

ASF NEWSLETTER

THE AUSTRALIAN SPELEOLOGICAL QUARTERLY



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The views expressed in this newsletter are those of the authors and not those of the Australian Speleological Federation Incorporated nor the Editor unless specifically stated.

EDITORIAL

This will be my second last ASF Newsletter. The last will be the 100th (!) which although well conceived and reasonably well developed, is still having a few problems with actually coming into the world.

What I need are some decent action caving photos, yes I know I've asked before and I thank those of you who have responded. Unfortunately, the photos that I have received, that are of appropriate quality, are either cave diving shots or photos taken in caves overseas. Doesn't anyone have a decent action shot of a caver in an Australian cave? What I am looking for is an exciting colour photo for the front cover as well as some good colour shots for the centre pages. There is also room for some good black and white shots and any humorous photos. I cannot offer you much more than the glory of your name in print but I hope that this, my final plea, will generate some sort of a response. If I don't get a response, you will be stuck with the inevitable New Guinea or New Zealand photos.

The new newsletter editor will be Kerry Bennett and I would like to wish Kerry the best of luck. I would also like to thank all the regular contributors, a quick glance at the contents tables of the last few newsletters will show you that it is always the same few people who keep this show on the road. I must admit that without the support of these people I would have chucked this job in years ago.

I feel that this is an appropriate time to draw everyone's attention to your good fortune in having such a good newsletter manager. Ian Mann does a lot of work behind the scenes, and it is his constant, but friendly hassling that has caused this newsletter to appear in spite of this editor's total disenchantment.

I wish the new team well and I hope a few more of you "out there" will give them the support they need to make this magazine a success.

JUDITH BATEMAN

NOTES ON THE ASF

ASF COUNCIL MEETING - January 1985

The Hobart meeting saw the winding up of the "old" ASF, final step in the transformation to ASF Inc. The two sessions were well attended, the only dissappointments being that three NSW clubs were not represented and that WASG was unfinancial and thus unable to vote. The absent clubs were BMSC, HSC and RANCA. RANCA's proxy only reached the ASF mailbox after the Secretary had left for Hobart.

Reports by the executive and by convenors of Commissions and Ad Hoc Committees were recieved. Some had been published in advance in ASF Newsletter 104, some were given in writing and regrettably some were only verbal! Some reports were not given, mostly where convenors were not in attendance; apologies were lacking here....

Most discussion was about two issues. The first being the deteriorating relations between ASF and the NSW Tourist Department in respect of access to Jenolan. The other being Speleo Handbook II. But more of these later.

Speleovision Proceedings were on sale at the Conference, whilst the Cave Convict proceedings are close to the printing stage. Meanwhile, the Nibicon Committee was disbanded, but the matter of Nibicon's Proceedings is still being pursued. This was despite the claim that few people now seemed interested in seeing a Nibicon Proceedings. There have also been requests for refunds and many of the authors have withdrawn their consent to publish.

It is intended to divide the publication of proceedings from Speleomania between Helectite and the ASF Newsletter, with at least an abstract of all the papers appearing in the ASF Newsletter.

Further on publications, there was talk about whether Speleo Abstracts would ever be resurrected. The feeling was that they could never take quite the detailed form they used to. However, we were reminded that ASF has not only an obligation to members, but also to the international caving community in this regard.

Also nearly ready for publication, is the new edition of the ASF Administrative Handbook; this has been prepared by Miles Pierce and Philip Toomer. Meanwhile, Mike Armstrong is working on a Beginner's Manual. A proposed contents was circulated at the meeting. Mike has undertaken to circulate a full draft before the next council meeting, due early in 1986.

On membership, Lloyd Mill prepared a short report on alternative membership structures from a financial and voting perspective. Capitation for 1986 was set at \$8.00. A suggestion of \$10.00 was defeated.

Darrel Warden was not present to report further on his review of association, but there is obviously more work to be done here. It is hoped that Darrel might publish his report in the ASF Newsletter at some future date.

"NEWCAVES" - Newcastle and Hunter Valley Speleological Society - were voted in as

Participating Associates of ASF Incorporated and invited to proceed to apply for membership.

A grant of \$100 from the Special Conservation Fund was voted to Northern Caverneers, to help defray the cost of the cleaning and conservation work in Kubla Khan Cave at Mole Creek.

A recommendation that the Cave Conservation Commission be amalgamated with the Cave Tourism and Management Commission was rejected. These are seen as separate roles for ASF as exemplified at Jenolan recently, where ASF has been used as a consultant on the reopening of the Nettle and Arch Caves. At the same time, our relationship with the Tourist Department on other matters are at a low ebb.

Discussion of the Jenolan issue ended with the ASF Council declaring its full support for both ASF and the NSW Speleological Council and authorising both Presidents to act on ASF's behalf in this matter, even to pursuing a solution at the highest possible level. ASF cannot leave the Jenolan matter unresolved, especially if we are serious about hosting an International Congress in NSW.

ASF has a committee looking at a World Heritage Nomination for the Nullarbor; a new committee under John Dunkley was formed to look at the possibility of nominating Jenolan. A committee under Nick White was formed to make a review of Karst items on the National Estate Register, particularly in regard to other possible World Heritage Nominations.

On the much delayed Speleo Handbook II, there was lengthy discussion inside and outside the meeting, both on the long promised publication and, more importantly, the ongoing structure of the karst database and the associated documentation and development functions. However, with the supposedly imminent publication of the Handbook, the meeting felt that any restructure would be premature.

As the "papers" are no longer to be included, only the Karst listing will be published at this stage. A new committee, under Evalt Crabb, is to look into the future of the "papers" and the future publication needs of ASF.

The meeting saw the re-election of John Dunkley as President, the election of Ian Mann and Kevin Mott as the Vice Presidents, replacing the retiring Darrel Warden and Rauleigh Webb. Ian Mann is convenor for "Speleotec '87", ASF's next conference. Another change was for the Newsletter. Kerry Bennett replaces Judith Bateman as editor. Finally on people, amongst the awards given at the conference dinner was the award of Fellow of the ASF, to Peter Matthews for his years of dedication, particularly to Speleo Handbook.

The Conference following "Speleotec 87" is scheduled for Queensland, with CCC already offering Chillagoe as a possible venue.

Chris Dunne

INTRODUCING TESS

- The Top End Speleological Society

After 15 years the Territory finally has a caving society!!! In 1982 there were only three of us (crazy cavers from the south), now there are approximately 17 members. "MASSIVE".

It was never intended to form a society until Senior Ranger at Cutta Cutta Caves Nature Reserve, Cliff Ellis, warned that the area that we were working on would one day be Park reserve. Not being total fools we heeded his warning and with his assistance, TESS was conceived. It took another two years of gestation and finally popped up in Jun 1984.

Unfortunately, due to a bureaucratic bungle of old, TESS will not be able to follow on from the defunct NTSS or DSG. Their records are few, or non existent. The only notable and reliable work done between 1969 and 1982 was in 1974 UNSWSS. Our research has taken up where UNSWSS left off.

Cutta Cutta Caves reserve was granted extensions in late 1984 by the Conservation Commission of the Northern Territory. The Reserve is now approximately 15 square kilometers and encompasses most of the significant limestone outcrops south of Katherine. Most caves tagged by UNSWSS in 1974 are now within its boundary.

The reserve itself, like all caving areas in the NT is a most inhospitable place. No surface water, very little shade and the temperatures often in the high 30's. To sum the surface up in one phrase: "Hiroshima, after the bomb".

The caves themselves are only slightly more entertaining. With the watertable at a maximum depth of 35 metres, a new cave depth record is out of the question! The caves are only active in the short wet season (unless water table links are present). Temperatures reach up to 38° C, and the humidity in the caves reaches up to 100%. To sum up in one phrase: "Bloody uncomfortable".

TESS' interests are mainly confined to Katherine at the moment but other ground have been illuminated by its ever seeking lights. Scott's Creek Station, west of Katherine, has proved a most important caving find. An expedition by Rod Silburn and Scott Crawford revealed a long low cave system, which contained an extremely large colony of *Rhinoicteris aurantius* (not positively identified). The colony size was in excess of 1000.

Jabiluka (as in Uranium province), consists of sandstone caves in elevated outcrops. The main interest in this area is the existence of *Macroderma gigas* colonies. I do not wish to dissappoint the naive, but, the caves do not glow in the dark!

All Caves List work is at present carried out by TESS. It is coordinated by the writer.

The K26 system has been extended beyond the findings of UNSWSS in 1974. Exploration led by Captain K has resulted in another entrance being dug and two water table locations being found. Blind shrimp were discovered at both water table locations. Professor W D Williams of Adelaide University accompanied TESS to "location one" to collect several specimens of the shrimp. A report of his findings will be submitted to the ASF Newsletter in the near future. Professor Williams' work on cave crustacea is a great

asset to Australian speleology. It is fortunate that we have something new to offer him.

Professor Henri Dumont's visit to K1 in October 1983 resulted in a second cave dwelling species of *Mesocyclops* being discovered. Professor Dumont is of the Zoological Institute, The State University of Gent, Belgium. The new Copepod is named *Mesocyclops cuttcuttae*, after the cave in which it was discovered, Cutta Cutta.

Bats have been collected for study on several occasions to date. Specimens of *Eptesicus pumilus*, *Miniopterus schreibersii* and *Macroderma gigas* have all been sent south for study - alive. The bats travel TNT air express in eskies!

The bats are sent in a torpid state, which is induced by placing the bat in front of an airconditioner. No reports have been recieved by either the Conservation Commission or TESS.

So as you see, on top of the "Land down under" things are really happening. We hope that continued interest will be shown by zoological institutions, as the surface of the investigation of tropical cave life has only been scratched in Australia.

As furthering speleology is our main aim, I am sure that interest in TESS will not die, so you may look forward to more new findings from the grovellers up north.

Southern caves are cool, but ours are real hot!

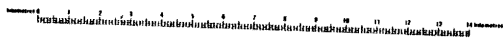
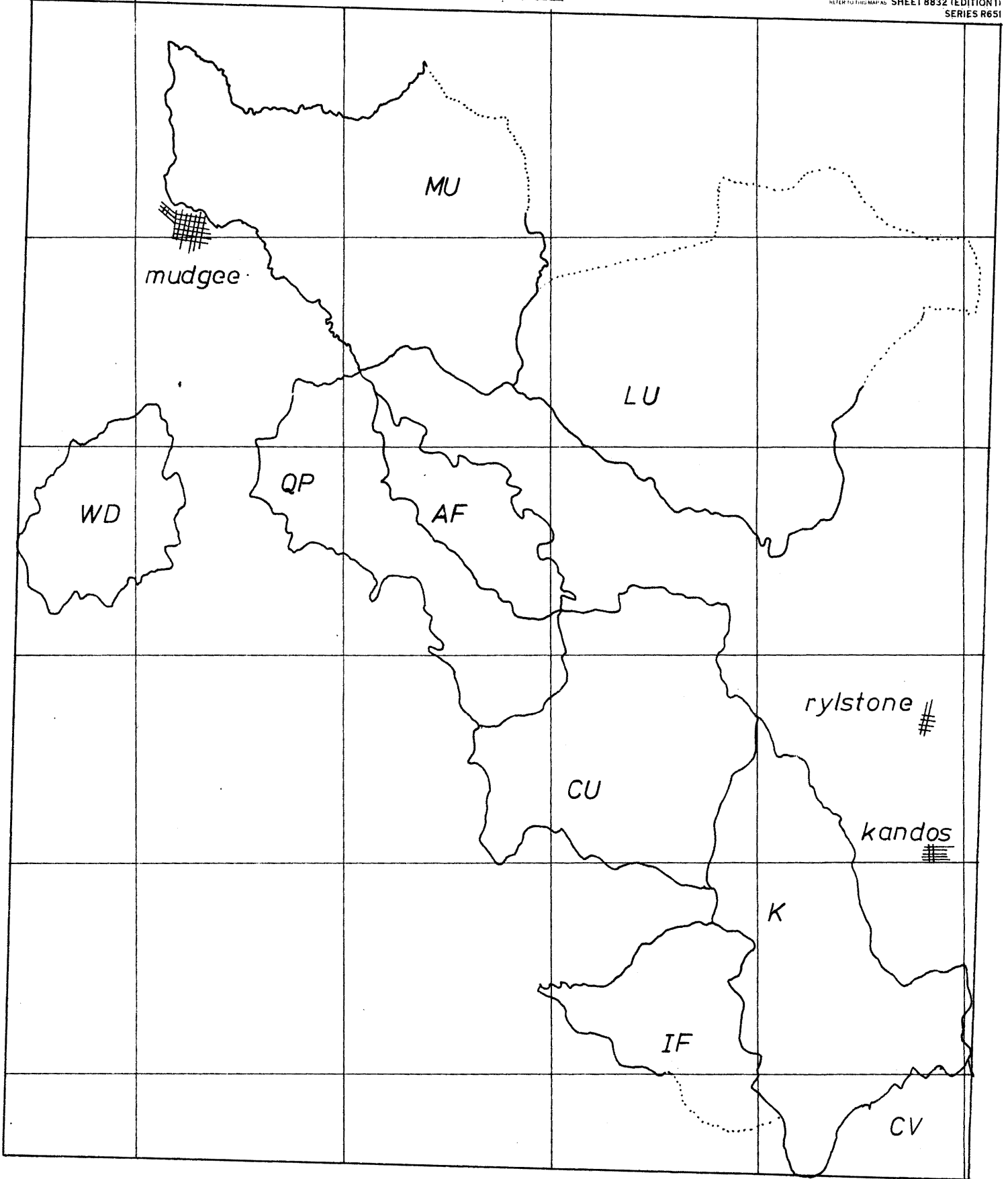
Captain Kremmen (Tod P Dennis)



AUSTRALIA 1:100 000
TOPOGRAPHIC SURVEY

MUDGEE

REFER TO GRID MAPS SHEET 8832 (EDITION 1)
SERIES R651



APPENDIX C

GRID CONFORMANCE
1:5° 02' 00" S

GRID MAGNETIC ANGLE
175° 02' 00" W

INDEX TO ADJOINING MAPS

FURBER 8732	GEEBONG 8833	MELBA 8933
CHURCHILL 8732	MUDGEE 8832	HONEY POINT 8732
STANGE 8731	RAILWAY 8831	WALLERWALL 8931

PART OF SHEET 8832
S1 55 4 DUBBO

A Revised Area Nomenclature for Karst Between Lithgow and Mudgee

PETER DYKES

INTRODUCTION

For the last few years I have been involved in the documentation of caves and karst in the Mudgee District. In doing so one of the greatest problems has been the lack of any clear area nomenclature/s for the limestone found in the region.

Previous area nomenclatures have been haphazardly applied and never accurately geographically defined. A great deal of time has therefore had to be spent in investigating and mapping the limestone outcrops. This has been followed, by clearly sorting the limestone outcrops into geographical areas for the purposes of documentation.

This report, which represents years of work in the Mudgee District, was presented to the NSW Speleological Council on 20 Feb 1982. It clearly defines area nomenclatures for limestone outcrops in the district based on geographical definitions and was accepted as defining the approved nomenclature by the NSW Speleological Council on 16 Apr 1983.

HISTORY

Limestone has been known to exist in the district for over 100 years and during this time has been mined extensively for lime, cement and road base. A number of large quarry operations have been in progress since the turn of the century and evidence of them can still be seen in most of the outcrops throughout the region. As a result of mining, very little of the original surface exposure of limestone is still present. Only in the remoter areas of Capertee Valley and Apple Tree Flat is much of the limestone still in its original state.

The first trip to the region by a caving club was run by Highland Caving Group (HCG) in 1960. Much of HCG's early exploration was centred on the limestone immediately around Mudgee, especially the outcrop at Buckaroo. Blayne Pearcey's report on Buckaroo in April 1963, concluded that there was little prospect of finding more cave development there and as a consequence interest shifted south to the areas of Cudgegong and Apple Tree Flat.

Up to 1966 HCG had explored quite a number of outcrops south of Mudgee: Apple Tree Flat and Cudgegong proving the most promising. However after this date the club's interest in the the region fell off until the early 1970's.

During this time other caving clubs had become interested in the region, namely:- Blue Mountains Speleological Club (BMSC) and Newcastle Technical University and College Speleological Society (NTUCSS)

NTUCSS had run a dig in MU5 (known as Fence Line Hole) at Buckaroo in the early 1960's. However as the club became defunct after 1970 and its records were never deposited with ASF, I can only speculate on the results of their work. It would seem that they spent some time looking over the Buckaroo outcrop but did not visit any of the areas south of Mudgee.

BMSC visited the areas in the Capertee Valley,

Blue Rocks, and Coko Creek, although no extensive work seems to have been carried out.

In 1970 the Mudgee Mini Conference was held. This ushered in a new era of exploration in the Mudgee District. Two new clubs came on the scene; ie. Pensula Speleological Group (PSG) and the University of New South Wales Speleological Society (UNSWSS). Most of the effort now concentrated around the areas of Queens Pinch / Apple Tree Flat or in the Capertee Valley.

PSG ran a couple of trips to the Cudgegong and Queens Pinch areas. It was as a result of these trips, or to be more precise, the published reports, that much of the area nomenclature confusion arose. PSG published a map of the caves at Queens Pinch along with a cave listing including the name of one cave called "Lemon Tree Pot". Lemon Tree Pot had originally been found at Apple Tree Flat area in the early 1960's by HCG and how PSG found it at Queens Pinch is beyond comprehension.

UNSWSS ran a trip to Apple Tree Flat in July 1972 and also produced an area map and a cave listing with ATFl called "Lemon Tree Pot".

As both area maps appeared similar it was assumed that they were in fact the same area. The fact that the caves at Apple Tree Flat and the caves PSG found at Queens Pinch were 8kms apart seems to have been overlooked until HCG reappeared on the scene in 1976.

Since 1976 HCG, mostly in the form of Evalt Crabb, Rik Tunney and myself have spent a great deal of time revisiting the limestone outcrops. Principally with the aid of Evalt, who remembers much of the early exploration of the district I have been able to sort out much of the confusion and begin a detailed documentation of the caves in the district.

CURRENT AREAS

In 1967 Speleo Handbook 1 recorded that there were four cave areas considered as being part of the Mudgee District with two areas in the Capertee Valley. These were;-

Mudgee District	Capertee Valley
Apple Tree Flat	Coko Creek
Buckaroo	Blue Rocks
Cudgegong	
Queens Pinch	

None of the above areas were geographically defined and most reports referred to only one outcrop in the area in which caves could be found. The fact that some of the areas had limestone extending in a fairly continuous belt for up to 10 kms was completely overlooked.

In the preparation for Speleo Handbook 2 the number of cave areas has been reduced to two;-

Queens Pinch	Cudgegong
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Again these areas are not geographically defined. Clearly the current area nomenclatures in the Mudgee District are inadequate for the

following reasons;-

- (a) They do not cover all the limestone or caves to be found in the region.
- (b) None of the areas are accurately geographically defined and as a consequence some confusion exist as to what area is what.
- (c) What area names do exist do not take into account all the limestone outcrops to be found in the immediate area, but rather refer to only one outcrop.

PROPOSED AREAS

It is proposed to put forward ten areas to cover all the limestone between Lithgow and Mudgee and that this be the basis of recording any karst feature found therein. The new areas to be known as;-

Apple Tree Flat	Lue
Capertee Valley	Mudgee
Cudgegong	Portland
Ilford	Queens Pinch
Kandos	Windeyer

While the number of cave areas has certainly increased, it is now possible to accurately record all the limestone, and any features to be found in the region.

It should be noted that in the case of three areas, no cave feature has been recorded to date;-

Kandos	Lue	Portland
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However as all three have extensive deposits of limestone, are of commercial interest and indirectly of interest to conservationists I have decided that they should be part of the N.S.W. Documentation of Karst Resources.

Also I wish to present as complete and accurate a documentation of all karst to found in the region as possible. I hope to avoid the situation that should a karst feature be identified in the future that there is no defined area and area name to which the feature can be recorded under. In effect I wish this report to be as definitive as is possible.

In deciding upon the new area names I have tried to retain as many old names as possible. However this was not feasible in the cases of Buckaroo, Coko Creek and Blue Rocks. Buckaroo was the name for only one outcrop amongst a great many to be found east of Mudgee. I have decided that the name Mudgee is a more appropriate name to cover all this limestone. In the case of Blue Rocks and Coko Creek, both names refer to either ends of the same continuous belt of limestone to be found in the Capertee Valley. Therefore to simplify names I have decided to use the name Capertee Valley.

The following is the geographical definitions for the new cave areas:-

APPLE TREE FLAT Prefix AF
All limestone drained by the western tributaries of the Cudgegong River upstream from its junction with Mullamaddy Creek to its junction with Limestone Creek.

CAPERTEE VALLEY Prefix CV
All limestone drained by the Capertee River.

CUDGEGONG Prefix CU
All limestone drained by both the eastern and western tributaries of the Cudgegong River from its Junction with Limestone Creek upstream to its junction with Cardwell Creek.

ILFORD Prefix IF
All limestone drained by the Crudine River upstream from its Junction with the Warrangunia Creek.

KANDOS Prefix K
All limestone drained by Cardwell Creek.

LUE Prefix LU
All limestone drained by Lawsons Creek upstream from its junction with Bara Creek to its junction with Breakfast Creek.

MUDGEE Prefix MU
All limestone drained by the eastern tributaries of the Cudgegong River from its Junction with the Eurundury Creek, including the Eurundury Creek, upstream to its junction with the Mullamuddy Creek and as far up Lawsons Creek as the junction of Lawsons Creek and Bara Creek.

PORTLAND Prefix P
All limestone drained by the Williwa and Dulhunty's Creeks.

QUEENS PINCH Prefix QP
All limestone drained by the Mullamuddy and Limestone Creeks

WINDEYER Prefix WD
All limestone drained by the Goorangore Creek upstream from its Junction with Four Mile Creek.

CONCLUSION

This report represents a great deal of time, not only by myself but also the members of Highland Caving Group. Their assistance, especially that of Evalt Crabb, has made my job easier.

Much of the limestone in the region has been mined and consequently most of the caves to be found are only small holes. However, there are some places of real interest: Capertee Valley limestone with its peculiar flora offers a stark contrast to the surrounding forest, while both Swallow Cave and Ilford Cave are probably the best caves worthy of a visit. Queens Pinch and Apple Tree Flat offer some good caves for beginners.

PETER DYKES

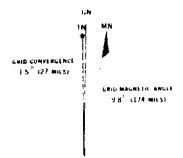
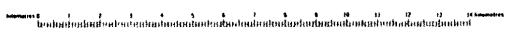
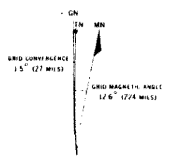
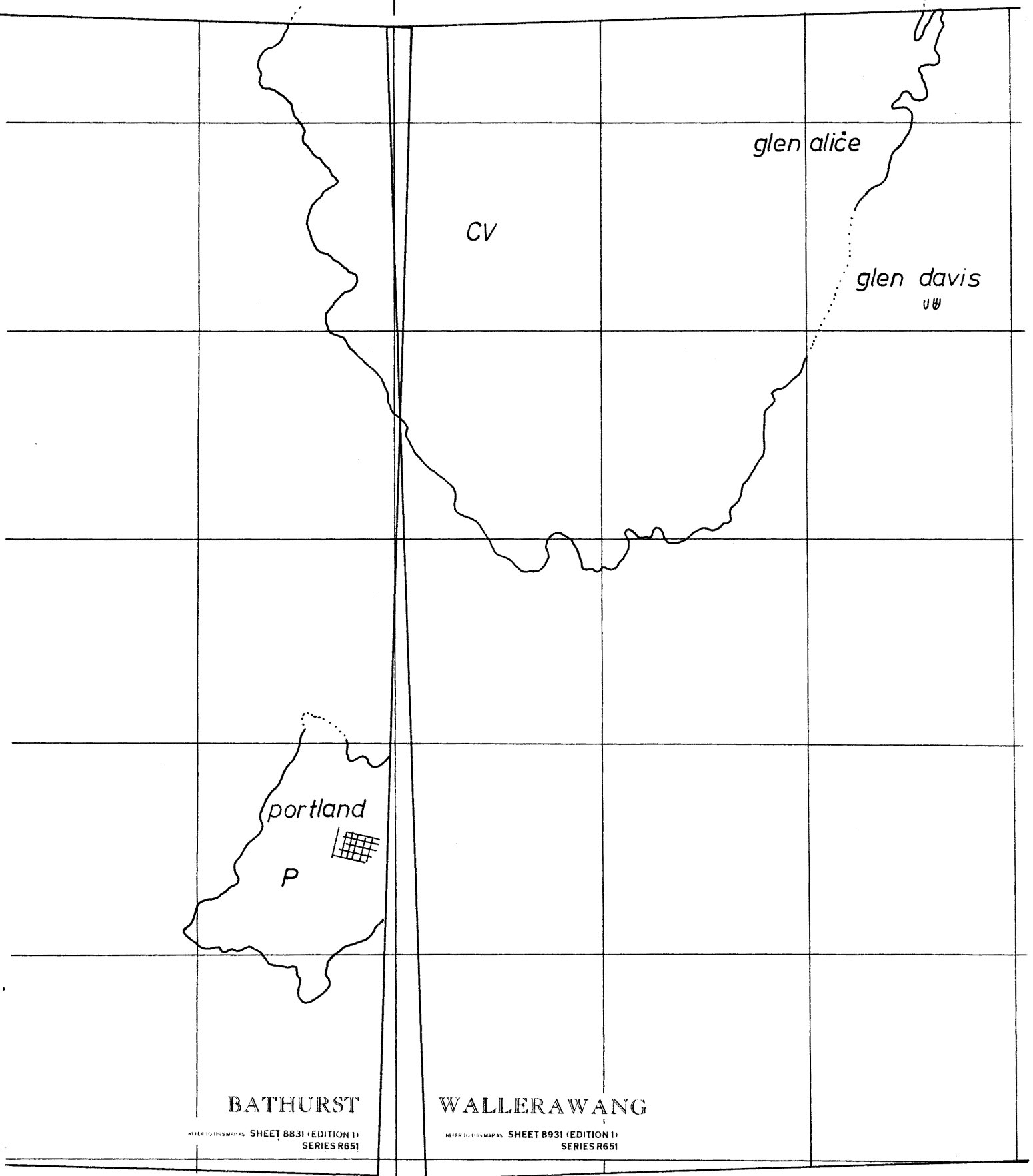
CONVEROR, NSW SPELEOLOGICAL COUNCIL CAVE NUMBERING AND NOMENCLATURE COMMITTEE.

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APPENDIX B

APPENDIX D

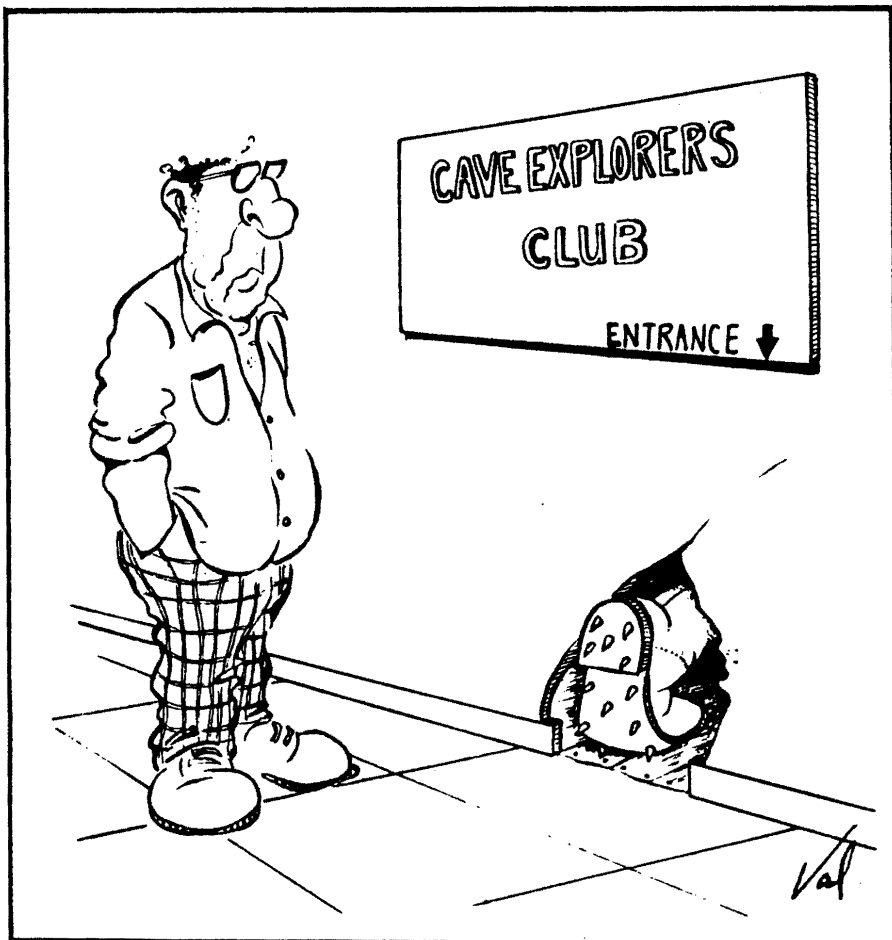
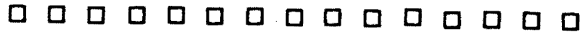


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APPENDICES

Below is a list of the Appendices provided with the original report. The maps have been reproduced in this issue. Appendix A is rather lengthy and will be in many club libraries and so has not been reproduced here. Copies are available from:
Peter Dykes, PO Box 1338, ORANGE NSW 2800.

- APPENDIX A
'REPORT OF MUDGEE MINI CONFERENCE PROCEEDINGS'
- APPENDIX B MAP:- BATHURST 1:100,000 Sheet
8831 (EDITION 1) Series R651
Compiled by ROYAL AUSTRALIAN
SURVEY CORPS Printed 1977
(Information on map correct to 1973)
COVERING; PART OF CAPERTEE VALLEY
AREA AND PORTLAND AREA
- APPENDIX C MAP:- MUDGEE 1:100,000 Sheet
8832 (EDITION 1) Series R651
Compiled by ROYAL AUSTRALIAN
SURVEY CORPS Printed 1977
(Information on map correct to 1973)
COVERING: APPLE TREE FLAT AREA
PART OF CAPERTEE VALLEY AREA
CUDGONG AREA
ILFORD AREA
KANDOS AREA
LUE AREA
MUDGEE AREA
QUEENS PINCH AREA
WINDEYER AREA
- APPENDIX D MAP:- WALLERAWANG 1:100,000 Sheet
8931 (EDITION 1) Series R651
Compiled by ROYAL AUSTRALIAN
SURVEY CORPS Printed 1977
(Information on map correct to 1973)
COVERING; MOST OF THE CAPERTEE VALLEY
AREA



A Review of the Literature on The Toxicology of Fluoroscein Dye

ROMAN LICHACZ

USES

Fluoroscein's major use in the field of Speleology is in confirming connections between water bodies in different regions of a cave, between the surface and underground waters and to show that different caves and different parts of the same cave are interconnected by the same body of water. In so doing, the underground hydrology can be determined. On occasions these tests are done without due care to the effects of fluoroscein on the environment utilising these water bodies. Hence the reason for doing this review on the toxicology of fluoroscein.

Outside of the Speleological interests, the main uses of fluoroscein are for sanitation processes (6), such as tracing flow patterns, flow rate measurements in sewers and streams, calculating retention times in sewerage settling tanks, tracing contaminated ground water, calculating zones in wastewater discharges in receiving waters and detecting waste flows of effluent from subsurface disposal fields. In chemistry it is used as an adsorption indicator for titrations and in medicine (6) it is used as a diagnostic agent in some ophthalmic (e.g. as an indicator of corneal trauma) and circulatory conditions and as a dental plaque disclosing agent (5).

CHEMISTRY

Fluoroscein sodium has also the following synonyms (11):- soluble fluoroscein, resorcinol phthalein sodium, uranine, uranine yellow and its IUPAC name of Spiro[iso benzofuran-1(3H),9'-[9H] xanthen] -3-one,3',6'-dihydroxy- [2321-07-5]. Its molecular weight is 376.27, with a molecular formula of $C_{20}H_{10}Na_2O_5$.

It is usually in the form of an orange-red powder, which is hygroscopic, freely soluble in water forming an orange-red solution that fluoresces with a yellowish-green colour. The colour (6) is first detectable at a pH of 4.6 and increases in intensity to a peak at a pH of 8.0. It is perceptible down to 0.02 ppm with the naked eye, while spectroscopic techniques will permit it to be detected down to 0.1 to 0.5 ppb.

Fluoroscein (6) is easily decomposed by sodium hypochlorite or potassium dichromate. Clays and soils have a great ability to adsorb considerable quantities of the compound.

TOXICOLOGY

(a) Mutagenicity

Fluoroscein proved to not be mutagenic using the Salmonella/mammalian-microsome test (8) and also by using *Bacillus subtilis* and *Escherichia coli* (4). The halogenated derivatives of fluoroscein proved to be mutagenic under the influence of light.

(b) Animal Toxicology

The experimental LT_{50} (2) (the lethal time for 50% of the population to die) for the house fly, *Musca domestica*, is 33.8 hours. The experimental LC_{50} (7) (the lethal concentration in ppm for 50% of the test fish to die in the specified time) for three

types of game fish was found to be as follows:-

FISH	24 hour	48 hour	96 hour
Rainbow Trout (<i>Salmo gairdner</i>)	4198	3420	1372
Channel Catfish (<i>Ictalurus punctatus</i>)	3828	2826	2267
Bluegill (<i>Lepomis Macrochirus</i>)	5000	4898	3433

These results indicate that the dye is relatively non-toxic to these large game fish, if the dye is used in dilute quantities as the dye should be used. At the same time a study (1) on the sea urchin, *Strongylocentrotus purpuratus*, gametes showed that fluoroscein rapidly inhibited fertilisation. The ability to block fertilisation is thought to be related to the dye's lipophilicity, making it capable of being absorbed onto the lipophilic regions of the vitelline layer (egg yolk) and/or the plasma membrane of the gametes.

The obtained experimental I_{50} (1) (the ability of the dye to inhibit fertilisation of 50% of the eggs) was found to be 4 millimoles or approximately 1500 ppm.

For ordinary mice the LD_{50} (5) (the lethal dose where 50% of the test population dies) was to be 4738 mg/kg of the mouse's weight. Effects on the mouse included decreased spontaneous motor activity, righting reflex, respiratory rate, ataxia (loss of coordination) and central nervous system depression at higher concentrations.

For rats the LD_{50} (5) was found to be 6721 mg/kg of rat weight. Effects observed on the rats included irritability, decreased spontaneous motor activity, ataxia, piloerection (hair erection) and decreased respiration rate. The LD_{50} for newborn rats was found to be only 1000 mg/kg of rat weight, this low value could be attributed to a decrease in biotransformation, renal excretion and an increase in the permeability of the blood-brain barrier in newborn rats.

(c) Plant Toxicology.

An extensive study (10) was conducted by Shellini on the effects of low and high concentrations of fluoroscein on the plants African Lemon Marigold (*Tagetes erecta*), Stone's variety of tomato (*Lycopersicon esculentum*), Black wax beans (*Phaseolus vulgaris*), and Crosby's Egyptian variety of beet (*Beta vulgaris rubra*). At low concentrations the plants grew bigger, larger and would bear more fruit than the control plants, but at high concentrations stunting would occur. This was at first thought to be due to the photodynamic destruction of auxin (which is formed in the leaves, and is involved in stem elongation and bending), but this explanation didn't explain the plant propagation in low concentrations of fluoroscein.

Further investigation revealed that the fluoroscein was ten to fifty times more concentrated in the ground than in the root xylem, which implies that it doesn't reach the leaves or the top of the plant. If the root system was damaged the fluoroscein would travel to the top of the plant which would subsequently die. So to test whether the effect was

photodynamic, tomato plants were kept in the dark and light and with and without fluorescein, the plants in the dark were fed a 10% sucrose solution to make up for the lack of sugar normally produced by photosynthesis. In both light and dark specimens treated with fluorescein the growth was reduced by 60-90% of the control plants. This suggests that the mechanism of inhibition isn't connected with a photodynamic effect.

The growth rate of stems is regulated by auxin (from the leaves) and caulocaline (a hormone found in the root). As the same effect is observed in the light and the dark it can be assumed that fluorescein is effecting something which is in perpetual darkness in the roots, such as the caulocaline. The observed increase in growth can only be obtained if all other factors, mineral nutrition, assimilation, auxin are optimal or at least not limiting in growth.

CONCLUSIONS

It is recommended that the halogenated derivatives (which exhibit greater fluorescence, toxicity and mutagenicity) not be used under any circumstances. In fact fluorescein shouldn't be used if the water is suspected of draining into a water supply downstream of the test site unless considerable dilution of the compound is first done so that it is visually undetectable or the water is chlorinated before being consumed.

Lastly, let me conclude by saying that the indiscriminate use of chemicals which can potentially contaminate the waterways should be avoided, unless there is absolutely no other method available and the results are absolutely necessary. The test should be conducted with due care and attention to the environment and it should be remembered that fluorescein is absorbed in clay and mud, so that an excess has to be used and it will leach out for some considerable amount of time.

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NOTICES and NEWS

Wayne Tyson of WASG has been contacted by Dr Robert Ko, president of FINSPAC, regarding a "Symposium on Java Karst". The symposium will be held in Yoyakarta, Central Java, Indonesia from 27-30 Aug 1985.

The purpose of the symposium, according to the leaflet received by Wayne is "To introduce the South Gombong Karst, with its Conical Hills, which is very different from the Gunung Sewu Type Conical Karst, considered hitherto as 'Classical Tropical Karst'".

The symposium is being organised jointly by the Federation of Indonesian Speleological Activities (FINSPAC) and The Foundation of Indonesian Speleology in cooperation with the Director General of Tourism, the Indonesian Science Institute and the Indonesian environmental forum.

Registration and accommodation will cost around US\$200-\$300, field trips will cost around US\$200. Those interested in attending the symposium and/or presenting a paper should in the first instance contact Dr R Ko, PO Box 55, Bogor, Indonesia.

The NEW EDITOR is:

Kerrie Bennett

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Woonona NSW 2517

order for which climbing ropes are designed. Hence, we need look no further; these ropes are relatively cheap, hardwearing, flexible, subject to stringent manufacturing standards and of course come in lots of pretty colours. This still leaves a couple of questions unanswered, which knot should we use? Is 9 or 11mm diameter rope best? In general, the choice of knot hardly matters; Overhand, Figure 8, Figure 9, Bowline - all are sufficiently strong and in repeated drop tests provide us with the right level of safety (3 x FF2). Figure 8, and particularly Figure 9 knots are safe but bulky, my cowstails are tied with Overhand Knots, well tightened and bound with adhesive tape to prevent them working loose. As for size, 9mm diameter dynamic climbing rope (half rope) is quite safe, 11mm diameter rope is bulky and the additional bulk useless. As for thinner ropes, in an attempt to reduce the weight of their gear by a few grams, some cavers have opted for cowstails of 8, 7 or even 6mm diameter in extreme cases (nut cases); there's obviously little future in this. To quote a famous French caver on this topic "It's very fortunate that wellies don't have laces"!

One final point - cowstails are subject to fairly hard use, and in common with all ropes are also weakened simply by the effect of age. It is important to replace them whenever they become worn and in any case renew them at least once each year. Compared with the rest of a caver's equipment, the cost of cowstails is negligible and a couple of pounds is a small price to pay for continued peace of mind.

Climbing Ropes?

Still on the subject of cowstails - some weeks ago a friend bought a bit of rope to replace his cowstails and just out of interest brought the old one along to test. Not that he was particularly worried about it, the sheath showed some signs of wear but still looked quite serviceable and in fact was only about four months old. So we tested it using the normal set up we use for SRT ropes (see below) and to his dismay it failed on the first fall factor 1 drop. Later we tested the new, unused length and this fared a little better, surviving one factor 1 drop and failing on the second, an improvement but still well below the level of safety required for cowstails. In addition, it's likely that after four months use, the second length would fare no better than the first. So what's the problem? Well, simply that there are ropes and ropes. Without mentioning names this particular bit of rope was bought from a caving suppliers in the Dales who described it as "8mm climbing rope". It is in fact nothing of the sort, but instead 8mm "static accessory cord". Now there's plenty of this stuff about, and its important to appreciate the difference; this is the type of cord that climbers thread through chocks and ice axe handles and many caves use for footloops. However, as our rather crude test shows, it has very poor shock absorption characteristics compared with real "dynamic climbing rope" which is designed to hold leader falls.

So, how to spot the difference:- Firstly, there are *no* 8mm diameter climbing ropes. Secondly, climbing ropes are almost always supplied in standard cut lengths of 45m for a 10/11mm "Single" rope, or 90m for an 8.7/9mm "Half" rope. So if it's on a reel in the shop, it's almost certainly static accessory cord. Thirdly, try to find a supplier who knows what he's talking about.

Caves and Caving No 26 1984

Experiments on harnesses

"*CHALAIN (39) May 84*" is a French report (courtesy of Dr. John Frankland) concerning the physiological effect of suspension in a caver's SRT harness. The tests were undertaken by a group of doctors employing sophisticated monitoring techniques on fit, volunteer cavers feigning unconsciousness or exhaustion - that is slumped in the harness without moving. Everyday caving experience proves that someone in good physical condition and in continuous motion on the rope can remain suspended for several hours without difficulty apart from discomfort. This study takes the case of a

completely inert subject incapable of helping himself. The results were unexpected and dramatic, so dramatic in fact that the experiments were abandoned as too dangerous after the first two volunteers became genuinely unconscious and had to be lowered immediately for emergency treatment - one caver after 30 minutes, the other after only 6 minutes inert suspension. This effect is seen as a possible new factor in previously unexplained deaths on ropes, not associated with a serious accident. Further experiments are planned to better define the problem although the doctors see this as a complex medical procedure and in the meantime issue the following advice to cavers:

1. *An exhausted caver should not begin the ascent of a deep pitch without first reaching a good physical condition (i.e. rest and food).*
2. *It appears to be a mistake to imagine that one can rest effectively during the ascent. It is better to descend again at the first signs of exhaustion.*
3. *Should a caver become exhausted on the rope, it is an emergency - his companions must quickly intervene to help him down.*

Thanks to my friend Chris Woods for her excellent translations of the two French reports.

Caves and Caving No 27 1985

SpeleoTechnics Fx2 - update

Looking back through past issues of *Caves & Caving*, it appears to have been over two years since the Speleo Technics Fx2 lamp was first introduced. At the time this lamp seemed a fairly radical innovation and as might be expected with a brand new product experienced a bit of market resistance and a few teething troubles. In the meantime, the lads at Speleo Technics (both active cavers) have not been idle in setting things to rights. Subsequent developments have greatly improved the lamp and merit a further brief description.

The battery pack itself remains much the same and comprises twin nicad cells sealed in a solid block of tough, shock absorbent plastic, connected to the headset lead by an integral moulded plug bolted to the battery pack. Some early models suffered from faulty cables, although the adaption of mining specification cable and a new bending process has entirely eliminated the problem. Nowadays, the Fx2 is fitted with a new headpiece, similar in appearance to the familiar Oldham job but with some improved features. For instance, the moulded shell is virtually unbreakable polycarbonate with a solid nylon bezel, the reflector is metal with sturdy screw-in bulb sockets and the headpiece is protected against the use of an incorrect charger. Modern halogen bulbs provide a great deal more light for about the same duration, that is around 10 hours. There are two single lamp chargers available each fitted with moulded plugs that connect directly to the battery pack, one for use with a 12 volt supply and the other a neat mains job with an integral 13 amp plug.

While I'm not a great champion of electric lamps for caving, this is a lighting system produced by cavers for use in caves, and certainly has a great deal going for it compared to a conventional miner's lamp. Neither are these lamps wholly intended for beginners in simple caves (eminently suitable though they are), last year some of the oldest cavers in existence used them to reach the bottom of the Gouffre Berger.

The Fx2 is lightweight, rugged and durable and above all completely leakproof. It affords great peace of mind to be able to chuck a lamp into a tackle sack along with the rope and not worry about it. Further details from Speleo Technics, Victoria Mill, Mersey Street, Preston. Or why not hire one for a day from Inglesport and try it out for yourself?

Caves and Caving No 28 1985

Lightweight Ropes

Throughout the past year I've become aware of increasingly widespread use of very lightweight 8/9mm SRT ropes. This is a trend which I find extremely disquieting; there is no doubt in my mind that cavers using these ropes are needlessly courting disaster. Such ropes have but one advantage over their thicker (10/11mm) counterparts - they are lighter and more compact. While on occasion this might offer some advantage to a small team pushing the further reaches of a very deep or arduous system, it is more or less totally irrelevant in the UK where such systems don't exist. With regard to safety, the price paid for this fairly modest reduction in weight and bulk is extremely high.

So what exactly is wrong with lightweight ropes? The answer I'm afraid is not a simple or precise one, and to a certain extent awaits the outcome of further use and research which is currently in progress. However, users of such ropes might do worse than consider carefully the following brief observations. Failing this, my advice would be to confine the use of 9mm ropes to short, free-hanging pitches, and make rigging slings, footloops or washing lines from the 8mm stuff.

Let's take for example the case of a normal 10mm diameter nylon speleo-rope (the type commonly used by cavers each weekend) - just how strong is it? - can't remember? Well, this much is easy - it's written on the reel of rope when you buy it and guaranteed by the manufacturer - perhaps 2500kg (2 1/2 tonnes), obviously extremely strong. Trouble is that as far as the caver is concerned, this figure is virtually meaningless. This is simply a measurement of the ropes tensile breaking load, taken on a machine in a laboratory, by wrapping a short length of rope around two large, round bars which are very slowly pulled apart until the rope breaks. It indicates no more than the maximum load the rope can support under ideal conditions. However, caving reality doesn't exactly correspond to this. For example, we find that there are no nice round bars at the top of each pitch and so, to use the rope at all, we have to put a knot in it. The precise effect the knot has on the rope is largely unknown except that it weakens it dramatically, perhaps by 50% or more (see Knot Tests in this issue). The strength of our new 2500kg rope is suddenly reduced to 1250kg. Further to this there is the effect on the rope used underground, again the exact causes of which are poorly understood (although probably related to silt trapped within the ropes fibres) which causes the rope to lose half its strength after fairly limited use. The rate and degree of weakening varies with each type of rope but may be in the order of 10 - 20 trips - perhaps 6 months to a year of regular use. The original, assumed figure of 1250kg for a knotted rope might by now be reduced to 600kg - only 25% of the figure quoted on the reel. Bear in mind that this applies to a relatively new rope in good condition, rather than one further weakened by the effects of water and ageing, or worse still by abrasion against the rock. Consider also that an 80kg caver making a jerky descent or ascending rather vigorously, generates forces in the rope of perhaps 200kg as he reaches the belay. This leaves a safety factor of only 3. Industrial safety applications require a factor of 7 - 10.

In spite of all this, a rope correctly used and rigged to avoid both shock-loading and abrasion against the rock (*Cave Science* Vol 9, No 4) is safe. That is until the effects of age and wear reduce its capacity below an acceptable level which we check periodically by subjecting a short length of each rope to a drop test (*Caves & Caving* No 14).

This then, broadly speaking, is the situation with regard to 10/11mm dia. rope, and the least we can say of 8/9mm ropes is that their capacity in *all* respects is considerably less than this. Consider the following points:

Breaking Load. An 8mm rope has roughly half the tensile breaking load of an equivalent 10mm rope.

Shock Absorption. A new 10mm rope, subjected to drop tests of fall factor 1 with an 80kg load, supports around 10 shocks before breaking. An 8mm rope of the same make supports only one.

Abrasion. To some extent it is a question of mass and cross sectional area. An 8mm rope has a proportionately far greater surface area and has far fewer fibres than the difference of 2mm

implies. With regard to an accidental rub-point in the pitch, the situation is worsened by the increased stretchiness of the thinner ropes. There is little point in attempting to quantify these comparisons precisely, sufficient to say that the degree of abrasion which severs say 25% of the fibres in a 10mm rope will have caused an 8mm rope to break.

In short we can say that a 10/11mm rope starts off with sufficient capacity to allow for a general decline in its capabilities (due to the unavoidable effect of wear and ageing) to a point where the rope is no longer safe. This provides a useful life extending to a number of years when used and cared for properly. Such ropes are light and compact enough for most purposes. Taking this as a 'normal' standard for a rope (determined by the minimum capacity to hold at least one factor 1 fall with an 80kg load on a wet rope) it is clear that an 8mm dia. rope for example, even assuming meticulous, abrasion-free rigging on every pitch, very soon deteriorates from the more or less new condition where it may be (just about) considered safe to use, to a point where it is weakened enough to be no longer safe.

I would suggest that within the techniques currently used, and apart from certain exceptions, these ropes are taking the quest for lightweight equipment a little too far, particularly in the UK where such radical measures might be seen as completely unnecessary.

Caves and Caving No 23 1984

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DOWN UNDER ALL OVER

CQSS REPORT ON THE ACTIVITIES OF CENTRAL QUEENSLAND SPELEOLOGICAL SOCIETY OVER THE PAST FEW YEARS.

The Society's membership in 1985 is 35 adults with a number of children in the Society under the family membership arrangement. CQSS has suffered the same malaise as many other societies around the country with activity being at a very low ebb even though the conservation efforts have been maintained at a commendable level.

A number of our members have given talks and slide displays to school groups ranging in age from preschoolers to high school students. With Bat Cleft at risk to a limestone quarry, much of our effort has gone into raising public awareness of the importance of this maternatiy cave to the *Miniopteris* species and to the local ecology.

Slide displays were given at local shopping centres during Environment Week and a captivating slide of a Little Bent Wing Bat held between thumb and forefinger attracted a great deal of interest and helped alliviate some of the fear about these little craetures. Members also addressed the Yeppon branch of the Wilderness Society emphasizing the spectacular emergence flight from Bat Cleft and the cave's`imminent danger from mining.

We even managed to get this phenomena into the press by running pre-dawn champagne breakfasts at Bat Cleft with people standing, goblet in hand, framed by tower karst and surrounded by bats! T-shirts printed with Bat Cleft slogans and "Save Our Caves" plea sell well at the end of excursions to Bat Cleft and visitors are encouraged to sign petitions asking for the preservation of the area, with State and Federal Governments the intended recipients.

CQSS have constructed showers, toilets and provided a water tank at our campsite at Mt Etna. Access is through an adjoining farm whose owner has been a staunch friend of the society and is a member of UQSS. These camping facilities are available to all member societies of ASF. There is a camp fee of \$1 per night and this goes towards provision of further facilities.

In 1982 a cave was entered in the limestone quarry on Mt Etna, a cave of such quality that it was considered comparable to Jenolan. Although consisting basically of only one chamber, the decoration covered all of the roof, the walls and the floor. Formation of the size, quality and grandeur were unsuspected in this area. The cave was open for three weeks and then blasted away!

We do have as a treasured momento, an excellent set of slides gathered in great haste and at ridiculous hours of the morning. The cave was posthumously named "Crystal Palace". It lives in the minds of those priviledged to see it, and exemplifies the necessity and

urgency of the cessation of mining on Mt Etna.

There have been but a few new caves discovered in recent years but the local feeling is that as we work harder ie dig, we will be turning up better and better caves. Each discovery has surpassed the earlier caves in beauty. With each new discovery comes an increased understanding of water flows and narrows the search area for potential caves.

Trips have been made to areas of associated interest, like an old gold mine, where aragonite deposits were noted on the walls. A disused clay pit on Mt Morgan (the world famous gold mine) was visited to see where dinosaur footprints are visible in the roof of the drives.

A search and rescue practice operation is mounted annually, often in conjunction with the SES, police or fire brigade.

A projected visit to the lava caves at Biggenden is hoped to revitalise interest and the trip will investigate rumoured volcanic caves recently revealed by an earth slip in the mountains to the west of Miriam Vale.

Four members made the pilgrimage to Hobart in January to attend the "Speleomania" conference and their return has fired many members to attend the Chillagoe conference so close to home in 1987.

There is a general feeling here that is shared by those that have met cavers in other states, that speleology is emerging from the doldrums it has been experiencng in recent years.

Kerrod Hamilton

HCG Over the last 12-18 months a number of trips have been run. These include trips to Timor, Cliefden, Bungonia and Jaunter, where a considerable number of hours were spent filling in cave data sheets (in conjunction with Peter Dykes) for the fabled "Speleo Handbook II". Another trip to Coolemon was washed out, while a refamiliarisation trip to the Mudgee Area looked at the biology of Queens Pinch, Apple Tree Flat and Cudgegong. A trip in conjunction with NSWITTS went to Colong and also did Bindook Slot Canyon.

Six members attended the conference in Hobart, two members managed to get in some caving at Waitomo in NZ and one manage to get on a one week trip to PNG. No great discoveries locally can be reported, however, a lot of old data finally saw publication in 1984. (Pay no attention to the 1982 date on Journal 3).

Graeme Smith

UNSWSS By now word is probably being passed around that something is happening at Cliefden involving not just UNSWSS, but BMSC and OSS. The proper documentation that this area desperately deserves is

finally to be undertaken. What maps have been completed are being brought together and those which are either to be started or finished have been identified. Duties have been distributed between the clubs with the aim of producing a loose leaf binder documenting the area.

In common with the Nullarbor Atlas and Chillagoe Karst, the folder will only be available to the member societies of ASF. Hopefully this will restrict any damage which may occur to the area from illicit caving. It has been considered advantageous to produce this information in a loose leaf folder, since it permits people who own a copy to efficiently update it as new information comes to light.

The history and geology have to some extent already been documented. Ian Charlson has almost finished his map of Island Cave and we are now preparing to check the club's map of Main Cave for inaccuracies. There is a possibility that Main will be closed for a period of one year to give the cave a rest and to give experiments, which could be disturbed by movements in the cave, a chance to be performed. This tough matter is ultimately for OSS to decide. Apart from Cliefden, UNSWSS was pretty quiet in the last part of 1984, due mainly to the student member's increasing involvement in their

studies. Despite this the armchair cavers were hard at work.

Ian Charlson and Rob Whyte acquired Apple Computers through the year and have been hard at work proving that the computer has a place in Australian caving. As a result Ian has been busy placing the "contents" of the SSS Journal into a data base. Meanwhile, as all the clubs with whom we exchange newsletters are sending their respective newsletters, Rob has been entering their "contents" into another data base. Although not Speleo Abstracts, this system enables you to see what has been published and where to find it. The data base contains the details from the "contents" page and keywords to indicate the type of each article. If anyone wants a printout of the files send \$2 to UNSWSS at the address inside the front cover of this Newsletter.

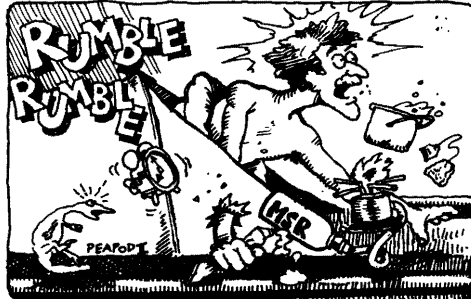
Meanwhile, our own journal, Spar is looking like it will appear six times during 1985. With a bit of luck, enough trips will be run to fill the pages with trip reports. Subscriptions are now \$10 including postage.

As usual, if anyone wants to find out what an UNSWSS trip is like, you will be more than welcome. Why not give us a ring; Rob Whyte (02) 623 5967 or John Williams (02) 671 4365 and find out what's happening.

Rob Whyte



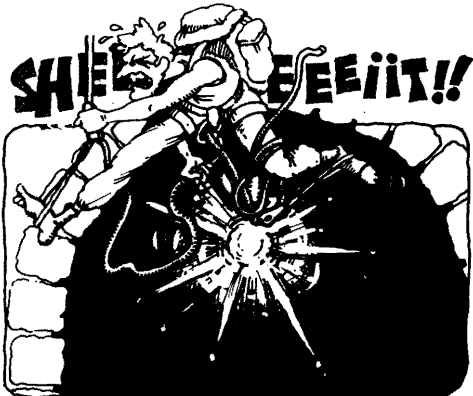
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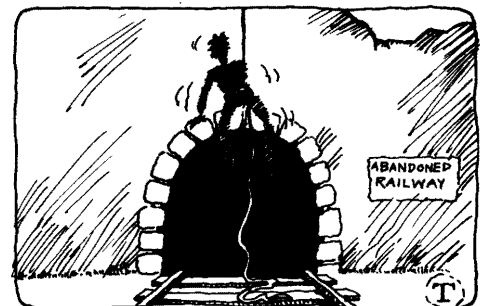
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As we informed on 21st May, 1984, we now give further information concerning the 9th International Speleology Congress. At the present time the guidelines have been approved, the financial study has been prepared — showing its viability— and a tentative activity programme has been drawn up. It should be pointed out that the indications of the Secretary General of the UIS have been accepted and the date of holding the Congress has been brought forward to the months of July and August 1986, with the following structure.

TECHNIQUE SYMPOSIUM - Madrid	21-30 17/86
EXCURSION AROUND "LARRA" - Navarra	

PRE-CONGRESS

5th. Barcelona Internacional Speleology Film Festival. 4th. International Speleology Photography Show. Exhibitions. Excursions around Catalonia.	RECEPTION, OPENING	SESSIONS	1-17/8/86
	GENERAL UIS MEETING		
	KARSTOLOGY - GEOSPELEOLOGY		
	NON LIMESTONE CAVITIES		
	BIOSPELEOLOGY		
	ARCHEOLOGY - PALEONTOLOGY		
	APPLIED SPELEOLOGY		
	DOCUMENTATION		
	COMMITTEES		
	GENERAL UIS MEETING		
	CLOSING		

CENTRAL EVENTS

VOLCANIC CAVITIES CAMP. - Islas Canarias	9-17/8/86
PREHISTORIC ROUTES - CANTABRIA - Santander	
OJO GUAREÑA, CAMP. - Burgos	
EXCURSION AROUND "LARRA" - Navarra	

POST-CONGRESS

Although the general organization of the Congress has been set up and the leading offices have been filled, the Coordinating Committee of the different Pre and Post activities has not yet defined the details and costs. Therefore it is not possible to give the final features in this letter. What we can ensure you is that, in spite of the time elapsed, the cost of the registration fees to the central events of the 9th Congress will not be higher than that of the 8th Congress in Kentucky.

We are proposing to send out the final documentation next October. By way of a decimal classification, this will be periodically extended as desirable to each of the programme activities.

This information will be sent out to every person or organization which expresses its interest in receiving it by returning the enclosed card.

Secretariat General del 9º. Congrés

Mail this card to:



9º Congreso Internacional de Espeleología ESPAÑA 1986

Apertado ☒ 343 08080 Barcelona ESPAÑA

Name

Address

I wish to receive the final Congress programme

My speciality within Speleology

Activities in which I am most interested

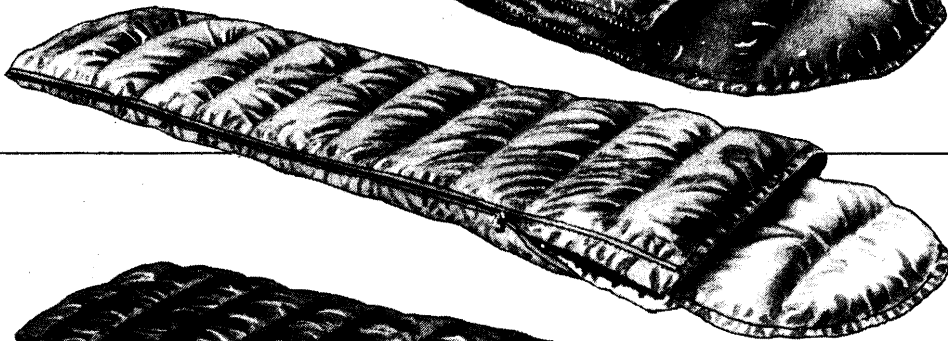
Camps Excursions Central Events

Suggestions

A big range of Paddymade bags -the choice is yours.



KIANDRA — compact! Mini size, mini weight with high quality and high comfort. Kiandra is a "3 season" semi-rectangular down-filled bag with ripstop nylon outer and cotton inner lining which ensures unlimited comfort. Able to mate with similar Paddymade bags. Kiandra's so small, ten will fit into an average size rucksack.



HOTHAM — versatile! The most popular Paddymade sleeping bag, perfect for every conceivable type of outdoor adventure. Hotham's box walls and high quality loft down, ripstop nylon shell and its ability to mate with similar Paddymades, make it the versatile, happy compromise sleeping bag.



BOGONG — the snow bag! The no-nonsense, no compromise winter sleeping bag. A versatile flat opening semi-rectangular bag, nevertheless is designed for truly cold conditions — perfect for skiers and climbers. Mates with similar Paddymades.



SNOWLORD — Everest conditions! The top-of-the-range tulip shape specialist sleeping bag. Designed for superior performance for major overseas climbs, extremes or high altitudes. Slanted walls, tapered ripstop nylon shell and boxed foot section make Snowlord the Ideal "expedition" bag for serious users.

PADDYMADE SLEEPING BAG COMPARISON CHART

MODEL	WEIGHT INC. STUFF SAC.	CONSTRUCTION	FILL WEIGHT	FILL	TEMP. RATING*	ZIP	SIZE IN STUFFSACK cm
KIANDRA	1.25 kg	Sewn Thru	500 g	550 Loft Down	5°C	Full Zip	30 x 17
BIMBERI	1.00 kg	Box Wall	550 g	550 Loft Down	-5°C	Side Zip	30 x 17
HIGH PLAINS	1.80 kg	Box Wall	1100 g	Featherdown	-5°C	Full Zip	34 x 23
HOTHAM	1.60 kg	Box Wall	700 g	550 Loft Down	-5°C	Full Zip	34 x 23
MELALEUCA	1.55 kg	Box Wall	800 g	550 Loft Down	-15°C	Side Zip	34 x 23
BOGONG	1.60 kg	Box Wall	900 g	550 Loft Down	-15°C	Full Zip	34 x 23
SNOWLORD	2.00 kg	Slant Wall	1100 g	550 Loft Down	-25°C	Side Zip	37 x 27

All bags fit people to 190 cm (6ft 3in) tall; bags to fit people 205 cm (6ft 9in) are available in most models.

*Temperature Ratings are a soft measurement — they represent an average expected performance level for a standard person although individuals will differ by up to $\pm 10^{\circ}\text{C}$. Paddymade reserves the right to alter these specifications without notice.



Paddy Pallin

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