SURVEYING IN VICTORIA FOSSIL CAVE

by
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Surveying in tourist caves poses particular problems with the effects of hand rails and electric lighting.

A survey was undertaken using a Tracon S25 surveying compass in the Victoria Fossil show cave. The problems of the survey and comparison of results between a magnetic survey and theodolite survey are made.

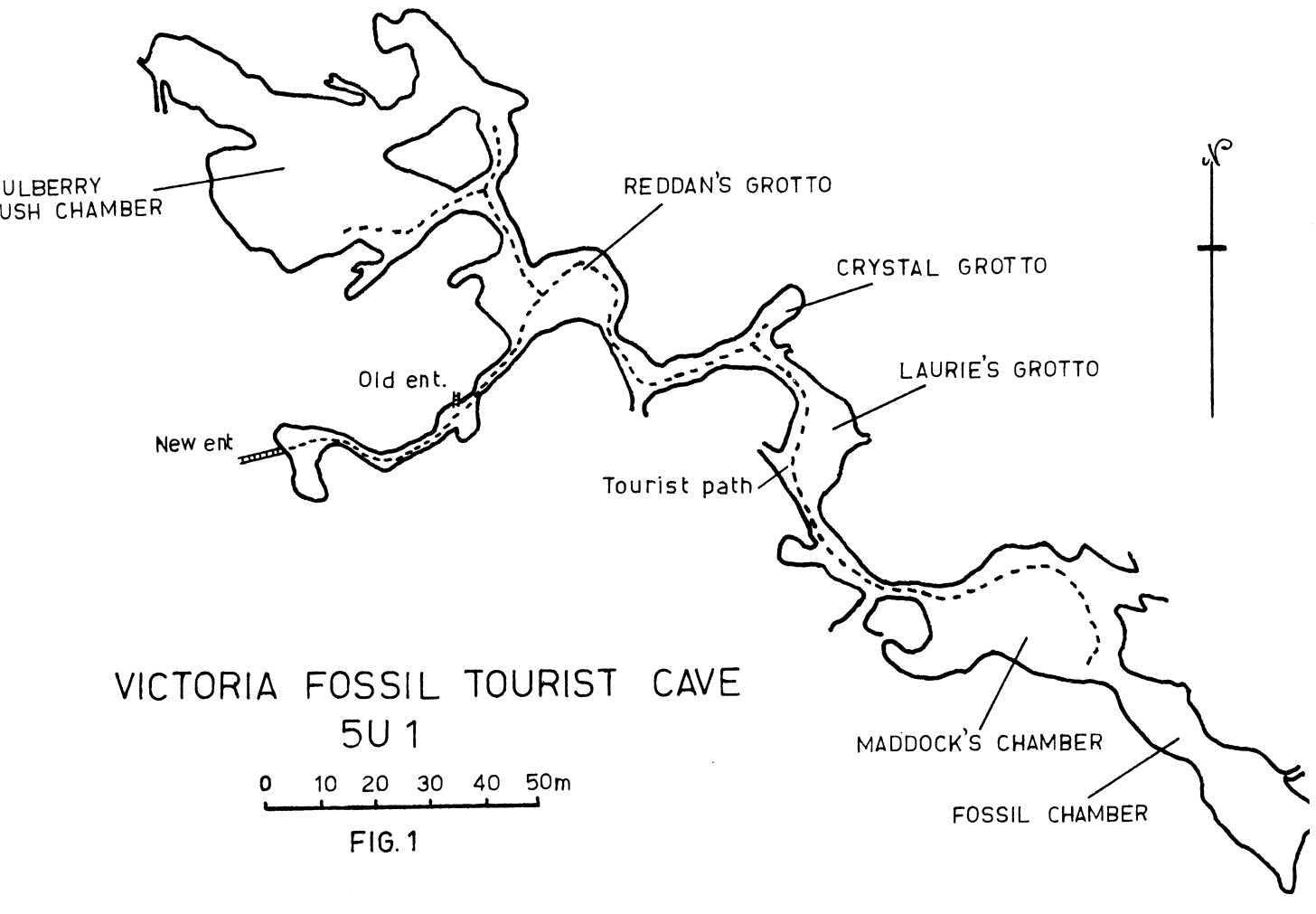

FIG. 1

This paper looks at the history of surveying in Victoria Fossil Cave, the problems we are having with surveying the cave and the results of the surveys.

Victoria Fossil Cave was discovered by William Reddan in 1893 and opened for tourism in 1897. It was known as Victoria Cave (after Queen Victoria) at that time. Probably it is South Australia's major tourist cave.

Although the cave has been known for quite a long time it was only in 1956 that the first map of the cave was produced. Those surveys usually were done with a compass; either a forestry compass or hand compass and a tape, and appeared quite satisfactory.

The extent of the original tourist cave was quite small; reaching only to Laurie's Grotto (Fig. 1). The entrance was a dug shaft with a near vertical ladder. To avoid the problem of old ladies falling down and young lads looking up the dresses of ladies climbing the ladder National Parks decided to excavate a new entrance in 1967. The site of the original entrance was opted for. CEGSA surveyed a route through the crawlway from the natural entrance to the existing tourist entrance. There were no problems with this survey.

With the discovery of the fossil beds by CEGSA in 1969 the tourist route was extended to include the Fossil Chamber in the tour. In 1975 the name was changed to Victoria Fossil Cave to avoid confusion of tourists thinking that there were two separate caves.

In 1979 the tourist route was upgraded and an exit constructed to enable through trips to be conducted to cater for the larger numbers visiting the cave since the discovery of the fossil beds. Using RDF as a control CEGSA surveyed the cave to determine the most practical route suitable for wheelchairs.

As it turned out the eventual pathway was too steep for wheelchairs. The survey based on RDF control did not correlate with the previous surveys. To complete the plans of the proposed new tourist route some adjustment had to be made to the previous surveys.

For the survey of the completed tourist route, which now bypassed the Mulberry Bush Chamber (Fig. 2), it was decided to use the Tracon S25 surveying compass. This instrument, in addition to the compass, has a horizontal circle for reading angles to an accuracy of 5 minutes.

With compass surveys in caves the practise has usually been to use a leap frog method of surveying. The instrument is set up at alternate points with back and forward bearings read to the appropriate intermediate points. Theodolite surveys are set up at each point of the traverse and angles read between the back and forward points.

Using the Tracon it was decided to do both methods concurrently using the compass and the horizontal circle. The theodolite type survey would provide the accuracy and a base to compare the compass survey with. Each survey station was marked by placing a masonry nail in a hole drilled in the concrete pathway. A hole had to be drilled because the rough concrete aggregate mix shattered if the nail was just hammered in. The nail head was left just protruding above the surface of the pathway. Although the tourists could not trip over them they did cover them with the mud they brought in on their shoes. Any future surveys in the tourist section of the cave can tie into the present traverse by relocating these nails.

The survey method appeared quite simple at first but a few problems occurred. Due to the amount of data to be recorded at each point (forward and back angles and bearings, dip, distance and instrument height) if one component was omitted the whole procedure at that point had to be repeated.

Originally the surveys were done at night after the normal daily caving activities. We were eventually given a dispensation to undertake the survey between the tours which were run at approximately hourly intervals. As tour parties approached we would transform into instant

stalagmites while the tour party gingerly picked their way past us and the instrument which naturally was placed in the middle of the pathway. Despite their ooh's and ahh's they did not bump the instrument. This feat was usually reserved for me as I recommenced the survey. Parts of the cave turned quite blue at times. Survey parties were always changing so each party needed instruction in the method and reasons before commencing the survey.

The equipment itself posed some particular problems. Parts of the route are quite steep. While some legs of up to 15m could be obtained most were between 3-5m. It was often very difficult to set up the tripod such that the column support of the compass was vertical when attached to the tripod. This is necessary because the adjusting ball joint of the compass is some considerable distance above the plumb-bob attachment on the tripod. If the column support of the compass is not vertical the centre of the compass's telescope is offset from the vertical projection of the survey point (Fig. 3). The Tracon needs to be attached to the tripod with a mechanism similar to that of the tribrach of a theodolite. The plumb-bob should be attached high up on the column support not the tripod.

The survey has not been closed yet as on the last trip I was stricken with hayfever upon exiting the cave and the continual sneezing and watery eyes made reading the instrument difficult. A cold front brought strong winds causing the plumb-bob to oscillate wildly so that the tripod could not be set up accurately.

The magnetic variation (Table 1) changes considerably throughout the cave, that is 19^{o} at the entrance, 11^{o} at the exit, 11^{o} at the power inlet and 32^{o} in Maddock's Chamber where there is no apparent cause of interference. The sense of the difference was not constant throughout the cave. As was expected the difference between the bearings at each point correlated closely with with the horizontal angle.

What needs to be done now is to close the traverse and to analyse the results with respect to what exists in the cave.

SUMMARY OF DISCUSSION FOLLOWING TALK

Ken Lance:

What do you propose to do with the magnetic field varying all over the place like that?

KRM: At this stage I am not sure what to do. Originally I intended to chart the differences and draw up a plan showing correction factors for compass surveys in the Tourist cave.

Henry Shannon:

At each point the compass, if able to be read to $\frac{1}{2}^{o}$, can be used as a theodolite as the error is constant and only the north point has changed. Can adjust survey by using line with least difference between back and forward bearings as a base.

Rauleigh Webb:

Similar problems in Lake Cave, Western Australia. Tested compass and found that if 2m from railing then no problems. Did survey with the cave lights off and staying 2m from rails.

KRM: Cannot do that here as we are constrained to stay on the pathway and keep of the decoration.

TABLE 1

Station	Difference between forward and backward magnetic bearings in degrees	
1	-19.0	Entrance
2	+ 3.3	
3	- 4.1	
4	- 4.8	
5	-17.5	Old Entrance
6	-13.0	
7	+ 4.8	
8	+ 1.8	
9	+10.0	
10	- 6.8	
11	0	
12	0	
13	+ 0.3	
14	-11.0	Power inlet
15	+ 7.0	
16	+ 5.0	
17	- 1.0	
18	- 2.5	
19	+ 2.0	
20	- 5.0	
21	-24.5	Maddock's Chamber
22	+32.5	
25	- 3.5	
26	- 0.5	
27	- 3.2	
28	+ 1.5	
29	+ 2.0	
30	- 5.0	
31	+ 4.5	
32	- 1.0	
33	+ 0.5	
34	+ 2.5	
35	0	
36	0	
37	+ 1.0	
38	- 2.0	
39	+ 1.0	
40	- 1.0	
41	-11.5	Exit

NOTE

Stations 23 and 24 are intermediate points within Maddock's Chamber.