sufficient sense of environmental ethics that they will only dive such sites under very tightly controlled conditions equivalent to entering a sterile laboratory area". [Hamilton-Smith 2002] "Dry" cavers too, need to be mindful that their clothing can easily transport detrimental contaminants [particulates and organic] from one cave, or section of cave, to another. As Australia's population steadily increases, spurred on by economic and political boosters in addition to various sectors of the general community, so too, has the upsurge in recreational or eco-tourism and in some regions, urban development encroaching on karst or karst watersheds. This has placed an additional burden on caves and troglobitic and associated fauna habitats, even in quite remote areas and sometimes outside the control or influence of some land managers let alone, speleological societies or the ASF. These pressures from increasing tourism and urban development need to be addressed by the speleological community via position statements to government at all levels and sympathetic politicians [Greens and Democrats for example]. This is why I maintain that it is important for the speleological community to embrace this issue as a matter of urgency and formulate and actively promote a population policy. [Poulter 1999] Irrespective of medium to long-term economic hardships associated with such a policy, the Australian and world environment depends on lowering global population. Concentrating on local or specific environmental issues, although periodically successful in achieving short-term "gains", is merely fiddling around the edges and ultimately doomed to failure unless the underlying cause, over-population, is tackled head-on and humanely solved.

As part of a submission in 1987, I formulated a quote, taken from several sources, that said "what we have now is less than we had yesterday". With the perceived extinction of the Dome's Tartarus spider - that is a creature we certainly HAD yesterday and we should work hard to prevent future extinctions.

To finish I shall repeat with a slight variation, the final paragraph from my original "Cave Rights for Troglobites" paper. Wherever there is a food source in a cave - it is possible there is also a faunal ecosystem. In times past we have argued the right of a cave to exist. It is about time we acknowledged that the fauna within a cave [no matter how much fear or contempt we may harbour for

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that fauna or its habitat], also has a right to exist - and that existence must be respected and protected.

ACKNOWLEDGEMENTS

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Continued from Page 24

the 2.4km to the Rockpile in around 2.25hrs. It was a methodical pace that I was able to maintain consistently. At approx the 1.5km mark I heard a stream of bubbles disappearing up to the roof. I rolled my shoulder to see gas escaping from my Oxygen cylinder. I laughed to myself, it reminded me of a quote from Apollo 13, "Houston, we are venting something into space....". I simply turned off this supply and saved my gas but remarked to myself the subtle similarities between space exploration and u/w cave exploration. By no means am I meaning to compare what we did with Apollo 13, but spend some time to think of the guys that explored Cocklebidy Cave to the 6km mark some 20yrs ago. Hugh Morrison, Peter Rogers, Ron Allum and the Legruen Boys, just to name a few. These guys were the true explorers of this cave system; we merely follow in their footsteps slowly stretching the boundaries of this massive flooded cavern.

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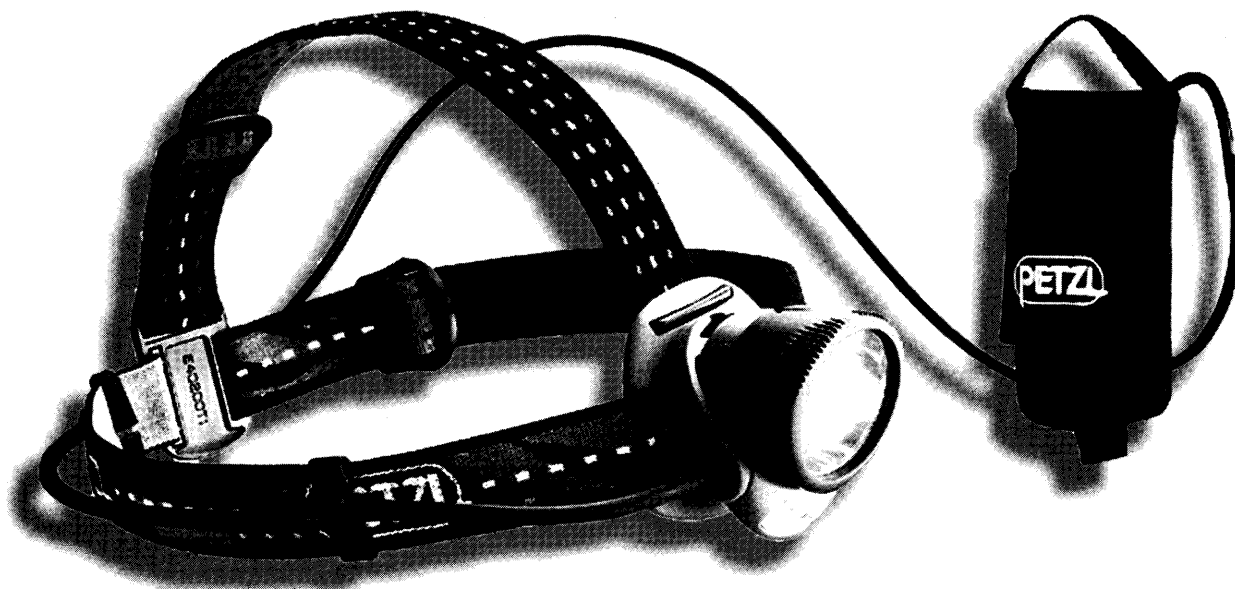
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