

THE IAH GROUNDWATER CONFERENCE AT DARWIN

- Ken Grimes

Danuta Karp (hydrologist, NT Government) shows Jacob Tumbulto (Ghana) a sinkhole that feeds groundwater to the floor of a polje on the outskirts of Katherine



THE CONFERENCE

The conference, held in Darwin in May and run by the International Association of Hydrologists (IAH), was on the theme of "Balancing the Groundwater Budget".

However, there was a session on karst, with a keynote paper by Stein-Erik Lauritzen (University of Bergen, Norway) on the Hydrology of Permafrost Karsts; and also one on Stygofauna and Ecosystem Dependence with a keynote paper by Bill Humphreys (Western Australian Museum) on Groundwater Ecosystems in Australia.

The karst papers were a bit mixed - I got the impression that the organisers had thrown in any paper that mentioned limestone in its abstract! Stein-Erik's paper was interesting (and possibly relevant to past glacial conditions in Tasmania) - karst solution and drainage **does** occur under permafrost and beneath glaciers!

Some other papers of note included one on part of the English chalk aquifer (which has analogies to our softrock karsts) by Nick Robins. Scott Evans spoke about the problems of managing yearly allocations from a small softrock limestone aquifer in the Eyre Peninsula, S. A. , that had highly variable recharge, small storage and short residence times.

But the prize for an interesting story must go to Salvatore Carrubba for his description of the ancient qanats ("homokarst"?) and limestone springs beneath the city of Palermo, Sicily, which

have been exploited since the 10th century at least.

There were also papers on local karst features which we visited on the field trips: e.g. the management of the Howard Spring by Tho Tien and others; the Water Balance of the Daly R. catchment, by Peter Jolly, and a poster by Danuta Karp on the Katherine sinkhole problem.

The Stygofauna sessions started with Bill Humphreys' excellent summary of the rapidly growing field of Australia's groundwater ecosystems and some of the threats to them.

Other papers in the session spoke of the groundwater faunas both in terms of their reliance on continuing water supply and quality (Susan Schmidt, and Stewart Halse both spoke on Western Australian examples), and also on their use as monitors for catchment quality (Holger Schindler and Hans Hahn both provided a European view).

An ongoing theme was the desperate lack of information on these cryptic, but fascinating faunas.

Trips within the conference tended to be rather tourist oriented, but included a number of the local springs of the Darwin area. Many of these appear to be sourced from Proterozoic (very old) dolomite aquifers and reach the surface via fault lines or degraded dolines that have broken through the Tertiary laterite cover; which is itself a good (silicate karst?) aquifer.

THE POST-CONFERENCE TRIP TO THE DALY RIVER KARST

About a dozen official delegates (representing every continent except South America), and several part-time people from local areas, spent an excellent three days in a mini-bus in the Katherine area.

Our leaders were Danuta Karp (hydrologist with the NT Department of Infrastructure, Planning and Environment), Stein-Erik Lauritzen (University of Bergen, Norway, who has been coming to the NT for the last ten years to work with Danuta on the karst) and Steve Tickell (from the same department as Danuta), together with several others who took control from time to time; e.g. Dirk Megirian from the NT Museum, and the bus driver, who had some original ideas about just where we were going - things got fairly anarchic at times!

We drove south from Darwin to Katherine through the smoldering evidence of early dry-season burn-offs.

We looked first at Lake Hickey, a large, irregular, shallow swamp on the outskirts of Katherine which Danuta classes as a polje as she has evidence that the wet season flooding is fed by both surface and underground water - the latter entering via small dolines (estavelles) in the floor of the polje.

Professor Stein-Erik Lauritzen, of Norway, demonstrates an area of paleokarst breccia exposed in a modern sinkhole near Cutta Cutta Caves.



The watertable can fluctuate by up to 10 m between dry and wet season, but surface flooding of the polje only happens after particularly strong wet seasons (such as the last few years).

None-the-less the NT government is currently digging a million-dollar drain to prevent flooding of a few buildings at the edge of the polje.



The group inspects a recent sinkhole on the edge of the Stuart Highway.

We also visited a nearby ridge of the Cambrian limestone with grikes, clints and pinnacles (which are a distinctive feature of the surface karst in this area) and looked at some "unroofed caves": paleokarst deposits in old fissure systems that include bone material that has been studied by Pyramo Marianelli as his honours thesis.

Dirk Megirian stood in for Pyramo to explain the significance of the deposits – which include

speleothems that have been dated by Stein-Erik Lauritzen at the limit of the Uranium series method (about 350 ka). The material also contained old soil pisolites – or were they cave pearls?

Next day saw us visiting several of the so-called "hot" springs in the Katherine area.

At 31-32°C these are not truly "hot", but simply at the regional mean temperature, and only seem hot to tourists who visit in winter when the air is cooler.

Flow rates show some variation with rainfall (though as the springs are submerged by the river during the wet this is difficult to gauge).

However, the chemistry shows very little change, which suggests substantial storage and/or a significant contribution from diffuse flow.

Water tracing (using Tinopal, an optical brightener) from the polje showed connections to two of these springs, but interestingly both springs showed two distinct arrival times (e.g. 3 and 14 days for the nearest spring).

The water must be travelling through two distinct conduits. Danuta recounted how she had also monitored the numerous private bores by leaving cotton samplers in the toilet cisterns of the houses: "Mummy, here comes the lavatory lady again!"

Heading toward the Cutta Cutta caves we looked at a knob of Cretaceous sandstone cover and several recent sinkholes in the limestone – including one right beside the Stuart Highway.

Runoff from the bitumen, coupled with blocking of the prior surface drainage by an old railway embankment seems to have aggravated the normal karst processes.

The new railway passes a few kilometres to the south of Katherine and the engineers are doing special surveys to detect potential sinkhole problems.

At Cutta Cutta we were joined by several people from the local Parks Service and visited the tourist cave. Stein-Erik pointed out features such as paleokarst fills in old fissures in the roof and some possible large scallops that are the basis for interpreting the ancient drainage of the cave as being southeastwards towards the present collapse entrance.

The cave is a linear system that follows a belt of en-echelon joints and the extensive solutional sculpturing suggests a largely phreatic development at a time of higher watertable.

It has a complex history of alternating solution and sedimentation.

A long drive east took us to the Mataranka "hot" Springs. In this area we were fortunate that the aboriginal community had given special permission for us to inspect some interesting lobate tufa deposits on their land. These occur in

vertical walls about 6 m high enclosing large closed depressions in the creek bed.



Dirk Megirian (NT Museum) in front of a wall of subaqueous(?) tufa.

The consensus was that they were subaqueous growths formed when the holes were full of water, so there are implications of climate change effecting discharge.

In detail they had porous slotted growth structures that were reminiscent of some stromatolites in the Gambier cenotes.

There were also obvious casts of pandanus trunks and foliage in the cores of some broken lobes. The day ended with a swim in Bitter Springs (temperature 32°C, TDS = 950 mg/L with subsidiary sulphate and NaCl components as well as carbonate).

The third day was a tourist trip to Katherine Gorge. As an ex Queenslander it was pleasant to sit waiting for our boat under a tree laden with a squabble of over-ripe flying foxes.

A few people who had “done” the gorge before went off to help Stein-Erik survey some unroofed caves near the first day's site that had been exposed after a grass fire.

And so back to Darwin where “they went to bed tired but happy”. My apologies for not maintaining

LETTER TO THE EDITOR

DISMAL SWAMP, TASMANIA and KARST PAVEMENTS, SOUTH AUSTRALIA

Dear Kent,

In the June Journal there were several items which generated extreme emotions for me. For one reason or another I have worked in four Dismal Swamps.

These were situated in East Gippsland, Victoria, south east South Australia, north of Rockhampton, Queensland and in north west Tasmania. Only the latter has major karstic interest.

the usual standard of conference reports by noting the price of petrol and other commodities, but I'm afraid I forgot to keep records.

TWO REPORTS

Danuta and Stein-Erik have produced two useful reports on the karst around Katherine – an area that has been poorly documented to date.

The first (Lauritzen & Karp, 1993) was essentially a preliminary working document indicating what further work was needed.

But it has a useful analysis of structural control on cave development, the paleo-flow analysis of the scallops, and discussion of the paleokarst deposits.

There are maps of several of the caves, but these lack detail or cross-sections, so it is difficult to get a picture of the passage style.

The second report (Karp, 2002) is a detailed and well-illustrated analysis of the sinkhole problem, including a morphometric analysis and also information on the regional and local groundwater behaviour.

It has two full colour maps at 1:50,000 scale which plot the sinkholes and other karst features on a background of (a) the geology, and (b) the land unit classification. Work is continuing so it will be a few years yet before we see their final karst reports.

REFERENCES

Lauritzen, S-E, & Karp, D. 1993: Speleological assessment of karst aquifers developed within the Tindall Limestone, Katherine, *Water Resources Division, N.T. Power and Water Authority, Darwin, Report 63/1993*. c. 65 pp.

Karp, D., 2002: Land degradation associated with sinkhole development in the Katherine Region. *Resource Assessment Branch, Department of Infrastructure, Planning and Environment, N.T., Technical Report No 11/2002*. 71 pp + 2 maps. This report and its maps are also available on CD as .pdf files.

The Tasmanian Dismal Swamp is Australia's best example of a polje. It is also host to a distinctive vegetation community (although this is found elsewhere). Kevin Kiernan has made strong representations as to the value of the site.

I was engaged by the Tasmanian Forests Department in 1990 to review Kevin's position and to provide additional comments as to the values of the site. I reinforced Kevin's well argued views.

For a fuller discussion see Chris Sharples' paper in the 13th Conference on Cave and Karst Management Conference Proceedings (Mount Gambier 1999) titled: "The Dismal Swamp Polje of northwest Tasmania: A Case Study in Geo-conservation" (see diagram from his paper, below).

The sort of theme park developments as outlined in the June Journal (page 6) are utterly obscene. That sort of kitch can go anywhere. The mysterious and moving Dismal Swamp should remain just that.

I urge all ACKMA members to write immediately to the Tasmanian Premier, Mr Jim Bacon, (Parliament House, Hobart, Tasmania 7000) protesting against this absolute insult to Tasmania's natural heritage. We will also need to respond to the Environmental Impact Statement.

Secondly, I was extremely distressed to read Steve Bourne's article about the destruction of the karst pavements near 'The Sisters' west of Mount Gambier. The limestone pavements here are unquestionably Australia's finest examples of this sort of landform. And further disabuse the northern hemisphere notion that this type of landform must necessarily be the result of glacial processes.

Whoever advised the landholder that ripping these lands could increase the productivity of this country has something much denser than limestone between the ears!

As Steve points out, most of the soil has been lost from these sites (probably as a result of wind erosion following fire and/or overgrazing). Ripping will merely bring more rock to the surface.

Again I would urge ACKMA members to get the boot into the South Australian government over this issue. Write to the Premier, Mr Mike Rahn, Parliament House, Adelaide. 5000. Contact me if you would like sample letters.

Sincerely,

Andy Spate



Elery Hamilton-Smith with Andy Spate in Korea.

