STRETCHERING A DEAD ONE OUT OF BRIDES

by Peter Wood

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Participants: Rob Klok, Jim Fyfe, David Graves, Dawn Graves, Michael Pimm, Peter Wood, Lesley Parker.

It's one thing to lie in the bottom of a cave with a cracked skull, broken leg, ankle and internal injuries, but you still have to get home and milk the cows. It was with this sobering thought , and four dairy farmers in current membership, that the sub-group decided to gear up for self-rescue. Aside from which rigging Z pulleys, rollers and "riding the stretcher" with ascenders and cows-tails (and someone else doing all the work) adds another facet to S.R.T., providing even more interest and skill to the whole caving exercise.

The sub-group has taken a "mobile" approach to rescue and have aimed to be in a "constant ready" mode for rescuing. Individual members have pulleys, carabiners and the usual personal gear, the group has complimented ropes and ladders with a S.C.U.D. stretcher (Stretchering Cavers Up and Down) and new carpet rope protectors, the pattern matches perfectly with that in Keith Tritton's new Tourist Bureau. The S.C.U.D. was selected for three reasons.

(1) It is flat bottomed and can be "skated" through an uneven crawl (as opposed to our Stokes litter).

(2) When rigged for ascending it can travel either vertically or horizontally.

(3) It rolls up inside its own backpack and becomes part of the normal caving gear; of less inconvenience to carry through the bush than 50 metres of Blue Water.

Our day at Brides consisted of stretchering a pine log (later used by R. Klok in the retaining wall) out of the doline several times so all the party members could practice both ends of the rope procedure. We have learnt that it is essential to minimise rope contact with the cliff face, using as many rollers as available; friction increases drag dramatically and boosts required man-power on the Z pulley.

Communication is also vital and the role of the person harnessed at the edge , ideally in visual contact with both Z pulley and stretcher cannot be underestimated. The power exerted by three people on a Z pulley could severely injure patient or companion if any part of a body or equipment was caught under a rock ledge or obstruction.

Discussion will always return to the different rescue situations cavers could encounter. Flood situations may be very rare in the south west, however adventure/abseilers with hair or clothing tangled in a figure 8 half way into Brides would be a very real scenario - as could broken limbs, hypothermia or snake bite. We also picked up on ideas for a few accessories like full patient face masks and other protective padding. The idea of being strapped immobile in a stretcher half way up a cliff, watching a baseball size rock hurtle towards your face doesn't bear thinking about.

There are now seven current St John First Aid Certificate holders in the Sub-group. Having come this far , and spent precious Sub-group funds, we will keep liaising with local police, St John Ambulance and S.E.S. people; which should help make the volunteer rescue base for the Leeuwin-Naturaliste Ridge even stronger.

Our primary concern is of course to make the group as self-sufficient as possible. Basic first aid kits and blankets space blankets should never be far from a cavers kit.

And all this, you say, just to make sure the cows get milked. Sometimes I think it would just be easier to lay in the bottom of a cave, broken bones and all.

TROGLOBITES ON BARROW ISLAND, WESTERN AUSTRALIA.

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Abstract

In addition to a diverse assemblage of land mammals, Barrow Island is now known to be home to an endemic and highly adapted cave fauna of Great antiquity but clearly related to the Cape Range troglobitic fauna. This finding is the result of a short field trip in September 1991 to survey for troglobitic fauna (obligatory cave inhabiting species).

Introduction

Cape Range on the North West Cape peninsula of Western Australia contains a very rich community of highly adapted troglobites (cave adapted animals usually eyeless, long limbed and without pigment). The affinities of part of the fauna clearly lie with the wet tropical forest leaf litter community of north-east Queensland. As such the presence of this fauna is the only evidence that such forest has occupied the area since the Miocene. The peninsula also harbours the entire vertebrate troglobite fauna of Australasia in the form of two blind fish in the Subterranean waters of the coastal limestone (Humphries 1991a,b; Humphries & Adams 1991), as well a both marine and freshwater troglobitic crustacea.

To the west of Cape Range the continental shelf is at the closest point in Australia to the current land area but to the north and east lies the extensive North West Shelf. This shelf would have been widely exposed in the Holocene and totally exposed at times during the Quaternary. Cape Range is currently isolated from two 'islands' of Cape Range Formation, namely Rough Range to the south-east and Barrow Island to the north-east. The isolation to the south is by hypersaline ground water below aeolian sands and in other directions by the marine inundation of the North West Shelf.

The most likely place to find a cave fauna similar to that on Cape Range is on Barrow Island which lies about 200 km to the north-east of North West Cape. Part of Barrow Island is covered by thin Quaternary deposits but elsewhere there are exposures of 'Trealla Limestone', the limestone that overlays the highly cavernous Tulki Limestone in Cape Range which contains the rich troglobite fauna. However, while the 'Trealla Limestone' on Barrow Island is the same age as the Trealla Limestone in Cape Range it is a new formation (J.K. McNamara and G.W. Kendrick, pers. comm. 1991) that is logically similar to the Tulki Limestone in Cape Range. As Barrow Island rises to 65 m there is sufficient height both for significant cave development and to have prevented inundation during post-Pliocene marine transgressions.

This speculation was confirmed during a recent visit to Barrow Island which has revealed a troglobite fauna similar to but distinct from that found in Cape Range. The fauna is, in part, clearly relictual from times when this now semi-arid region was much wetter (Humphries 1990; Humphries *et al* 1989).

Climate

The mean annual rainfall of Barrow Island is 330 mm and falls more predictably than the mean of 284 mm of rain on the North West Cape peninsula. The vegetation of Barrow Island has close affinities with that of the North West Cape peninsula.

The caves on Barrow Island are at the upper extreme of temperature range of the Cape Range caves (Table 1). The temperature and humidity of Ledge Cave (B1) are fairly uniform throughout, not differing significantly between areas. The mean temperature was 27.6 $^{\circ}C$ (s.d. 0.6, n = 11) and the mean relative humidity was >96% throughout, approaching 100% in parts. The lower chamber of B1 containing mud banks that contained 26.3% water, while the cracking mud higher in the chamber contained 23.1% water by weight. In Cape Range the relict rainforest troglobites are found in all caves with >27% soil water and below this level the proportion of caves with troglobites declines. The mud away from the water in the upper chamber contained 19% (S.D. 0.7, n = 4) water.

The water table is reached in cave B1 and it is saline and exhibits tidal flow: the cave is close to the sea cliffs. After heavy rain a layer of freshwater would be expected to form on the surface of this water; indeed, white 'sand hoppers' have been reported at such times in this cave. In the northern hemisphere such anchialine caves, even on islands, often contain relict higher taxonomic groups which are considered to be "living fossils", especially in the crustacea (Schram 1986). Indeed, one such group of Crustacea, the Thermosbaenacea, has recently been found in anchialine systems on the North West Cape peninsula (Poore & Humphries in ms).

There are rock clefts on Barrow Island from which warm and humid air is blowing (e.g. B6) and such clefts clearly communicate with much larger humid caverns where troglobitic fauna may be expected.

Searching

All caves or potential caves that were known by those long familiar with the island were examined. Considerable searching on foot and by helicopter failed to reveal any substantial caves not already known to those familiar with the small (223 km^2) island. In one respect this is unsurprising as the island has been worked by numerous people over >30 years including competent field geologists and naturalists: the intensity of this working is indicated by there being *ca* 10 km of road or seismic track per square kilometre of island, plus numerous pipeline routes that are not congruent with these roads and tracks. In another respect the lack of openings is surprising because drillers familiar with the area repeatedly report hitting cavities between 12-30 m from the surface. While it is known that most cavities in limestone do not have entrances (Curl 1966), the implied high degree of entranceless cavities on Barrow Island itself warrants a study based on the examination of the bore data.

During the visit the island the surface vegetation in both Cape Range and Barrow Island was relatively lush owing to well spaced but small falls of rain. However, the accessible parts of the caves themselves, having taken no inflow of water, were dry and almost devoid of life and contained almost no vegetable matter as an energy source. The cave systems on Barrow Island thus appear to be of the type that receive substantial inputs only after exceptional rainfall (>156 mm in one fall) like some of the Cape Range caves (Humphries *et al.* 1989). Following such rainfall the caves would be expected to contain the greatest number of troglobitic species and ideally they should be sampled at such time.

To increase the chance of finding troglobites and based on the results of experiments in Cape Range (Humphries 1991b), two caves were manipulated by the addition of the depleted resources.

Manipulations

Evidence from Cape Range shows that the caves receive, from periodic but unpredictable heavy rainfall, the influx of water and organic matter needed to fuel the cave community. The water and organic carbon content of the caves then declines until the next influx of water and its contained organic matter. Should either the water or organic carbon content of the cave fall below some threshold level then the troglobites disappear from the cave but can be induced to return over a period of many weeks by replenishing the supply of water and organic carbon (Humphries et al. 1989, Humphries 1991b).

Ledge Cave (B1) was clearly low in organic material although the relative humidity and the water content of the mud-banks is sufficiently high to support troglobites. Cave B3 (a sinkhole) was clearly too dry and lacked a base of organic matter. To encourage any troglobitic fauna to enter the caves from the crevices (Humphries 1991b) water and organic matter (leaf litter) was added to B3 and organic matter alone added to two levels in B1.

The relative humidity at the bottom of cave B3 rose from 69% before the addition of water to 84% and thereafter fell to 79% RH eight days later. Both manipulations worked as expected, attracting in numbers to the moist litter within the first week the humid adapted but non-troglobitic isopod *Laevophiloscia yalgoonensis* not previously present in the area. This is as predicted from experimental work in Cape Range (Humphries 1991b).

Within seven weeks of the manipulation the numbers of all known species of troglobites had increased substantially in B1 but not in B3 (D. Goodgame; pers. comm. 1991).

Fauna

Humid caves

A Cape Range-style troglobite fauna was found in only one cave (B1, Ledge Cave). It includes a new species of micro-whip scorpion (Chelicerata: Schizomida) which is only the second species of a genus previously known only from Cape Range as *Schizomus vinei* Harvey (Harvey in press a). There is a highly cave adapted blind cockroach similar to but distinct from the Cape Range cave cockroach *Nocticola flabella* Roth (Blattodea) and a millipede belonging to an Order (Diplopoda: Spirobolida) not recorded from Cape Range where highly cave adapted millipedes of several species are found (Humphries & Shear in ms; Shear in ms). In addition to several species of non-troglobitic woodlice (Crustacea: Isopoda) in the cave there is a troglobitic species of unknown affinities, probably an Oniscidae. It also contains the epigean but humid adapted terrestrial Philosciid Isopod (*Laevophiloscia* *yalgoonensis*), as did the dry cave (B3) after it was reactivated by adding water and organic matter; this species is found also in Cape Range caves where they are an important food source for some troglobites (Humphries *et al.* 1989).

This fauna has clear and close affinities with that found in Cape Range. Because it covers the entire range of troglobites, from the environmentally relatively resilient schizomids to the most sensitive *Nocticola*, I would expect that Barrow Island contains a much richer, troglobitic fauna than has yet been sampled.

All the schizomids were found within a 0.5 m area in the upper part of the top chamber on a dry surface but where the relative humidity was high (>96%); in Cape Range it has been found that the troglobites will travel through dry areas if the relative humidity is high enough and may thus approach cave entrances. The *Nocticola* sp. were taken in the lower 'mud-chamber' on the mid-level mud-banks where the humidity is high and the soil water content was between 23-26%; the millipedes were also taken in this location.

Dry caves

The dry caves (B2 & B3) contained an undescribed genus and species of pillbugs (Isopoda: Armadillidae: Buddelundiinae; H. Dalens, pers. comm. 1991) that shows no morphological adaptations to cave life. Cape Range contains a diverse endemic fauna of both armadillid and philosciid isopods, mostly epigean species although some clearly dependent on humid conditions. Philosciid Isopod (*Laevophiloscia yalgoonensis*) was found in cave B3 after it was reactivated by adding water and organic matter.

Predatory bugs (Hemiptera: Reduviidae) of two species were found in the dry caves (B3, B4, B5 & B8). Both are clearly related to those found in Cape Range.

In addition an undescribed species of pseudoscorpion *Oratemnus* sp. nov. ?(Atemnidae) was found in a dry cave (B5) and it has clear cave adaptation (M.S. Harvey, pers. comm. 1991) in that it is slightly built for its family. It is, however, much more sclerotised and heavily built than the troglobitic pseudoscorpions from the humid caves of Cape Range. The genus is widespread in Australia and includes species from caves. The family Atemnidae is unknown from Cape Range where six species, including a new genus, are known from three families (Harvey 1991, in press b).

A juvenile *Janusia* sp. (Ctenidae) was collected from B2 in 1976 by D. Lowry. The genus is known also from Cape Range, the Nullarbor and the Undara lava tubes in NE Queensland. Its presence in B2 is somewhat surprising as the cave is very dry. New species of Filistatid spider are being described from the island and from Cape Range (M.R. Gray pers. comm. 1991).

Remarks

The finding of a Cape Range-like troglobite fauna on Barrow Island in non-Tulki Limestone raises questions about the occurrence of similar fauna elsewhere. The limestones abutting on the fauna in Cape Range are the Mandu, Tulki and Trealla which are part of the Cape Range Group. However, the Cape Range Group is very extensive covering large areas of the North West Shelf as well as adjacent land areas. Barrow Island is the only one with elements of the Cape Range group exposed above sea level so that, on the present understanding of the fauna, it is unlikely to be found on any other islands. There are a number of potential on-shore 'islands', especially Rough and Giralia Ranges which are potential candidates. Rough range is an obvious candidate but no caves have been reported from the area despite very intense oil exploration in the range over many decades. In addition the range is formed of Trealla Limestone which is not known to be cavernous in Cape Range.

Acknowledgements

Brian Vine accompanied and sustained me on this trip and without whose help the troglobites of Barrow Island would remain to be discovered. I thank West Australian Petroleum Pty Limited for the provision of transport, accommodation, victuals and the local knowledge which made this trip a success and Messers W.H. Butler, G. Devenny, D. Goodgame, R. Lagdon and B. Young for sharing with us their knowledge of cave locations and conditions on Barrow Island. I am grateful for the determinations made by Dr M.S. Harvey and Ms. J. Waldock (W.A. Museum: Chelicerata) and Dr H. Dalens (Toulouse: Isopoda). This work was carried out under permits from the Department of Conservation and Wildlife (No. SF 549 and NE 436).

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Table 1: Temperature and humidity of some caves on Barrow Island in September 1991. Temperature and relative humidity were spot measured by whirling hygrometer (Brannan, England).

Cave	Date	Temp °C	RH %	Vapour pressure hPa	Location
B1	5.9	27.6	96	35.3	Main chamber.
B1	5.9	28.0	93	35.5	Main chamber
B1	5.9	28.2	97	37.1	Small water pool, flowing seawater
B1	5.9	27.9	97	36.4	Mudhole. mud 26.3%
B1	6.9	27.6	98	35.3	Schizomid area
B1	6.9	27.8	96	35.9	1m below schizomid area
B1	11.9	27.3	96	36.1	Main chamber
B1	11.9	28.0	99	37.5	Schizomid area
B1	11.9	27.7	97	36.0	Mudhole
B1	12.9	27.3	99	36.0	Mudhole, cracking mud 23.1%
B1	12.9	26.3	100	34.2	Main chamber
B2	8.9	25.1	63	20.1	Outside
B2	8.9	24.3	70	21.5	Inside
B3	4.9	29.3	73	29.6	Base: water added to cave
B3	7.9	28.8	88	35.0	Base
B3	12.9	27.2	85	31.0	Base
B3	12.9	29.0	79	31.7	Base
B4	7.9	24.7	56	17.6	Upper chamber
B4	7.9	24.8	63	19.8	Lower chamber
B4	7.9	25.1	81	24.6	Upper aven
B5	7.9	26.2	47	16.0	Mouth of cave in doline
B5	7.9	25.6	57	18.0	Surface
B5	7.9	23.8	69	20.4	Back of cave
B5	7.9	23.7	77	22.4	Left back chamber
B10	9.9	23.4	62	17.8	Surface
B10	9.9	28.8	79	31.2	Bottom 30m

TRIP REPORT - WILLYABRUP CLIFF

by Peter Wood

Date: August 1991

Place: Willyabrup Cliffs.

Participants: Michael Pimm, David Graves, Dawn Graves, Peter Wood, Anne Wood, Beau Pickersgill, Jim Fyfe.

We arrived at the car-park on a fine, breezy morning looking forward to a quiet few hours abseil and prussick. But of course nothing is ever as simple as it seems. We made it to the second car-park - the first was full with Bunbury S.E.S., Adventure West and other vehicles. We collectively thought, here we go, as full as Mike Pimm's thermos. Undeterred we loaded up and hiked to the cliff face, a pleasant experience in itself.

It's a good thing the cliffs are big - at the first area it was standing room only - and that was on the vertical face. We ventured further on - slung our three ropes and worked at being human yo-yos for three hours, trying and discussing the merits and otherwise of various S.R.T.'s. Interspersed of course with lunch and time spent just taking in the spectacular view of ocean, cliffs and sea swell.

Some of the Sub-group have recently switched to Petzl Bobbins for abseiling. They do have the increased safety factor but cannot be used for rapid descents. As Michael found out they can overheat the rope and come to a sticky halt. Next abseil I am going to rig my figure 8 at helmet height on a cows tail (fed through chest harness) with a prussick knot from harness to abseil rope for safety. These things are always worth a try and it worked in the hay shed at home hanging from a roof truss.

Willyabrup is only a 35 metre abseil but somehow the great abyss of Indian Ocean and breaking waves makes the initial move to the edge more daunting than Brides - which is actually a bit deeper. We had a couple of malingerers but the social pressure became irresistible.

All in, an extremely pleasant day, finished of with a cup of brew on Graves verandah at Gracetown.