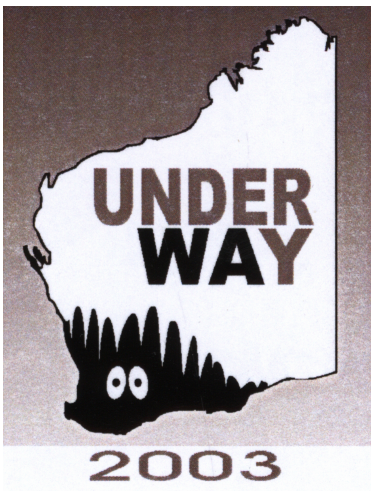

Conference Programme

2nd – 8th January 2003
Bunbury, Western Australia

24th Biennial Conference of the Australian Speleological Federation

Incorporating
3rd Australian Cave History Seminar
6th Australian Karst Studies Seminar

The Under **WA**y conference thanks all its sponsors and supporters for their willing assistance and support

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Programme Index

♦ ♦ ♦ ♦ ♦

Registration Desk

Registration desk, merchandise and Photo Competition display will be attended at the following times:

Thursday	2.00 – 6.15pm		
Friday	8.00 – 8.45am	1.00 – 6.15pm	
Saturday	8.00 – 8.45am	1.00 – 2.00pm	5.30 – 6.15pm
Monday	8.00 – 8.45am	1.00 – 2.00pm	5.30 – 6.15pm
Tuesday	8.00am – 2.00pm		5.30 – 6.15pm
Wednesday	8.00 – 10.00am		

Conference Contacts

In an emergency, outside people can contact you through the following mobiles:

Jay & Ross Anderson 0407 473 539
Ida & Rebecca Newton 0419 914 154
Vicki Bresnan 0412 607 179
Howard Richardson 0414 919 921

Conference Committee

CONVENOR
Ida Newton

PUBLISHING
Rebecca Newton

AGENDA
Norman Poulter

PARTNERS / CHILDREN / TOURIST INFO / SPONSORSHIP
Fran Head

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Howard Richardson / Vicki Bresnan

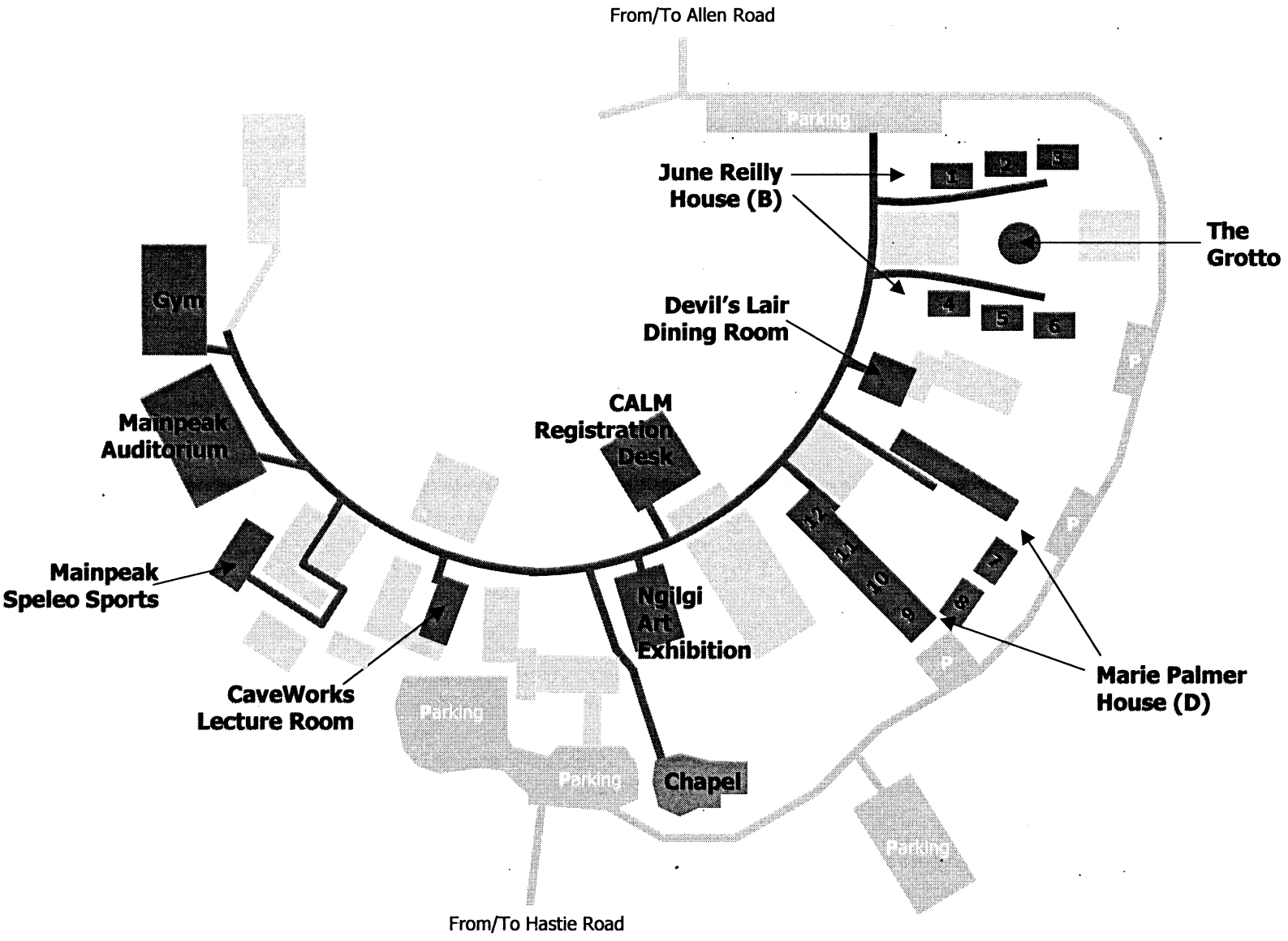
ACCOUNTS
Vicky Bresnan

SPELEOSPORTS / ACTIVITIES
Ian Collette

POST CONFERENCE CAVING
Jay & Ross Anderson

PHOTO COMPETITION
Ida Newton / Norman Poulter

Venue Map


From/To Allen Road
Parking
June Reilly House (B)
1
2
3
The Grotto
Gym
Devil's Lair Dining Room
4
5
6
P
CALM Registration Desk
Mainpeak Auditorium
Mainpeak Speleo Sports
Ngilgi Art Exhibition
12
11
10
9
8
7
P
P
CaveWorks Lecture Room
Parking
Parking
Chapel
Parking
Marie Palmer House (D)
From/To Hastie Road

Timetable

Thursday

TIME	ACTIVITY
2.00 – 5.00pm	Registration
6.00pm	Welcome dinner in the dining room

Friday

KARST STUDIES and GENERAL

TIME	MAINPEAK Auditorium	CAVEWORKS Lecture Room
9.00am	*OFFICIAL OPENING* **Dr. Brian O'Brien**	
9.30am	*A little plane, a big plain and very many feet; the finding of Thylacoleo* **(K)** **Ken Boland**	
10.00am	*Documentation and ground exploration of Nullarbor Karst* **(K)** **Paul Devine (CEGSA,SRGWA)**	
	MORNING TEA Mainpeak Auditorium	
11.00am	*New discoveries of articulated well-preserved megafauna from Nullarbor caves* **(K)** **Dr John Long**	
11.30am	*Continued* **Dr John Long**	
12.00am	*Troglobitic spiders of the Nullarbor Plain* **(K)** **Norman Poulter OAM**	
12.30am	*Underwater helictites from the Nullarbor* **(K)** **Jill Rowling**	
	LUNCH Devil's Lair Dining Room	
2.00 – 3.30pm		ASF COUNCIL MEETING *PART 1*
	AFTERNOON TEA Mainpeak Auditorium	
4.00 – 5.30pm		ASF COUNCIL MEETING *PART 1*
6.00pm	DINNER Devil's Lair Dining Room	
7.00– 8.000pm	IMAGES FROM BELOW - Art Show Opening	
8.30pm	*Inside Karst - slide show* **(G)** **Andrew Eavis**	

Art Show – Images From Below

The exhibition and sale of cave-related art is open to any speleo artist either nationally or internationally, working in a non-photographic artistic medium - painting, drawing, printmaking, sculpture, poetry etc. Artworks may be offered for sale or exhibition only.

Saturday

CAVE HISTORY and GENERAL

TIME	MAINPEAK Auditorium	CAVEWORKS Lecture Room
9.00am	*Where is Australia's first identifiable, recorded cave discovery?* **(H)** **John Dunkley**	*Risk management* **(G)** **Jodie Rutledge**
9.30am	*Augusta's Jewel Cave from a caving perspective* **(H)** **Lloyd Robinson**	*Risk management continued* **Jodie Rutledge**
10.00am	*Who was Australia's first speleologist?* **(H)** **John Dunkley**	*Risk management continued* **Jodie Rutledge**
	MORNING TEA Mainpeak Auditorium	
11.00am	*Tales of Maiden – A history of the Yanchep caves* **(H)** **Lex Bastian**	*Risk management continued* **Jodie Rutledge**
11.30am	*Some little-known early cave visitors* **(H)** **John Dunkley**	*Risk management continued* **Jodie Rutledge**
12.00am	*A thumbnail sketch of the Leeuwin Ridge and caves history since European settlement* **(H)** **Brian Combley**	
12.30am	*The ideal health and holiday resort – Caves House, Yallingup* **(H)** **Lise Summers**	*The law of intellectual property and it's potential for the protection of cave site information* **(G)** **Sandy Boulter**
	LUNCH Devil's Lair Dining Room	
2.00pm	*Acetylene Illumination of early Tasmanian show caves – Grace Matts Reading* **(H)** **Steve McCabe**	*Arthropod ecology of Bat Cave Naracoorte SA* **(K)** **Timothy Moulds**
2.30pm	*Abridged oral history interview with Mr Peter Smith* **(H)** **Busselton Historical Society**	*Karst features in Pleistocene dune limestones, San Salvador, New Providence Islands, the Bahamas* **(K)** **Sue White** and **Nicholas White**
3.00pm	*The new Caves of South Mole Creek, North Tasmania* **(H)** **Arthur Clarke**	*Carbon Dioxide and climate in Jewel Cave* **(K)** **Stefan Eberhard** and **Neville Michie**
	AFTERNOON TEA Mainpeak Auditorium	
4.00pm	*Cave photography – getting started* **(G)** **David Wools-Cobb**	*Caving for "Pink Puffers" and "Blue Bloaters".* **(G)** **Garry K Smith**
4.30pm	*Where are the cave conservation projects in Australia?* **(G)** **Rauleigh Webb**	*Karst development at Naracoorte SA, why there?* **(K)** **Sue White** and **John Webb**
5.00pm	*Cave photography – getting good photos* **(G)** **David Wools-Cobb**	*Cave fauna & cave ecosystems in Southern China* **(K)** **Arthur Clarke**
6.00 – 7.00pm	DINNER Devil's Lair Dining Room	
7.30pm	PRUSSIK CHALLENGE - GYMNASIUM	
7.30pm	Official Judging Photography Competition	

Sunday

BUS TRIP – Sponsored by CaveWorks, the Department of Conservation And Land Management and Ngilgi Cave.

TIME	ACTIVITY	CONCURRENT PRESENTER
8.00am	Leave on the bus	
9.30 – 11.00am	Ngilgi Cave/morning tea	
11.00am	Bus in transit to Warncliffe	
12.00 noon	*Labyrinth Cave survey* **(G)** **Michael Bradley**	
12.30am	*Managing people and caves in the Margaret River area, WA* **(G)** **Anne Wood**	
1.00pm	LUNCH	*Walkway technology* **(G)** **Neil Taylor**
2.30pm	Bus in transit to Calgardup/Mammoth or Lake/Giants caves	
3.00pm	Lake Cave – Caveworks display	
4.00 - 6.00pm	Visit Calgardup/Mammoth or Lake/Giants caves	
6.30pm approx	Head back to the college for dinner	
8.00pm	DINNER	

Surveyors Stakes

Get together with a friend and enter the survey competition. Beginners more than welcome, and instruction will be given. Survey sheet, compass, clino and tape measure will be supplied, or bring your own. (No laser measuring devices or theodolites.) A looped course of 20 stations will be set up around the conference site and results entered into a computer. Closest closure wins the prize!

There is no set time to complete the survey, in fairness to other entrants, the equipment will need to be returned in reasonable time. Final survey entries will need to be handed in no later than Monday dinner. Enquiries at the Registration Desk.

Prussick Challenge

See how fast you can get yourself up a standard length of rope in the Prussik Challenge. We'll be having a timed contest to see who is the champion prussiker for this conference. If you win, you not only get the glory, you get a prize as well.

Monday

KARST STUDIES and GENERAL

TIME	MAINPEAK Auditorium	CAVEWORKS Lecture Room
9.00am	*Hydrogeology and speleogenesis in the Leeuwin-Naturaliste Ridge* (K) **Stefan Eberhard (CaveWorks)**	*Graffiti at Loch Ard Gorge, Port Campbell National Park, Victoria* (G) **Nicholas White**
9.30am	*Dune Subsystems of the Swan Coastal Plain* (K) **Lex Bastian**	
10.00am	*Recent advances in Radiogenic isotope mass spectrometry : implications for reduced environmental impact of speleothem paleoenvironmental studies* (K) **Dr John Hellstrom**	*Cave Rights revisited* (G) **Norman Poulter OAM**
	MORNING TEA Mainpeak Auditorium	
11.00am	*The hydrogeology and speleogenesis of the Yanchep cave area, WA* (K) **Lex Bastian**	
11.30am	*Anchialine systems in Australia – why are they so interesting?* (K) **Dr Bill Humphreys**	
12.00am	*Environmental hydrology and stygofauna in the Jewel Cave karst system* (K) **Stefan Eberhard (CaveWorks)**	
12.30am	*Caves under your house* (K) **Paul Tholen**	*Pilchers Mountain caves* (G) **Garry K Smith**
	LUNCH Devil's Lair Dining Room	
2.00pm	*Troglobitic spiders of research cave 6N-327* (K) **Norman Poulter OAM**	
2.30pm	*Tufa deposits of the south coast, WA* (K) **Jane Scott**	*The ASF's web-based Karst Index database* (G) **Michael Lake**
3.00pm	*Speleogenesis in Cainozoic limestones, Western Otway Basin, Southeastern Aust* (K) **Sue White**	*Video - Nullarbor Cave diving, (Mullamullang, Olwolgie)* (G) **Paul Hosie**
3.30pm	AFTERNOON TEA Mainpeak Auditorium	
4.00pm	*Water loss in caves of the Yanchep Region* (K) **Lex Bastian**	*Video- Kimberley Cave diving (KN1-19)* (G) **Paul Hosie**
4.30pm	*Cave aragonites of New South Wales* (K) **Jill Rowling**	*An eclectic review of subterranean biology in Australian waters* (K) **Dr Bill Humphreys**
5.00pm	*New troglobitic cave fauna species in Tasmania* (K) **Arthur Clarke**	*Karst abuse in Western Australia* (G) **Rauleigh Webb**
6.00 – 7.00pm	DINNER Devil's Lair Dining Room	
7.30pm	Photography competition slide show	

Tuesday

TIME	CAVEWORKS Lecture Room	CONCURRENT PRESENTER
9.00 – 10.30am	ASF COUNCIL MEETING *PART 2*	Gear, lights and gadgetry Adjacent to playground (G) **Main Peak**
	MORNING TEA Mainpeak Auditorium	
11.00 – 1.00pm	ASF COUNCIL MEETING *PART 2*	
	LUNCH Devil's Lair Dining Room	
2.00pm-3.30pm	SPELEOSPORTS Junior playground	2.00 – 2.30 pm - rope testing etc Adjacent to playground (G) 2.30 – 3.30pm – Karst Index Database meeting (unconfirmed) **Ian McCann**
	AFTERNOON TEA Mainpeak Auditorium	
4.00pm–5.30pm	SPELEOSPORTS Junior playground	
6.30pm	CAVER'S DINNER - Awards and prize presentation Devil's Lair Dining Room	

Speleo Sports

Here's a chance to test your speed and obstacle negotiation skills. Entrants, in teams of 4 will be timed through an obstacle course set up with a wide array of skill-testing crawls. grovels squeezes and who knows what else. Be afraid, be very afraid.

Wednesday

TIME	ACTIVITY
10.00am	Leave accommodation and head out for post conference caving

Post Conference Caving

All those participating in Post Conference Caving will be heading to the Margaret River area with their nominated trip leaders.

Abstracts

Anderson, Jay

ASF Conservation Co-convenor

Mining Court Recognises Hidden Treasures in Northern WA (Poster)

The Cape Range region of Western Australia is a place of world significance for many reasons. The karst system of the Peninsula is world renowned due to the subterranean fauna that reside there. The cave systems support troglobites, stygofauna, spiders, millipedes and mollusks. Despite the fragility and acknowledged importance of the karst and reef systems, the area is under pressure from Tourism, Oil and gas Industries, mining and other human activities. Only a small part of this significant karst system lies within the National Park. During 1999, there was an application for a grant of 10 mining leases over 8,250 hectares of Cape Range, covering approximately 80% of the proposed "5 (h)" reserve area, and over which the company holds mining exploration licenses.

There were a number of objectors, on environmental grounds, to the grant of the mining leases. The Western Australian Speleological Group (WASG) and Speleological Research Group Western Australia (SRGWA) were the Objectors that were represented by the Australian Speleological Federation (Inc) (ASF). Representation of the Speleological Groups was made in court by the Environmental Defenders Office.

The ASF holds the view that Cape Range contains a karst area of considerable significance, which should be protected from mining. The ASF had information that the Cape Range karst contained features of considerable significance which should be protected from mining. The environmental attributes of the Cape Range Peninsula, and in particular the value of its subterranean fauna, were considered at a hearing in the Perth Mining Warden's Court. This hearing took place over 8 days during 1999 (August 12-11, 24-25, September 21-22). This poster follows the events that have occurred since 1999 regarding actions taken to protect the karst area at threat.

Armstrong, Peter

Western Australian Speleological Group Inc.

Seasonal Roost Site Selection by the Chocolate Wattled Bat *Chalinolobus morio* in Quininup Lake Cave, WA (Poster)

- Kyle Armstrong
- Ric Brown *(SRGWA)*

We are currently examining whether the chocolate wattled bat *Chalinolobus morio* changes roosting position within the Quininup Lake Cave, near Gracetown, according to season. Preliminary observations confirmed the presence of this bat species through an examination of echolocation calls collected at the cave entrance during nightly emergence. The ultimate purpose of this research is to be able to determine if current management practices can be augmented based on our observations. The cave has two main chambers, both of which appear to be used by the bats, although preliminary observations suggest that one is used more than the other. Track marking has already been undertaken in the cave, mainly with consideration to protection of geological features, however, we wish to establish whether this track is also suitable in terms of minimizing disturbance to bats at all times of the year. We are also considering whether current management practices are suitable for the troglophilic invertebrates that occupy bat guano beneath bat roosts. We plan to extend our experience in Quininup Lake Cave to other caves in the southwest, with the development of a proposed regional management plan for bats in caves.

Bastian, Lex V

Western Australian Speleological Group Inc.

Dune Subsystems of the Swan Coastal Plain (Karst)

In terms of its topographic expression, the Tamala Limestone in the Perth region is known as the Spearwood Dunes. These are a highly composite feature containing many individual dune events. A partial subdivision of the Spearwood Dunes has been made, based on several distinct ridge lines with intervening swales. These are, from west to east:

- Trigg Dunes,
- Karrinyup Dunes,
- Gwelup Dunes,
- Balcatta Dunes and
- Yokine Dunes, to which is now added the Yanchep Dunes.

Several of these are themselves composite features with somewhat less distinct dune elements manifested in different places. In total they are equivalent to the dune ranges of southeast South Australia.

The Hydrogeology and Speleogenesis of the Yanchep Cave area, Western Australia (Karst)
Caves at Yanchep are developed in Tamala Limestone, a dune limestone of Pleistocene age. The limestone lies upon a permeable sand formation, with a contact plane which slopes westward towards the Indian Ocean. Cave distribution falls into a pattern of distinct east-west zones as a consequence of the contact relationships with the underlying sand formation, a total of five zones being recognised.

In the eastern-most zone the water table is in the sand formation below the base of the limestone, which is devoid of caves. This zone is defined as the Dry Substrate Zone.

The point at which groundwater makes initial contact with the base of the limestone is the Cave Source Zone, manifested by an onset of strong cave development and on the surface by marked topographic and vegetation changes. Water then discharges with excess hydrostatic pressure into cave systems, forming numerous cave streams which run down the contact between the limestone and sand substrate. This results in a unique mechanism for speleogenesis, for which the term Paraphreatic is introduced. The zone in which this occurs is thus defined as the Paraphreatic Cave Zone. The primary cave form in this zone is a watertable slot.

Cave streams efflux onto a major Interdune Lake Chain, which in winter functions as a chain of natural dams. The lakes overflow via cave spillways into a younger dune component of the Tamala Limestone, the water continuing thence to the Indian Ocean where it emerges as submarine springs. As the limestone base descends, the groundwater invades the limestone resulting in a Phreatic Cave Zone, characterised by caves showing typical phreatic cave development. Transitions between watertable slots and fully phreatic caves can be identified.

Extensive tracts of the limestone in the areas of strong speleogenesis have failed, and are undergoing mass subsidence, manifested on the surface by rifted terrain and rotational collapse of cave ceilings. The process leads eventually to complete disappearance of the limestone, the lakes are being enlarged as a result.

Water Loss in Caves of the Yanchep Region (Karst)
Water levels in the Yanchep region have fallen over the past decade, and are now critically low, with most streams already dried out. Possible causes for this are discussed, and it is concluded that the primary cause of the decline is the large pine forest tract to the east of the karstic belt. Given that the authorities want to retain the pines until they are going to earn profit, the potential for further disastrous decline in water levels is mooted.

Tales of Maiden - A History of the Yanchep Caves (Karst)
The first white man to visit caves of the Yanchep area was George Grey in 1838, who was shown to a cave now known as the Doogarch Cave, south of Yanchep. This was followed by an excursion in October 1841 by John Septimus Roe, for the specific purpose of visiting caves in the area. Roe saw six caves around the area known as Boomerang Gorge, and recorded the aboriginal name "maidin" or "maiden", which became the name in use for the cave area.

The Main early period of cave exploration occurred between 1903 and 1905, during which most of the well-known caves of the area were discovered, including today's tourist cave Crystal Cave.

In the early 1930's the area was developed for tourism by the State Gardens Board under the chairmanship of Louis Shapcott. Shapcott wrote-out the true history of the Yanchep caves and substituted it with a false history which was more colourful. At this time a large quantity of bones was placed in Yonderup Cave and a false history invented about aborigines throwing their womenfolk into it, to increase tourist numbers.

As a result of systematic searches, many new discoveries have been made through the 1990's.

Boland, Ken

Victorian Speleological Association Inc.

A Little Plane, A Big Plain and Very Many feet; The Finding of *Thylacoleo* (Karst)
Upon completing the survey of a major Nullarbor cave, and looking for a new project, a choice was made to examine a large area known to have no features of interest to cavers.

A three-day solo walk showed the presence of regular features, and revealed the impossibility of the method without substantial modification.

On gaining an aerial platform, it was decided to plot and record all discernible features within an encompassable area, and to examine as many as possible from the ground with available personnel and time. As envisaged, ground crews found additional features, and met many challenges.

After the first two years the team had gained experience, developed an effective and economical method, noted some patterns emerging, and learned to expect no discoveries of general interest.

Consequently the finding of bones of Thylacoleo and other species was a surprise, and those with relevant expertise were notified.

Ken's appearance at the Conference is with the financial support of: St. Francis' Church [Vic.], June and George McLucas [SA], Rob Foulds, Ida Newton, Norman Poulter OAM, Frances Loveday, and members of CLINC and WASG [WA].

Boulter, Sandy

Environmental Defenders Office

The Law of Intellectual Property and its Potential for the Protection of Cave Site Information (General)
This presentation will give a short overview of the law of intellectual property and how this area of law might be used to protect cave site information.

Bradley, Michael

Speleological Research Group Western Australia Inc.

Labyrinth Cave Survey (General)
Labyrinth Cave [6Au-16] is located in the southern sector of the Leeuwin-Naturaliste National Park near Augusta. The purpose of this paper is to explain how an accurate up-to-date survey of Labyrinth Cave was accomplished.

There was an incomplete map dating from the 1960's and several later attempts to resurvey the cave when the watertable was much higher – which now alarmingly, is virtually non-existent. The lower watertable has allowed more of the cave to be explored and surveyed.

Because Labyrinth Cave is an extensive phreatic maze, it was decided the survey would be best done as a joint-venture between SRGWA, WASG and CLINC.

This is a record of how I surveyed my section of Labyrinth and reveals what was discovered during the survey.

Busselton Historical Society Inc

Oral History Interview (History)
Abridged oral history interview with Mr Peter Smith, an early cave guide from the Margaret River region of Western Australia.

Clarke, Arthur

School of Zoology, University of Tasmania

The New Caves of South Mole Creek, in Northern Tasmania (History)
The limestone and caves near Mole Creek have been known since the late 1820's when surveyors with the Van Diemens Land Company began their "westward" exploration. The first reports of cave exploration in the Mole Creek karst area date back to 1829 when caves were "discovered" in the Chudleigh area. The earliest descriptions of the "Chudleigh Caves": two neighbouring systems: Honeycomb Caverns and Wet Cave systems are recorded from 1833 and most of the cave descriptions in subsequent publications till 1878 relate to these two caves near Chudleigh. These "Chudleigh Caves" were known by several names during the course of their history. Some 40-50 years after being discovered by early settlers, the Chudleigh Caves became referred to as the "Old Caves" following the discovery of some new (initially unnamed) caves at South Mole Creek in the mid to late 1870's. This "new" area was described as being quite near to the Chudleigh district, but in actual fact the two cave areas were some distant apart and were thus considered separately as the "new caves" and the "old caves". In 1883, Higgins and Petterd described the Tasmanian Cave Spider (*Hickmania troglodytes*) from one of these unmanned "new" caves at South Mole Creek. In 1888, in his treatise on the Geology of Tasmania, R.M. Johnston describes the cave site with the recently described spider as one of the "New Caves in the Chudleigh neighbourhood" on the land of Mr. Pickett. Although its location and name [if any] was a mystery, the cave was also known as a site recommended for further study because it contained a rich deposit of mammalian remains. In 1921, Baldocks Cave is identified as one of two caves in the Mole Creek district that was studied intensely, due to the presence of a rich deposit of mammalian remains. Literature sources and records from the Lands and Titles Office in Hobart indicate that the "New Caves" of the Chudleigh district were principally found in the Sassafras Creek area during the 1870'2 and 1880's, including Baldocks Cave that was opened for tourism privately, around 1890. Other caves known from this area - and believed to have been discovered during this time – are Sassafras, Glowworm and Cyclops Caves.

Invertebrate Biodiversity in the Karst Bio-space of Tasmania (Poster)
Karst is a word used to describe the landforms [eg. caves] derived from the natural solution of carbonate rocks, such as limestone or dolomite. Karst bio-space is a convenient term to describe the total habitat space for the aquatic and

terrestrial species living in carbonate rock karst areas. The karst bio-space is represented as the sum-total of the actual or potential habitats and micro-habitats of all living species in karst. This bio-space can be described in dimensional terms as micro-caverns [<1mm], meso-caverns [1 to 15-20mm] and macro-caverns [>15-20mm]. Although most of our cave fauna records relate to species known or collected from caves [the macro-cavern component of the bio-space], in many karst areas, the meso-cavern size voids, tubes or cracks probably represent the major habitat component for invertebrate cavernicoles in the karst bio-space: either in the saturated zone below the water table] or in the unsaturated zone above the water table. The spatial component of these meso-cavern spaces includes the numerous interstitial voids in cave streambed or streamside substrates as well as the minutely small solution tubes, cracks and fissures that distribute waters through the carbonate rock, draining surface mantles, surface soils and forest litters or ground cover.

There are about 4,000 known caves in Tasmania in 135 karst areas and additional non-karst areas. Cavernicolous invertebrates have been recorded from almost half of the cavernous areas of Tasmania. The cave fauna database for the 1997 Tasmanian Regional Forest Agreement [RFA] includes a list of 692 recorded invertebrate species and a map shows the location of the major karst areas where cave invertebrates have been collected or recorded. The cavernicolous invertebrate biodiversity in Tasmania includes a range of aquatic and terrestrial species from several ecological niches, with varying dependence on the cave environment, and the relationship between some of these species can be demonstrated with a food web, typically expressed in some of the stream caves in Tasmania.

References

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Clarke, A. 2002 Surface Disturbance Threats to Karst Faunas in Tasmania, Australia. *Proceedings of the 14th. National Cave and Karst Management Symposium.* Chattanooga, Tennessee, USA. pp:23-28.

Richards, AM & Ollier, CD 1976 Investigation and report of the ecological protection of Exit Cave, near Ida Bay, Tasmania. *Unpublished report to National Parks and Wildlife Service - Tasmania.* 73pp.

New Troglobitic Cave Fauna Species in Tasmania, Including Apparent Species Varieties of the Southern Cave Harvestman: *Hickmanoxyomma cavaticum* (Karst)

There are now more than 4,000 caves in the known karst (and non-karst) areas of Tasmania. New caves are still being regularly discovered in known cave areas and several new areas. Most of the karst caves are found in limestone or dolomite. The non-karst caves in Tasmania mainly occur in dolerite, granite and sandstone. The majority of karst and non-karst caves in Tasmania are found in forested regions where the sheltering effect of tree canopies and understorey plants helps maintain a moist or humid envelope around underlying rock surfaces and the caves therein. Over the last two decades, the collections of invertebrate cavernicoles in Tasmania by cave biologists Eberhard and Clarke have lead to the discovery of many new aquatic and terrestrial invertebrate species. A number of these new cavernicoles are obligate species (confined to caves). Defined as troglobites, these obligates show varying degrees of "troglomorpy" and amongst these there are several microphthalmic or anophthalmic species. More than 85% of the new cave species have not been identified and it will be many years (or decades) before most new species are described. The general lack of taxonomic resolution amongst our Tasmanian cavernicoles means that our species list includes new "undescribed" species, "undetermined" or "indeterminate" species. Notable amongst the new troglobitic cave species there are crustaceans (with apparent speciation amongst anaspidacean syncarids), hydrobiid (aquatic) snails, carabid beetles, collembola and many arachnid species, including spiders, mites, pseudoscorpions and harvestmen.

Harvestmen are one of the most abundant groups of arachnid species types found in caves in Tasmania and a number of the cave-dwelling forms were described by the late Dr. Glenn Hunt. In his 1990 description of the genus *Hickmanoxyomma*, Hunt included the results of some preliminary allozyme studies conducted on some of the cave dwelling species being described. One of seven new *Hickmanoxyomma* species described, the southern cave harvestman [*H. cavaticum*] is recorded from three distinctly separate, but neighbouring karst areas of southern Tasmania: Hastings, Ida Bay and North Lune. Based on the allozyme studies, Hunt suggests the Hastings and North Lune populations of *H. cavaticum* may be considered as genetically isolated populations. In private discussion with the writer, Hunt gave permission for the southern cave harvestman to be considered as three variety types (corresponding to the three separate karst areas): *H. cavaticum* (variety 1) from the Ida Bay karst, *H. cavaticum* (variety 2) from Hastings and *H. cavaticum* (variety 3) from North Lune.

Cave Fauna and Cave Ecosystems in Southern China (Karst)
China has an area of carbonate rocks covering approximately 3.5 million km2 (almost equal in area to half the size of Australia). Dating from the Pre-Cambrian to Quaternary, the carbonate rock (limestone and dolomite) sequences in China extended to 3000 metres thick, giving potential for some deep cave systems. During recent cave exploration in Chonqing, cavers descended to -920m in *Qikeng Dong* and expect to break the one kilometre depth mark later in 2002 or early 2003. Although some carbonate rocks areas are still inaccessible, caves have been recorded from almost every province in China and at least a third of the known carbonate rock areas in China contain confirmed karst, situated within a range of climatic zones with abundant annual precipitation. Tectonic activity has resulted in the formation of numerous structurally separated blocks of limestone with locally or regionally defined independent karst drainage patterns, resulting in extensive but ecologically separated and isolated subterranean hydrological systems. Karst is a prominent landform in at least six provinces of southern China, where there are a range of varied structural or solutional forms present. The southern lowland plains of China are dominated by tower karst; cone karst and associated tiankeng collapses are found in the more mountainous areas further north; and "stone-forest" type pinnacles form in the dissected plateau karst of more elevated areas. The most intensely karstified region is situated in three adjoining provinces (of SW China): Guangxi, Guizhou and Yunnan, where the varied subterranean systems comprise large multi-level chambers and passages, active streamways and abandoned upper fossil levels providing hypogean environments and habitats for numerous cavernicolous species.

Combined with the high nutrient inputs in cave ecosystems of southern China, the presence of vast amounts of perennial throughflow water and percolation fed standing waters have promoted the evolution of a diverse hypogean aquatic fauna including a rich troglobitic ichthyofauna (comprising 31 cave-limited fish species), numerous crustacean species (particularly copepods and decapods), aquatic beetles and amphipods. The troglobitic terrestrial fauna of Chinese caves is mainly composed of diplopoda, collembola and coleoptera (dominated by 40 trechine carabid species), plus a few cave adapted spiders, crickets and isopods. Some of the troglobites found during recent caving expeditions in China, are from animal groups new to science, including species of a possible new family of decapod shrimps and two new genera of beetles: *Guizhaphaenops* [*Guiaphaenops*) *lingyunensis* and *Giraffaphaenops clarkei*]. Apart from the troglobitic invertebrates and the true cavefish, the ecosystems of Chinese caves include an abundance of epigean species (often washed in by floodwaters), plus vertebrate trogloxenes such as bats and birds. There is increasing evidence to show that many cave ecosystems are now being impacted by regional developmental pressures such as dam construction and associated works including diversion tunnels and a number of both vertebrate and invertebrate species appear to be diminishing from cave sites, due to the foraging habits or culinary preferences of local Chinese villagers.

Combley, Brian

Cavers Leeuwin Inc.

A Thumbnail Sketch of the Leeuwin Ridge and Caves History Since European Settlement (History)
The session consists of notes based on the earliest records known of the caves on the Leeuwin ridge with then and now photographs where available. One of the reports on which the presentation is based, was by a surveyor named H. M. Ommanney, who was described as "A gentleman and a Surveyor", his report was the first indication of the existence of caves in the region in 1840. Another report was published in Feb 1900 by C. Erskine May in which conservation was first recommended. Using the photos from Mayís report, and current photos some comparison can be gained of then and now.

Several photographs of the Leeuwin Ridge, caves, dolines and coastline as it is now, are included, some, taken from the air giving a good perspective of the area and features. Transcripts of the actual reports and the newspaper articles are to be included with the conference notes. Copies of the photos will be included with the electronic version of the notes.

Devine, Paul

Cave Exploration Group South Australia Inc.
Speleological Research Group Western Australia Inc.

Documentation and Ground Exploration of Nullarbor Karst (Karst)
After becoming involved with Nullarbor karst exploration, things which quickly became apparent were the logistical and time constraining difficulties of ground-based exploration. This first emphasised the need for accurate documentation of karst features found.

It also raised the question of how little we actually know about Nullarbor karst features.

The past history of the Plain along with the number of features which can be found all seemed to indicate the number of features documented is very small, but also included a high number of features which have been located in the past but never recorded.

In early 2000 whilst in the middle of an extended Nullarbor stint, I found myself with the time resources and good fortune to be invited to be part of Ken Boland's team.

Being part of Ken's team enabled me to help with, alongside Peter Ackroyd and the rest of the crew, in the enormous and at times daunting task of documentation and ground exploration on Ken's trips. Through efforts of all involved, this led to a 33% increase [540+] in documented karst features on the Nullarbor.

The difficulties, especially the physical attributes of the Plain and the past lack of being able to gain precise locations, has ensured a need for constant, broad encompassing and accurate cross correlation between old and new features.

It has also played a role in ensuring that the number and type of features recorded over the years, have not been a true reflection of the proportions of Nullarbor karst features.

Dunkley, John

Canberra Speleological Society Inc.

Where is Australia's First Identifiable, Recorded Cave Discovery? (History)
In 1802 Francis Barallier, an aide-de-camp to Governor King ascended the Tonalli River west of Camden, NSW. Caught out in a rainstorm on 25 November he took shelter in a cave "large enough to contain twenty men which, the natives assured me, was the home of wombats".

Just where the cave is has remained a mystery for nearly 200 years, but in the 1990's two possible candidates were located and described by historians interested in plotting Barallier's route. In 2002 CSS relocated one of these and a bicentennial trip to document the other is planned for November 2002.

As well as being our first identifiable, recorded cave discovery (albeit in sandstone) the cave is significant in that its location supports evidence that Barallier descended to the Kowmung River via Byrnes Gap and not via Church Creek. That being the case, he was not, as some writers have asserted, the first white man to sight the Church Creek limestone. It is also possible that the rainstorm was indirectly instrumental in depriving him of the honour of the first white man to cross the Blue Mountains.

Who Was Australia's First Speleologist? (History)
In 1973 Ken Pickering described Lieut. William Lawson as Australia's first speleologist, but Lawson's first recorded entry to a limestone cave (at Limekilns) scarcely qualifies for that title.

Others have handed the honours to NSW Surveyor-General Thomas Mitchell who surveyed the Wellington Caves in 1830 and later published his account of the bones. Less well-known is John Henderson who may have reached Wellington just before Mitchell, publishing an account in 1832 which included sketches of Wellington and Borenore Caves. Both were opportunistic amateur palaeontologists, but Mitchell reached a wider audience while Henderson was overly influenced by antediluvian explanations of cave bones. Henderson deserves recognition for his contribution to cave science in Australia, but Mitchell was indisputably our first speleologist.

Some Little-Known Early Cave Visitors (History)
This brief paper deals with some early visitors whose exploits appear to have escaped the notice of speleo-historians. In the nineteenth century travellers of independent means wandered around the growing colonies. Some like George Bennett were accomplished amateur scientists who published their findings widely. Others were less distinguished. An anonymous writer described the caves on Cavan property near Wee Jasper in April 1837. Another early traveller in the Australian bush, Godfrey Mundy visited Abercrombie Caves on 20 November 1846.

In February 1875 John Gale made an extensive tour of the Cooleman Caves, returning in 1903 and publishing a book about the exploits. Gale (1831-1929), founded the Queanbeyan Age newspaper, was MLA for Murrumbidgee and a Methodist lay preacher.

Mention will also be made of some early, apparently previously unrecorded visits to, and maps made of Tuglow Caves in the 1930's.

Eavis, Andrew

United Kingdom

Inside Karst (General)
A highly illustrated lecture on caves around the world including many of the largest passages, chambers and cave systems. The lecture will be an overview of caves and cave formation using photographic examples taken from British Expeditions over the last 30 years. Spectacular photographs of gigantic caves will be used from many areas around the world. These include

Brazil, Mexico and USA in the Americas, Ursbekistan and China in Asia, Malaysia, Indonesia, Papua New Guinea, Australia and New Zealand in Australasia not to mention pictures from all over Europe.

Eberhard, Stefan

CaveWorks

Environmental Hydrology and Stygofauna in the Jewel Cave Karst System (Karst)
There is no abstract or written component for this presentation.

Hydrogeology and Speleogenesis in the Leeuwin-Naturaliste Ridge (Karst)
There is no abstract or written component for this presentation.

Carbon Dioxide and Climate in Jewel Cave (Karst)
- Neville Michie

There is no abstract or written component for this presentation.

Grimes, Ken. G

Regolith Mapping

Syngenetic Karst (Poster)
In syngenetic karst speleogenesis and lithogenesis are concurrent: caves and karst features are forming at the same time as the soft sediment is being cemented into a rock. "Eogenetic karst" and "soft-rock karst" are closely related terms for features developed in soft, poorly-consolidated limestones. The distinctive features of syngenetic karst are: shallow horizontal cave systems; a general lack of directed conduits (low irregular chambers occur instead); clustering of caves at the margins of topographic highs or along the coast; paleosoil horizons; vertical solution pipes which locally form dense fields; extensive breakdown and subsidence to form collapse-dominated cave systems, a variety of surface and subsurface breccias and locally large collapse dolines & cenotes; and limited surface sculpturing (karren). These features are best developed in host sediments that have well developed primary porosity and limited secondary cementation (and hence limited mechanical strength), for example dune calcarenites. Certain hydrological environments also assist: invading swamp waters or mixing at a well developed watertable; or, near the coast, mixing above and below a freshwater lens floating on salt water. Where these factors are absent the karst forms tend to be more akin to those of classical hard-rock or telogenetic karst.

Hellstrom, Dr. John

University of Melbourne
Caving Club of Victoria Inc.

Recent Advances in Radiogenic Isotope Mass Spectrometry and Their Implications for Reduced Environmental Impact of Speleothem Paleoenvironmental Studies (Karst)
Records reconstructed from measured geochemical parameters within speleothems are playing an increasingly important role in the reconstruction and understanding of past climates and environments. The first significant records of this type were published over thirty years ago, since when improvements in analytical technology have on one hand reduced sample size demands and on the other hand increased the number of analyses undertaken. Because all geochemical analyses are essentially destructive techniques, conflict can arise regarding the relative importance of speleothems' intrinsic values within caves versus their scientific value once removed.

Most published speleothem paleoenvironmental records to date have been based on the analysis of whole stalagmites, partly because of their generally high suitability for stable isotope analysis and partly because they are the most straightforward means of recovering a continuous interval of speleothem deposition from a cave. A few researchers have instead targeted core samples of flowstones, hoping to obtain longer more continuous records, but also because the visual impact of such sampling on the cave environment is hopefully lower. Unfortunately the sample size demands required for uranium-thorium dating have been such that recovery of core samples large enough to be useful has been very difficult.

Many of the parameters of interest such as stable isotope ratios (particularly oxygen and carbon) and trace element contents (e.g. magnesium, strontium, uranium) can now be measured on samples as small as a few hundred micrograms or indeed even by laser ablation or other micro-beam techniques. This has reflected a slow but steady improvement in the capabilities of available analytical technologies, but leaves the actual dating of speleothems as the last common analysis type requiring significant amounts of sample. For a speleothem paleoenvironmental record to have any significance it must be placed against time, which almost always requires the use of a radiometric dating technique such as uranium-thorium.

Uranium-thorium disequilibrium dating was first undertaken using alpha-spectrometry, a technique which in most cases required hundreds of grams of speleothem for a single date. Since the late 1980's alpha-spectrometry has given way

to thermal ionization mass spectrometry, which produces more precise ages from typically two to five grams of sample. It is this advance which has made flowstone coring viable as a sampling technique, but only where long, large diameter cores can be taken. Here I will review and report progress in adapting the relatively new technique of multi-collector inductively-coupled plasma mass spectrometry (MC-ICP-MS) to the uranium-thorium dating of very small speleothem samples.

MC-ICP-MS U-Th dates at the University of Melbourne are giving good precision on samples containing less than ten nanograms of uranium, which in practice means that only a few hundredths of a gram of speleothem are required to date most samples. This advance means that time-resolved paleoenvironmental records can be reconstructed from flowstone core samples of as little as 10mm in diameter even where the speleothem growth rate is of only a few millimetres per thousand years. A case study from a 22mm flowstone core sample from New Zealand spanning the last 150,000 years will be presented and contrasted with an earlier study from the same location requiring one metre of 50mm core sample. Details of a new portable electric drilling system for recovering 10mm and 22mm core samples will also be presented with discussion of drill site impact and rehabilitation techniques.

Hosie, Paul

Western Australian Speleological Group Inc.

Nullarbor Cave Diving - Mullamullang, Olwolgie (General)
Video

Kimberley Cave Diving (General)
Video

Humphreys, Dr. W.F. (Bill)

Western Australian Museum

An Eclectic Review of Subterranean Biology in Australian Waters (Karst)
This paper will be verbally presented with no write-up in the conference proceedings.

The last decade has seen a major shift in understanding of subterranean biodiversity in Australia. Two decades ago Australia was considered to be depauperate in subterranean fauna (cf Howarth 1988), a decade ago it was firmly established that the eastern seaboard, both tropical and temperate zones, had a rich subterranean fauna (Howarth 1988; Eberhard and Spate 1995; Eberhard et al. 1995). It is now recognised that the arid zone and the "shield" regions of Australia also contain rich subterranean faunas, in both tradition (karst) and novel habitats.

Remarkable widely disjunct faunas inhabit salinity stratified near coastal aquifers (anchialine ecosystems) at Cape Range (Humphreys, 2000) and Christmas Island (Humphreys and Eberhard 2001), although the faunas themselves are quite distinct. The former-remiped community-has close affinities with anchialine habitats on either side of the North Atlantic while the latter-*Procaris* community-has affinities with the anchialine fauna of sea mounts (Bermuda, Ascension Island, Fiji, Hawaii).

Numerous subterranean communities comprising short-range endemic species are now known also from the "shield" regions (Pilbara, Yilgarn and Arunta Block) in arid Australia. However, these are found in areas not the traditional focus of biospeleological research in hyporheic (below river) groundwater and in groundwater calcretes in the palaeodrainage channels. The chains of salt lakes (playas) that form such a conspicuous component of the landscape of arid Australia are the surface expression of groundwater flows within the alluvial infill of ancient palaeochannels. Rainfall recharges the groundwater which flows towards the base level represented by the playa surface. The groundwater flowpath gradually comes closer to the ground surface and through which evaporation occurs. The resulting salinity gradient leads to CaCO3 precipitation (<3000mg L-1 TDS) near the groundwater surface and subsequently to gypsum deposition closer to the saltlake fringe. On a landscape scale this results in a series of isolated masses of limestone (calcrete) in the landscape immediately upflow of the playa (Humphreys 1999).

Groundwater calcretes are especially important in the Australian context as they form in arid climates (annual rainfall <200mm) with high potential evaporation (>3000mm per year), where rainfall is episodic and resulting in fluctuating groundwater levels. Thus groundwater calcretes are found throughout arid Australia and in Western Australian alone there are more than 200 major deposits (Humphreys 2001). These calcretes are widely referred to as karstic and the general models have them expanding, contracting and coalescing with changing climatic conditions.

Groundwater calcretes are the focus of considerable stygobite (obligate groundwater inhabitants) biodiversity and they have become a hot topic in the scientific and resource development area. Claims of a very speciose amphipod fauna in the Pilbara iron ore region

(Bradbury 2000) are being disputed on the basis of allozyme data (Finston et al., in press) in the same areas that new genera of ostracods are being described, each of which is known from only a single calcrete area. The calcrete fauna undoubtedly is best known in the Yilgarn where almost every discrete calcrete area examined have proven-based on both morphological and molecular evidence-to have a unique fauna (Cooper et al. 2002). For example, these calcretes were invaded by numerous lineages of diving beetles at about the same time-molecular evidence indicates that this occurred in the middle Miocene-and within which subsequent speciation appears to have occurred (Leys et al. 2002). There is a real need to obtain independent estimates of the age of groundwater calcretes but this seems to be an intractable problem.

Together, these faunas provide evidence for the past connections of Australia with Pangaea, Gondwana and Tethys and for the onset of aridity (Humphreys in press), and they make a major contribution to the biodiversity of Australia. They include a number of higher order taxa variously new to science (undescribed family of flabelliferan Isopoda), new to the southern hemisphere (Thermosbaenacea; Remipedia; Epacteriscidae; *Danielopolina* Thaumatocyprididae: Ostracoda), or new to Australia (Spelaeogriphacea; *Stygocyclopia*: Pseudocyclopiidae). In addition numerous new genera and species of Amphipoda, Ostracoda, Copepoda and Coleoptera are being described by numerous researchers-particularly John Bradbury, Ivana Karanovic, Tom Karanovic, Chris Watts respectively-in an active process of investigation of these new and exciting stygal worlds.

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Anchialine Systems in Australia - Why Are They So Interesting? (Karst)

This paper will be verbally presented with no write-up in the conference proceedings.

Anchialine habitats are groundwater estuaries, being inland mixohaline groundwaters affected by marine tides, usually with a reduced subaerial exposure. They occur mostly in arid coastal areas in tropical and subtropical latitudes around

the globe. The water column characteristically has a stable hydrological stratification with a marked density cline, with the salinity increasing and oxygen decreasing with depth. The systems may show complex microbiological assemblages associated with a nitrogen species cascade and bands of hydrogen sulphide.

Anchialine ecosystems often support diverse crustacean assemblages and from which at least 12 new families and a new class of crustacean has been described recently. Anchialine ecosystems-especially in the oligoxic reaches of the water column-support macroinvertebrate communities the structure of which is highly predictable, mostly comprising biogeographic and/or phylogenetic relicts. Those assemblages occurring in continental or epicontinental waters are remiped-type, while those on remote oceanic islands (mid-ocean ridge islands and sea-mounts) are of the procarid-type. Australia has anchialine systems of both the remiped-type (in the northwest) and the procarid-type (Christmas Island, Indian Ocean) and a synopsis of these Australian anchialine systems is presented.

As found in the amphi-Atlantic sites, the Australian remiped-type anchialine system is composed of atyid shrimps, thermosbaenaceans, hadziid amphipods, cirolanid isopods, remipeds, thaumatocypridid ostracods, and an array of copepods, including epacteriscid and psedocyclopiid calanoids, halicyclopine cyclopoids, speleophriid misophrioids. So far ridgewayiid calanoids and superornatiremid harpacticoids have not been reported from the Australian anchialine system although they may be expected as they are characteristic in the Northern Hemisphere systems.

The procarid-type anchialine system of Christmas Island is the only one known from the Indian Ocean. All described procaridids are sympatric with one or more species of atyid shrimps. The occurrence of procaridid, alpheid, hippolytid and atyid shrimps in the same anchialine system on Christmas Island mirrors that found on Bermuda. As well as Christmas Island (Indian Ocean), the genus *Procaris* is known from Hawaii, Fiji (Pacific), Ascension Island, Bermuda and Cozumel Island, Quintana Roo, Mexico (Atlantic/Caribbean).

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Lake, Michael

Safety Convenor, Australian Speleological Federation

The ASF's Web-Based Karst Index Database - A Brief Update (General)

The Web-based Karst Index Database has now been operational for over a year and is usually the most popular destination for visitors to the ASF's web site. It is also the first Web-based implementation of the International Union of Speleology's Cave and Karst Data Exchange Standards.

This is an update on the ASF's Web-based Karst Index Database - the current status of the KID, plans for the future and where we expect to be in six months time.

Long, Dr. John

Western Australian Museum

New Discoveries Of Articulated Well-Preserved Megafauna From Nullarbor Caves (Karst)

- Gavin Prideaux *(Flinders University, Adelaide)*
- Ken Boland *(Victorian Speleological Association)*
- Ray Gibbons *(Cave Exploration Group South Australia)*
- Peter Ackroyd *(Victorian Speleological Association)*
- Paul Divine *(Cave Exploration Group South Australia)*

In May 2002, cavers from CEGSA and VSA using ultralight aircraft discovered a number of new karst features on the western Nullarbor. Some of these caves contained articulated skeletons of extinct mammals. The cavers notified museum specialists in Victoria and South Australia, who

then in turn notified paleontologists at the W. A. Museum as the caves occur on WA crown land. A recovery expedition took place in July 2002, resulting in the finding of several complete skeletons of the marsupial lion, *Thylacoleo*; skeletons of three species of sthenurine kangaroo, the giant wombat *Phascolonus gigas*, the giant kangaroo *Procoptodon goliah*, extinct species of *Wallabia* and remains of an unidentified macropodine kangaroo.

The Nullarbor discoveries are extremely important in providing the first complete, articulated skeletons of megafauna from the Pleistocene epoch from anywhere in Australia. Samples are currently being tested for ancient DNA, and for dating the age of the fossils using OSL (optical stimulation luminescence) and ESR (electron spin resonance) techniques. It is likely that the unique preservation of the fossil material was the result of a long period of constant dry conditions in the caves, which we believe may have been sealed off in some cases shortly after the animals accidentally fell in.

The series of events that took place from time of first discovery to recovery of the specimens is a crucial time to preserve valuable scientific information. Correct procedures were followed here enabling uncontaminated skeletal specimens to be sampled for ancient DNA. On first discovering a skeleton in a cave, cavers should stay clear and take photographs which can then be sent to appropriate museum authorities. If, as in this case, the material proves to be of great scientific value, then an expedition can always be arranged to retrieve the fossils. In any event it is better to leave bones in caves and send photographs than to touch or remove specimens from their in-situ positions.

Research on the prehistoric animals discovered from the Nullarbor caves is sponsored by the Rio Tinto Futures Fund.

McCabe, Steve

Highland Caving Group Inc.

Acetylene Illumination of Early Tasmanian Show Caves (History)

Tasmania, the apple isle possesses some unique and interesting speleological features. One aspect of cave tourism in Tasmania, which has fascinated me since reading about a brief mention of it in the Journal of Sydney Speleological Society [Middleton 1988], is their illumination by means of an acetylene generator.

Acetylene illumination, although interesting and novel at the time really damaged the cave environment. The noxious smoke and gas filled the cave, formations were stained, ceilings became covered in soot, and spent carbide was a problem to dispose of. All this plus the usual development damage the caves endured, and remain today a time capsule or window into this fascinating period of cave tourism.

This short article is a result of my studies into this little known and documented piece of Australian Spelean History.

Moulds, Timothy

The University of Adelaide, Department of Environmental Biology

Arthropod Ecology of Bat Cave, Naracoorte, South Australia (Karst)

The Bat Cave, Naracoorte, South Australia, is the largest of only two maternal sites for the large bent-wing bat (*Minopterus schreibersii bassiini*). Guano dropped by these bats in the maternal chamber provides a habitat for an extremely diverse arthropod community that includes several endemic species. Despite a comprehensive species inventory from previous invertebrate surveys, the ecology of arthropod species in the cave remains completely unknown. The current study seeks to elucidate and explain temporal and spatial patterns of arthropod diversity and abundance in the maternal chamber. A range of environmental factors including pH, moisture content and guano deposition rates are being examined to evaluate their micro- and meso-scale affects on arthropod populations. Pitfall traps, open for 48 hours, bimonthly, have been positioned in 18 guano piles throughout the maternal chamber. The traps have been placed in pairs at the top and bottom of piles to determine the importance of fresh guano to arthropod populations. Preliminary data indicates guano is usually slightly acidic, with the tops of guano piles slightly less so. The abundances of Acarina spp., Coleoptera (Carabidae sp., Histeridae sp. and Anobiidae sp.), Diptera (Phoridae spp.) and Pseudoscorpionida (*Protochelifer naracoortensis*) have been found to be higher on the tops of piles where guano deposition and moisture content are higher. Arthropod abundance and diversity is postulated to be strongly linked to seasonal guano deposition, peaking over summer months. Further studies should include research on fungal and microbial diversity which, apart from guano, form the basis of the maternal chamber food web. Detailed ecological information on species endemic to the maternal chamber would also greatly enhance management and conservation practices for this fragile environment.

Poulter OAM, Norman

Speleological Research Group Western Australia Inc.

Troglobitic Spiders of Research Cave 6N-327 (Karst)
The cave 6N-327 on Mundrabilla Station was first entered on January 1, 1997 following the result of a successful morning's dig. The limited exploration of the cave over the next two days led to the discovery of a large population of troglobitic spiders of the genus *Tartarus* and the realization that the cave's fauna and environment must be preserved.

Negotiations were immediately held with the land manager to declare the cave a "research site", have it gated and entry restricted. This action was mirrored several months later when another significant population of these spiders was found in cave 6N-1327 on the Roe Plain region of the adjacent Madura Station.

A partial survey of the cave 6N-327 in 2001-2002 counted 90 *Tartarus* spiders, making it the largest known population of these unique spiders.

This paper describes what has been learnt about the cave and *Tartarus* spider.

Troglobitic Spiders of the Nullarbor Plain (Karst)
Seven species of troglobitic spiders, belonging to four different spider families, are known from the Nullarbor caves. An account of their history, distribution and what little is known about their biology is given.

Cave Rights Revisited (General)
It has been sixteen years since Dr. Mike Gray of the Australian Museum made the suggestion during a 1987 field trip to the Nullarbor Plain that entry to the Dome chamber of Mullamullang Cave should be banned in order to give the resident fauna population of the spider *Tartarus mullamullangensis* and cockroach *Trogloblattella nullarborensis* a chance to recover their numbers - if possible. He suggested that their population decline was mainly due to habitat disturbance.

These suggestions ultimately led to my paper entitled "Cave Rights For Troglobites" delivered at the 18th. ASF Conference [Cave Leeuwin 1991] which resulted in a successful voluntary non-entry ban [to the Dome] resolution from the council meeting a day later. Within a week this ban was violated by members of a conference field trip.

Now, twelve years since that resolution was instituted - what, if anything has changed?

Robinson, Lloyd N

Illawarra Speleological Society Inc.

Augusta's Jewel Cave From a Caving Perspective (History)
The original entrance to the Jewel Cave was known in the 1880's and possibly earlier. Unsuccessful attempts were made to gain entry during these earlier times. With two caves in the area operating as tourist caves and two world wars caused Jewel Cave to be left in limbo until January 1957 when a brief entry was achieved by a party lowering one of their number to the cave floor on a rope.

Over a year later, a party of two entered the cave and made a hurried reconnoitre of the first two caverns. A short time later the cave was explored by a party of three who made the find known; this resulted in publicity. The local tourist bureau was able to obtain finance to have the cave developed for tourism.

A flow-on from the media interest in cave explorations helped to bring forward the re-commencing of organised speleology in Western Australia.

Rowling, Jill

University of Sydney
Department of Geosciences

Cave Aragonites of NSW. Project Report for MSc (Karst)
Although cavers and cave managers have reported aragonite from a number of NSW caves, there is surprisingly little literature in the scientific community regarding its occurrence in NSW caves. The aims of this project are to:

- Investigate caves reported to contain aragonite
- Verify that the material either is or is not aragonite
- Analyse the substrate on which the aragonite is depositing
- Determine what factors lead to the deposition of aragonite in NSW caves.

The first task was to investigate reports by other workers regarding the occurrence of aragonite in NSW Caves. This involved talking to people, reading library references and in many cases, checking the reported sites physically. Sites at the following NSW karst areas were examined in detail: Jenolan, Walli and Wombeyan. Other karst areas in NSW with aragonite include Bungonia, Cliefden, Jaunter, Wee Jasper, Wyanbene, Yarrangobilly with possible occurrences at Colong, Timor and Wellington.

Very small samples of aragonite were taken from the samples sites with the permission of the Karst management. These were confirmed [or denied] using X-ray diffraction [XRD] of powdered material on a glass slide.

Samples of the substrate were taken. They were examined optically as thin sections, and their mineral content examined with XRD. In most cases, the substrates were porous gossans.

The various minerals present around the aragonite were examined, also temperature. The closeness to the cave entrance was considered, along with the amount of water present and air movement. The bedrock and geological setting were also considered. Samples were taken of the bedrock in the vicinity of the aragonite and above the cave.

A pattern is emerging regarding the chemical influences on aragonite in NSW caves, in particular magnesium compounds and, to a lesser extent, sulphates, appear to be the main chemical influences [crystal poisoning]. Bedrock influences appear to include dolomitisation [source of magnesium], near-vertical bedding and/or jointing [source of water. Pyrite oxidation [source of sulphur] seems to be a factor as well.

Jill began a part-time MSc in Geosciences at the University of Sydney in late 1999. Her supervisors are Dr. Tom Hubble [Geosciences Dept. University of Sydney] and Dr. Armstrong Osborne [Education Dept. University of Sydney]. Jill expects to complete her work by mid-2003.

Underwater Helictites from the Nullarbor (Karst)
It all started with a discussion on the internet as to what were the peculiar underwater helictites present in one of the caves of the Nullarbor. Members of the Trimix Divers Club had been investigating the underwater sections of Nurina Cave and recorded their findings of unusual speleothems including a thick wall deposit and three different kinds of helictites.

Paul Hosie was interested in identifying the helictites so he sent a number of digital pictures to interested people. A couple of samples of two different varieties of these was sent to myself for identification. A preliminary report was emailed to Paul, based on the present classification scheme devised by Hill and Forti, however a more comprehensive report was required [as Paul says] "to do justice to" these particular speleothems.

The helictites examined are of two forms: one which is a fairly conventional cylindrical shape ["pool fingers"] and the other which has an almost triangular symmetry and flattened structure ("sh'bulatites").

The helictites have a rather unconventional layered structure, and minerals present include high and low magnesium calcite, aragonite, hydromagnesite, huntite and other minerals deposited in a hypersaline environment. The substrate appears to be a reddish deposit with large limestone blocks apparently collapsed into it. The helictites develop vertically from the blocks [so perhaps they should be called heligmites].

Paul obtained all permissions for diving and sampling with the Karst Manager.

Scott, Jane

Cavers Leeuwin Inc.

Tufa Deposits of the Cape's Coast, Western Australia (Karst)
"Deposits of tufa occur frequently along the coast between Cape Naturaliste and Cape Leeuwin where water from springs and seepages emerges at the junction of the Tamala limestone and the underlying, impervious granite-gneiss basement rocks. These deposits vary from a thin veneer over the underlying rocks to rimstone pools and spectacular cliff formations. Conditions in rimstone pools on the coast, where the water is rich in calcium carbonate, are favourable for the development of unique stromatolitic structures, similar in type to those found in ancient fossils."

Smith, Garry K.

Newcastle and Hunter Valley Speleological Society

Pilchers Mountain Caves (General)
Fifty four kilometres north of Newcastle NSW, lies Australia's largest and most unique sandstone cave systems. This relatively unknown natural phenomenon is protected within a Crown Reserve which was gazetted in 1889. Since there is no formed road to the reserve and it is completely surrounded by private property, the caves have remained almost undisturbed since their discovery.

The caves were created as a result of massive sandstone block separation along sub-parallel joint planes. Movement of the blocks toward the valley floor was aided by the dip of the sandstone layers and presence of underlying shale bands which acted as slip planes when lubricated by groundwater. The caves are home to a significant population of bats and contain a diverse range of fauna, while the gorges provide a micro climate which supports a unique pocket of subtropical rainforest.

Caving for "Pink Puffers" and "Blue Bloaters" (General)
The terms "Pink Puffers" and "Blue Bloaters" have been around for many years. They are used in a colloquial sense by speleologists to describe how cavers react to an elevated concentration of carbon dioxide (CO2) and reduced oxygen (O2) in a cave's "foul air" atmosphere. Foul air is only found in a small number of Australian caves and is defined as having a noticeable abnormal physiological effect on humans. Pink Puffers hyperventilate when exposed to foul air while Blue Bloaters are slow to react and run the risk of losing consciousness without warning.

This paper compares these colloquial terms with the same terminology used by some doctors to describe patients with medical conditions related to Chronic Obstructive Airways Disease (COAD). Pink Puffers hyperventilate and have good colour, while Blue Bloaters do not hyperventilate and look bluish because they are starved of oxygen. This is where the similarity in definitions ends. In the caving fraternity the term refers to a speleologist's respiratory reaction to one of three types of foul air in a cave whereas in medical terminology it refers to a COAD patient's specific condition and how their body functions in good air.

Also discussed are possible links between smokers and ex-smokers with early stages of COAD (not yet causing noticeable disability in good air) who go underground and when subjected to foul air become speleologist blue bloaters. Two possible scenarios are put forward for discussion, which could form the basis of a future research project for someone with access to lung function measurements equipment.

Summers, Lise

State Records Office of Western Australia

Yanchep - Yallingup: The Caves (Poster)
Presented by the State Records Office of Western Australia, the display documents government involvement in the development and promotion of two of Western Australia's premier caving and tourism sites.

The Ideal Health and Holiday Resort: Caves House, Yallingup (History)
The Yallingup cave system, part of a larger complex of over 300 caves, has long been seen as a tourist destination. French explorers with St. Allouarn in 1772 noted the existence of an obvious cave entry as they sailed past, and later explorers such as James Stirling also commented on the sculptured limestone structures which make up the Western Australian coast. Despite this, European interest and knowledge of the caves did not develop until the mid to late 1800's.

Following an increase in interest in the caves as a natural resource in the 1890's, a Cave Board was established to administer and protect the caves, and the land on which they were located, a Caves Reserve. The key role of the Board, in line with similar Boards created around the same time, was to "improve" the reserve by doing "all such things as are calculated to adapt such ... reserves to the purposes of public recreation, health and enjoyment ..." The erection of a guest house, work to broaden entrances to caves and the like, all added to the amenity of the caves and their construction within Western Australian society as a tourism destination.

This paper will explore some of the issues surrounding the development of the caves as a tourist destination from this early period until World War II.

Taylor, Neil

Dept. of Conservation and Land Management and Cavers Leeuwin Inc.

Walkway Technology (General)
This session will be informative and hands on.. There will be a technical sheet handed out on the specific materials used in the walkway. .The session is about the provision of a walkway into a cave with minimal impact on the cave. There will be a 3m section of walkway in kit form on site; participants can watch/assist as the kit is put together(and disassembled). The real value will be to see the materials used and be able to ask questions during the session. Course participants wishing to see it put into Calgardup Cave will be able to do so if time permits. The materials used are 316 stainless steel and recycled plastic and the system could be adapted to accommodate varying path widths.

Tholen, Paul

Nature Conservation Ranger
Yanchep National Park

Caves Under Your House (Karst)
In Perth, Western Australia, the steady push of urban development extends along the coast. To the South down to Mandurah and to the North up through Two Rocks, the Perth metropolitan area grows by an average of 100 000 people per year (stats yet to be confirmed). In 1900 with a distance of 60 miles between the city and Yanchep, caves newly discovered by European settlers, were set aside for preservation, the question being would

any person be able to see their magnificence with such a distance between the civilized world and the beautiful bush setting. Just on one hundred years past the first cave tour by Mr. Henry White, urbanization is beginning to have such an effect on caves that formations and specialized flora and fauna are now under threat.

The Department of Conservation in Western Australia recognises the importance of managing the karst systems for present and future generations and employs specialised cave managers in both the areas of Yanchep and the Leeuwin-Naturalist Ridge where caves exist under CALM land. Rare and Endangered cave fauna in the form of aquatic crustaceans, troglobitic spiders and associated communities have been found in several caves and are managed by Rangers under the direction of Recovery Plans developed by ecologists, scientists and other interested bodies including members from local speleological groups.

Targeting threatening processes, human influence in the forms of road development, housing estates, pine plantation establishment, water abstraction and feral animal introduction all have a negative impact upon cave inhabitants as has the changing climate and subsequent rainfall. With the population growth of the Perth metropolitan area concentrating along the coastal strip between Mandurah and Lancelin, entire karst systems are now under threat as caves are buried to support homes by the ocean.

This story focuses on the threatened species that exist within the Yanchep National Park area, the implementation of recovery plans and the outlook for the future.

Webb, Rauleigh

Western Australia Speleological Group Inc.

Where Are the Cave Conservation Projects in Australia? (General)
The current active cave conservation projects around Australia are reviewed. A comparison with current conservation projects implemented in the United States is provided.

The possible future of active cave conservation projects in Australia is discussed and a proposal to instigate a coordinated approach to cave conservation projects is provided.

Karst Abuse in Western Australia (General)
The karst areas of Western Australia are reviewed and the existing mining leases on karst areas are examined. The potential impacts of mining in karst areas is considered and a plan to avoid future mining impacts, on the karst regions, is proposed.

The abuse of our karst resources is outlined with examples of how karst features as well as karst areas are being "mined" as decoration for public facilities. A proposal to reduce karst abuse is outlined.

White, Nicholas

Victorian Speleological Association Inc.

Graffiti at Loch Ard Gorge, Port Campbell National Park, Victoria (General)
Port Campbell National Park with its striking coastal scenery of rugged cliffs and stacks, The Twelve Apostles, is one of Victoria's icons. It is promoted in all tourist literature and Loch Ard Gorge is one of the featured attractions with a car park, developed walking tracks along the cliffs and a track with a timber stairway down to the beach in the Gorge. Loch Ard Gorge was the scene of the shipwreck of the Loch Ard in 1878 from which there were only 2 survivors. The two caves in the gorge are named Pearce Cave (3SW-2) and Carmichael Cave (3SW-3) after these survivors. Reputedly they sheltered in the caves before being rescued. Many people however, do not realise that this is a karst landscape developed on Tertiary limestone. The gorge is now showing signs of wear and tear and graffiti is accumulating on accessible cliff areas and within the caves. Recently this was brought to the attention of Parks Victoria and steps are being taken to address the problems. More information will be available at the Conference.

White, Susan

Victorian Speleological Association Inc.
Dept. of Earth Sciences,
Latrobe University Bundoora, Victoria

Karst Development at Naracoorte, South Australia - Why There? (Karst)

- John Webb *(Dept. of Earth Sciences, Latrobe University Bundoora, Victoria)*

The Lower Southeast Region of South Australia and a substantial part of southwestern Victoria form a limestone province with discontinuous areas of intensive karst development such as Naracoorte, where the relatively high density of caves is atypical for the karst province as a whole.

The Naracoorte caves have attracted a great deal of interest and research since the discovery of extensive Pleistocene vertebrate fossil deposits in 1969. The solution pipe entrances to some chambers acted as pit traps, and in Victoria Fossil Cave, large, now extinct animals like the thylacine, marsupial lion (Thylacoleo), giant kangaroos and diprotodontids fell into the

cave, and are preserved in the extensive bone deposits. The fossils accumulated in several episodes during the Middle Pleistocene (100,000-400,000 years ago).

The entrances to the Naracoorte caves are either vertical solution pipes less than 1m across and up to 20m deep or collapse windows. Both open into horizontal systems of collapse chambers floored by rubble cones and connected by low, wide, solutionally sculptured passages often partially filled with sediment. Sand from dunes on the surface sometimes falls into the caves through such solution pipes to form distinctive sand cones. The sand plugging the pipes may collapse from time to time to form a surface sinkhole. Phreatic passages, sometimes with spongework, are present, particularly in the lower levels near the water table, where they may be partially filled with clay. Caves that reach the water table have still, shallow pools with calcite rafts on the surface; the level of these lakes has fluctuated over time in response to changes in the regional water table. The longest cave, Victoria Fossil Cave, has over 3000m of an extensive rambling network of large collapse chambers and smaller connecting passages, some very well decorated.

Naracoorte cave passages show a preferential northwest-southeast alignment, more or less parallel to the Kanawinka Fault which cuts through the host Gambier Limestone as a cliff-line formed originally by fault movement, but later modified by wave erosion. The fault has moved in the last few million years; the uplifted northeastern side is topographically higher.

Karstification at Naracoorte may have started when the sea retreated and first exposed the limestones to weathering around 15 million years ago. Cave formation probably slowed when the sea returned ~5 million years ago and covered the area for 2-3 million years. Around 900,000 years ago the sea advanced to the Naracoorte area for the last time, forming the sea cliff and sand dunes there. The caves may have been flooded by this sea level advance. Blanche and Alexandra Caves contain columns and flowstone (not yet dated) that have been extensively dissolved, exposing their internal layering, and suggesting that the caves were flooded after the speleothems had formed. The Naracoorte caves have remained dry since then. In Victoria Fossil Cave the oldest flowstones, growing directly on the floor of a chamber, are over 500,000 years old. Calcite deposition in the caves occurred during times when the climate was relatively wet, most recently about 20,000 years ago; there is only limited speleothem deposition at present.

It is uncertain why cave development at Naracoorte is so extensive, but it may be reflect a greater input of aggressive water at this location, perhaps from the nearby Mosquito Creek, and possibly accentuated by uplift along the Kanawinka Fault. Alternatively, there may be structural control of groundwater flow, so that it has been focussed by a greater concentration of joints and fractures in this area.

Karst Features in Pleistocene Dune Limestones, San Salvador & New Providence Islands, The Bahamas (Karst)

- Nicholas White (Victorian Speleological Association)

The Bahamas is an archipelago of carbonate islands and shallow banks in the Western Atlantic Ocean. It is characterised by oolitic carbonate banks, oolitic and aeolianite carbonate islands and cays. The islands are predominantly low lying, up to 30m ASL and the topography dominated by aeolianite dune ridges. The area experiences a subtropical temperate to semi arid climate which is more arid in the southern islands with hurricanes in the summer months. Previously the islands were heavily vegetated with mixed tropical broadleaf coppice but is now largely covered by pine barrens with palmetto as well as thick scrub on the dune ridges.

There are interesting similarities with the Pleistocene dune karst of Australia. There is similar physiography including collapse features, cave types, solution pipes, and soil pipes. However, there are also important differences due to the Bahamian limestone being generally younger and containing a lower non carbonate fraction and in an island rather than a continental margin setting. Landforms are more dependent on sea level position than their Australian equivalents. The aeolianite ridges, up to 30m ASL, formed during all phases of the sea level highstands and show distinctive crossbedding, calcrete horizons and terra rossa palaeosols.

The karst is concentrated on the dune ridges and karst features include caves, Blue Holes, solution pipes (pits), Banana Holes, lake drains, notches and other minor solutional features. Extensive work has been done on the karst in the area with the development of the model of island karst and flank margin caves. The flank margin caves, such as Lighthouse Cave, formed in the freshwater lens under the aeolianite ridge and dissolution occurs where fresh and salt water mixes. This probably occurred during the Late Pleistocene. Blue Holes are pits extending below sea level for most of their depth and are flooded karst features of polygenetic origin. Solutional features such as karren can be seen on the dune ridges.

Speleogenesis in Cainozoic Limestones, Western Otway Basin, Southeastern Australia (Karst)
Southeastern Australia has extensive areas of Cainozoic limestones. These include both Oligo-Miocene marine calcarenites and calcilutites and Pleistocene dune calcarenites. This talk will illustrate the factors involved in speleogenesis in these limestones and outline the relationships between speleogenesis, hydrogeology and lithology in relatively young limestones.

These limestones, whilst more extensive in area than the Palaeozoic impounded karsts of eastern Australia, are less well known especially for cave exploration. However they have both extensive and intensive cave systems including the flooded cenotes of the Mount Gambier area, large caves with important palaeontological deposits and maze-like systems in the Pleistocene dune ridges.

Speleogenesis in these lithologies is an interplay between the groundwater conditions and the lithification and diagenesis of the calcareous sediments. As such sediments are highly variable in their calcareous content, the solution/precipitation balance also varies from site to site. This variability is combined with both high primary porosity and permeability resulting in diverse surface and underground karst features.

The caves are dependent on the ability of the calcarenites to develop sufficient structural strength in the form of an indurated layer. This "caprock" is necessary for the development of many karst forms, especially caves, as it gives the relatively unconsolidated calcarenite structural strength. The caprock develops in both limestone sequences where conditions are favourable but somewhat better in the Pleistocene dunes.

The development of cave systems is also directly related to the groundwater conditions. Evidence of fluctuating groundwater conditions over time can be seen in the caves, especially the drowned cenotes of the Lower Southeast of South Australia. The inter-relationship of groundwater conditions and relatively horizontal lithologies, combined with the development of an indurated layer are the keys to understanding speleogenesis in these limestones.

Karstification in lithologies that have not been traditionally regarded as having high potential for caves can bring insight into the interplay of factors controlling speleogenesis. The variation in host lithology, hydrogeology and an ability to develop a structurally competent roof must be taken into account in the context of the time available for solution and speleogenesis.

Wood BSc, Anne

Caves Manager
Dept. of Conservation and Land Management

Managing People and Caves in the Margaret River Area, Western Australia (General)
A brief overview of the history of cave use in the Leeuwin-Naturaliste Ridge, and the "Cave and Abseil Permit System" which was introduced in 1992 is followed by a review of changes to the operation of the Permit System.

The most recent is the introduction of The Department of Conservation and Land Management's Cave Leader Course. The course focuses on minimal impact caving, group leadership, and safety.

Since the introduction of the course there has been a significant reduction in the number of people able to book cave permits. A decrease in both visitor impacts and cave accidents could also be expected.

Wools-Cobb, David

Northern Caverneers

Cave Photography - Getting Started (General)
Do you want to take good photos in caves but feel intimidated?

In this presentation David will outline the choices in equipment in order to get started in cave photography. To get good photos you don't have to be "an expert"; it can cost little and be fairly easy if you're well prepared. For the more serious, David will outline the various options to be considered before you spend lots of money.

Cave Photography - Getting Good Photos (General)
So you've been a bit frustrated with your caving photos so far?

This presentation is a follow-on from "Cave Photography- Getting Started" In this discussion-based presentation David will outline how to use basic equipment to its best effect. You don't have to spend lots of money on "gismos" to get good photos. David will explain several techniques that will ensure your photography has more impact and give you a springboard towards that "winning shot".