AUSTRALIAN SPELEOLOGICAL FEDERATION
PROCEEDINGS 10TH BIENNIAL CONFERENCE

PSEUDOKARST CAVES IN DURICRUST/GRANITE TERRAIN, BANANA RANGE, CENTRAL QUEENSLAND

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ABSTRACT

Three enterable through caves, ranging up to 67 m in total passage length are described from the Barfield area. The caves occur in and under a sandstone duricrust resting on weathered granite. The sandstone is an indurated colluvial deposit derived from the surrounding granite and accumulating as sheets in low gradient sections of gullies. Induration to mottled sandstone occurred later in a lateritic weathering regime. The rock is very resistant and forms cliffs and waterfalls.

Cave development is initiated along disconformity surfaces; most commonly along the granite/sandstone contact but sometimes in an internal disconformity in the sandstone. The clay component of the rock can be dispersed into colloidal suspension. The process mimics true solution and provides a close analogy to true karst.

Three caves were located and mapped in the area which was traversed extensively during a mineral exploration program. As an area for the study of pseudokarst the area has the advantage of having more than one cave so it is possible to assess variation.

The terrain is granitic and is mapped as Glandore Granodiorite on the regional map. My own work in the area showed that there are several bodies within the granitic area which should be named separately, however the caves occur in the area of common granodiorite. This rock type has few fresh outcrops and these are found in creek sections and occasional tors. The usual surface expression of the granite is coarse arkosic sand, with angular grains of feldspar prominent and some brick sized pieces of aplite.

Overlying the granodiorite along the drainage lines of the area is a peculiar duricrust material which has been derived in the following manner: arkosic sand has been shed from the hillslopes to accumulate in the lower gradient zone along the gullies. The material is unsorted but crudely stratified, and thus was deposited as slopewash (colluvium) presumably by sand lodging against grass or rushes. The deposit was later subjected to a profound form of weathering in which it was converted to a duricrust. The feldspar and clay matrix material of the original sediment are now a dense (siliceous?) clay and the rock is much harder than the weathered granite below it.

The duricrust is exposed in cliffs mostly where a tributary gully comes in to a creek. At present rejuvenation has passed up the main creeks and the knick point is held at the waterfalls on the gullies. Elsewhere the duricrust surface expression is a fine quartz sand.

Caves were found only in hanging valley situations where a gentle gradient tributary gully drops over a cliff. There was always an inlet sinkhole where the level duricrust area abutted against the granite hillside, but sometimes there were others penetrating the duricrust pavement itself which seem to have developed later.

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The stream in the cave is a lineal descendant of the stream which cut the valley and deposited the arkose, thus giving the paradox of a cave stream being older than the cave (cf. West Australian dune limestone caves).

All the caves can be seen to follow disconformities; most often the contact of the duricrust sandstone and the granodiorite but one cave (Pool Cave) follows two disconformities within the duricrust sandstone.

In the case of the largest cave (Wedding Present) the basic passage section is a rounded off flat rectangle 2-3 m wide and 1-1.8 m high in the main passage, which is mostly excavated in the granite. The granite/sandstone contact is visible throughout near the ceiling. At the inlet end a flattener connects to the original entrance doline, and near the other end another flattener at ceiling level loops round to emerge in the downstream entrance rock shelter. The modern stream bed is a small affair fed by local catchment of the entrance dolines. The main gully now runs over the surface to the downstream end rock shelter where it comes in as a waterfall during rainy weather.

This larger gully is sufficient to fit the size of the passages in the cave, and the probable history of the cave is as follows: once the modern cliff face was established the gully ran over the site of the inlet dolines; water leaked along the granite/sandstone contact entraining deflocculated clay particles in a colloidal suspension. The piping process continued with actual erosion of sand from the downstream end until the pipe got through the capture the gully entirely. Initially the course followed was through the flatteners, but later a direct route was cut to bypass the loop flattener and also the main entrance doline developed capturing the gully from the initial entrance. This arrangement persisted while the cave cut down into the granite. Late in the history of the cave the main gully was diverted well upstream. The modern relic stream has not done much to modify the cave.

The Scrubber Cave is similar to the Wedding Present Cave in that it follows the granite/sandstone contact and is currently occupied by a relic stream with small catchment. More water enters the cave through a hole in the roof near the downstream entrance.

The basic cross section of the cave is quite different; it is much wider with most of the extra width occurring as a flattener along the sandstone/granite contact typically 0.3 m high in contrast to the winding channel cut into the granite where the cave is 1.0 m high.

The flattener appears to be essentially a rock shelter, developed in a zone where much clay matrix had been removed before stream capture took place. The basic cause of the variant shown here is delay in capture with prolonged preparation of the contact zone.

The Pool Cave differs fron the others in having a greater fall through the cave and in particular lying within the sandstone for most of its length; the pool which is the name feature of the cave is a plunge pool in solid sandstone and a continuous bar of sandstone crosses the cave floor below it.

So there is no doubt about the cave being inside the sandstone at this point. Two disconformity surfaces can be traced in parts of the cave in wall niches which separate sandstones with differing styles of duricrust mottling. The nature of the crossover between the two surfaces was not established but it seems likely that there is some vertical jointing in the duricrust which was sufficient control.

This cave also has a number of domes, so it lacks a regular cross section; its affinities are with the Wedding Present Cave in that it lacks development beyond the width needed by its original feeder gully.

The caves are quite closely analogous to true karst caves, since the colloidal suspension of clay mineral flakes in water is very close to true solution of

calcium carbonate. The disconformity surfaces have taken the place usually filled by vertical joints, etc. in true karst in providing initial openings for enlargement. The further development of the caves has been by corrosion acting on the stream bed and the fretting action which operates to produce rock shelters; actions which are normally subordinate in karst caves.

Though there were a large number of gullies with duricrust sandstone bodies most did not have caves. It seems that it is very difficult for long through caves to form. One factor that may be important is that drainage diversion seems to have occurred only at the very edge of the sandstone outcrop.

References

SHANNON, Henry, 1973 Explorations in the Barfield Area. *Down Under*, Vol. 12, No. 3, pp 83-89, August 1973.

SHANNON, Henry, 1974 More on the Barfield Area. *Down Under*, Vol. 13, No. 2, pp 60-61, May 1974.

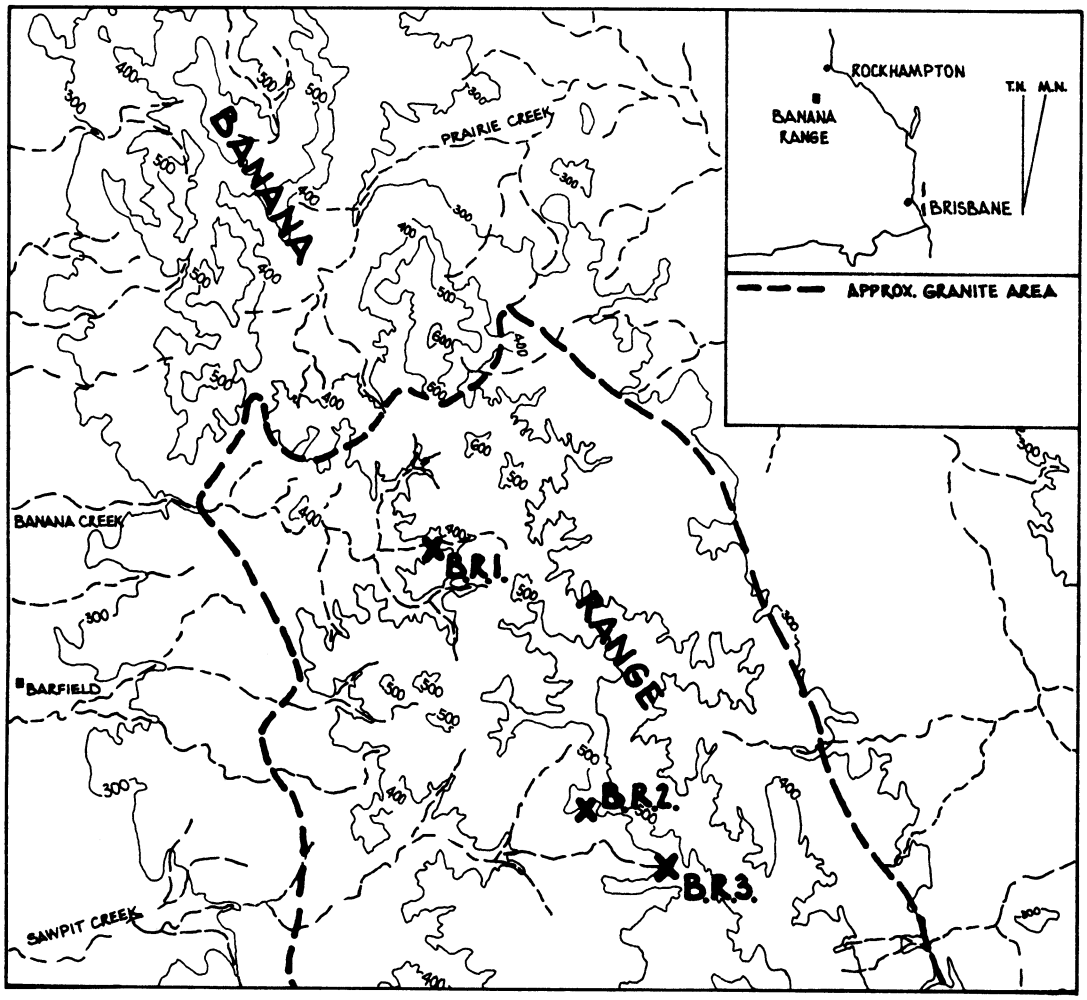

Figure 1. Location sketch for Banana Range pseudokarst area.

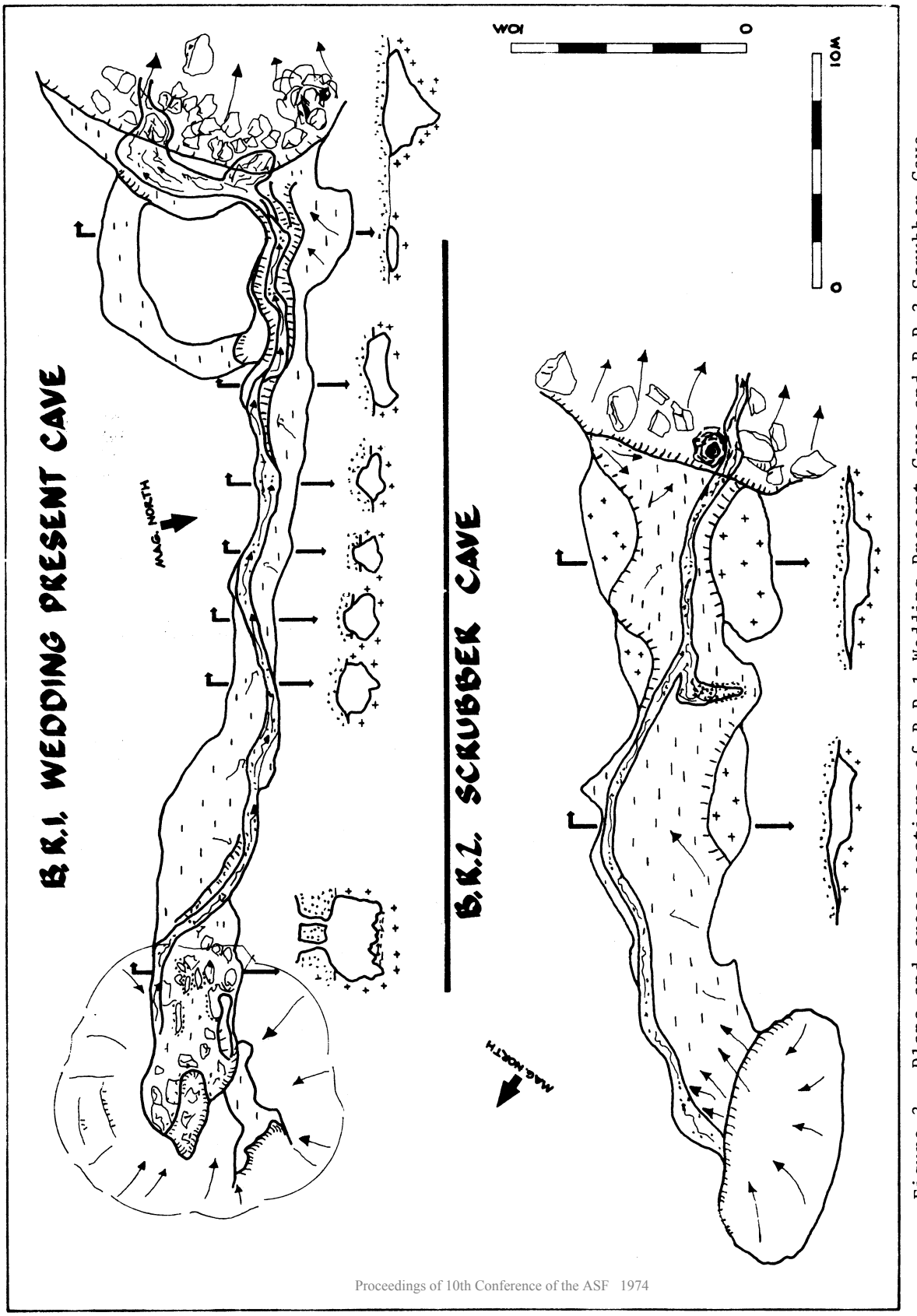

Figure 2. Plans and cross-sections of B.R.1 Wedding Present Cave and B.R.2 Scrubber Cave.

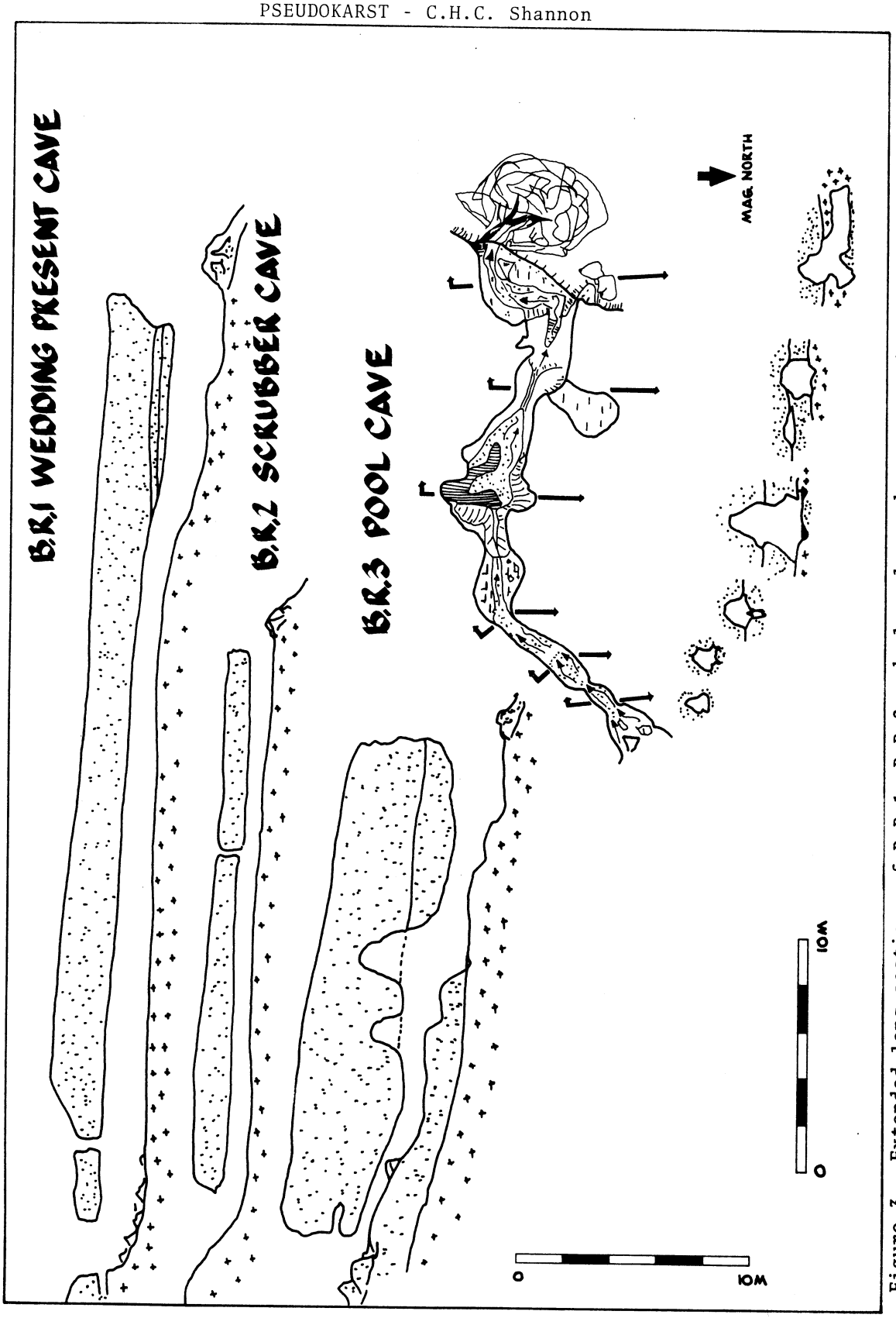

Figure 3. Extended long sections of B.R.1, B.R.2 and also plan and cross-sections of B.R.3 Pool Cave.