

The IAH Groundwater Conference at Darwin, May 2002

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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”. This included a session on karst, with a keynote paper by Stein-Erik Lauritzen (University of Bergen, Norway) on the Hydrology of Permafrost Karsts; and also a session on Stygofauna and Ecosystem Dependence with a keynote paper by Bill Humphreys (WA Museum) on Groundwater Ecosystems in Australia. The proceedings are available on a CD from steven.tickell@nt.gov.au.

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 Australian 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, SA, 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 at least since the 10th century.

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 River catchment, by Peter Jolly, and a poster by Danuta Karp on the Katherine sinkhole problem.

The Stygofauna sessions started with an excellent summary by Bill Humphreys 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). A ongoing theme was the desperate lack of information on these cryptic, but fascinating faunas.

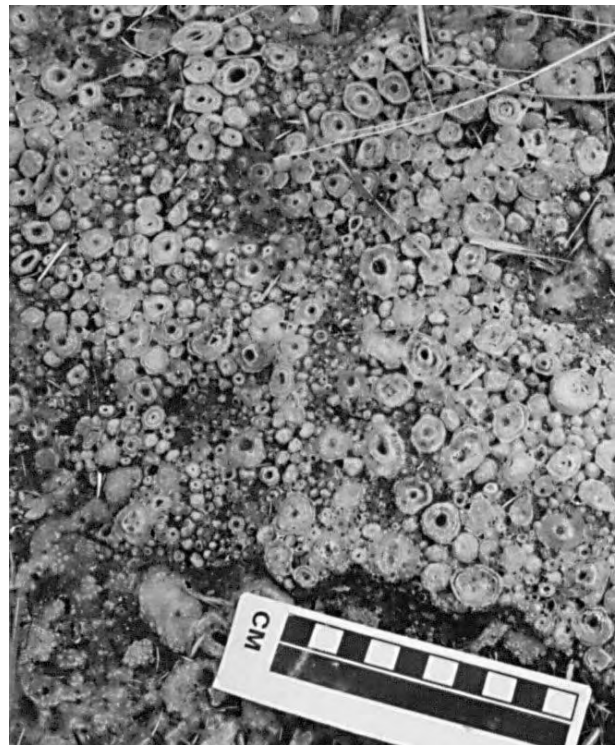
Trips during the conference visited a number of the local springs of the Darwin area. Many of these appear to be sourced from Proterozoic dolomite aquifers and reach the surface via fault lines or degraded dolines that have broken through the Tertiary laterite cover; which is itself a good (silicate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

POST-CONFERENCE TRIP: DALY RIVER KARST

About a dozen delegates spent an excellent three days 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 working with Danuta on the karst for the last ten years) and Steve Tickell (from the same department as Danuta), together with Dirk Megirian from the NT Museum.

Lake Hickey, a large, irregular, shallow swamp on the western outskirts of Katherine was classed as a polje by Danuta Karp 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. 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).

A nearby ridge of the Cambrian limestone had grikes, clints and pinnacles which are a distinctive feature of the surface karst in this area, and also some “unroofed caves”: palaeokarst deposits in old fissure systems that include bone material that has been studied by Marianelli (1995). The material contains old soil pisolites—or were they cave pearls? Speleothems in the deposits have been dated by Stein-Erik Lauritzen at the limit of the Uranium series method (about 350 ka).



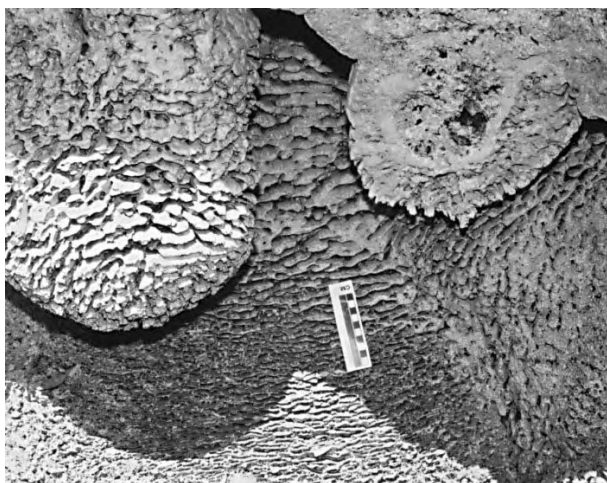
Palaeokarst fissure fill near Katherine: pedogenic pisolites—or cave pearls?

There are several 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. Water tracing 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.

Near the Cutta Cutta caves we were shown 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 accelerated the normal karst processes.

At Cutta Cutta we visited the tourist cave where Stein-Erik Lauritzen pointed out features such as palaeokarst 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.

Further east are the Mataranka “hot” Springs. The aboriginal community had given special permission for us to inspect some interesting bulbous tufa deposits near here. These occur in vertical walls about 6 m high enclosing large closed depressions in the creek bed. The consensus was that they were subaqueous growths formed when the holes were full of water, so there are implications of climate change affecting 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.



Detail of slotted tufa lobes, including a broken section at the top right (scale is 10 cm).



Bulbous, subaqueous, tufa deposits

REPORTS ON THE KATHERINE AREA

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 palaeokarst 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.

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

MARIANELLI, P.C. 1995: *Palaeoenvironmental study of Quaternary fossiliferous fissure fills of the Katherine area, Northern Territory.* Unpublished Honours thesis, Flinders University of South Australia.

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

