

## Dye Testing in Chapel-le-Dale

### Introduction

Over the course of the previous year a series of water tracing tests based on the streams feeding the God's Bridge resurgence in Chapel-le-Dale have been carried out. It was hoped that these tests might give some indication of the potential of the diving sites in this part of the valley. The original work in this area was carried out by members of the Yorkshire Geological Society in the early 1900's, the results of this work being published in Volume 15 of their Proceedings (1904). Although very comprehensive, their tests did not include Joint Hole, nor, because theirs was a study on karst water on Ingleborough, did they cross the valley to test some of the streams sinking on the slopes of Whernside. As access to Joint Hole has recently become easier, Joint was an obvious candidate for testing and there was also much speculation about a branch in Midge Hole possibly leading up to Ellerbeck Hole. The test was fairly straightforward, or so it was thought.

### Results

The results of the test have been a bit of an eye-opener. Conventional wisdom has Meregill Hole going to Meregill Skit, Roaring Hole to Joint Hole, Great Douk Cave and Hardrawkin Pot to Hurtle Pot and Ellerbeck Hole to Midge Hole. Quite how the Great Douk to Hurtle myth arose is something of a mystery as the YGS's tests indicated that Great Douk did not go via Hurtle on its way to God's Bridge. However, this is the route given in "Limestone and Caves of North West England". It may have resulted from misinterpretation of the map published in the proceedings which shown a line drawn from Great Douk to a point just below Hurtle. In the event Hardrawkin and probably Great Douk go to Joint. I say "probably" for Great Douk because it hasn't been tested to Joint (there were no detectors in Joint at the time) but it certainly doesn't go to Hurtle which leaves one with few alternatives.

Sunset Hole goes through the lower streamway in Roaring on its way to Meregill Skit and although Meregill also goes to Meregill Skit the results of the test were significantly different from that done by the YGS. When they did the test Meregill Skit appears to have been a permanent resurgence whereas now it only acts as a resurgence in very wet weather. The dye was introduced at 1 pm in the surface stream and reappeared next morning at Meregill Skit. Next time, the dye was introduced into the stream below Aven Entrance, but took several days to reach Meregill Skit. Detectors removed 64 hours after the dye was introduced were negative. There are a number of possible explanations for this.

- (a) The fact that Meregill Skit no longer resurges under normal conditions reflects a fundamental change in the course of the water underground so that it now takes a far less direct route to its eventual resurgence.

(b) There is another outflow from the Mere which takes an entirely separate and far shorter route to Meregill Skit. This could be proved either way by an exact repeat of the YGS test.

(c) The dye coming out of Meregill Skit was not in fact from Meregill but was the remnant of a previous test. The only reason for putting this alternative forward is that it was the reason for another of their false results, Sunset Hole to Hardrawkin. However, I think that this is unlikely.

Whilst on the subject of Meregill Skit and Joint it is apparent from the tests that the two connect quite close behind God's Bridge. Tests that were positive at Joint Hole were negative at Meregill Skit and therefore the water in Joint does not flow through Meregill Skit on its way to God's Bridge.

Further up the valley having "lost" the first lot of dye in Ellerbeck Hole a second attempt with double the quantity proved that Ellerbeck goes to Hurtle and not to Midge. It is likely to be the source of the deep route in Hurtle though this has not been specifically tested.

Whilst this testing has solved a number of problems it has by no means completed the work on streams feeding God's Bridge. There remain a number of loose ends to tie up including testing Great Douk to Joint and Ellerbeck to the deep route in Hurtle. There is also a need to establish the watershed on the Whernside side of the valley. Does Blake Bank Moss Cave represent the limit of the God's Bridge catchment area or does it extend to Dale Barn Cave? It's a long time since we've heard anything about the trans-Craven system!

## The Tests

A diary of the tests is given below. The exact location of each of the major detector sites was as follows.

God's Bridge -

Normally one in the furthest upstream of the two main resurgences and one in the highest rising in normal conditions. In fact it doesn't matter where the detectors are placed at this site as one of the earlier tests established that all the risings are connected.

Hurtle Pot -

Bottom of entrance boulder slope going upstream, just before passage turns left.

Joint Hole -

15m into the first sump.

Meregill Skit -

10m into bedding plane at bottom of pot heading approximately South East.

Midge Hole -

In a pool at the end of a crawl which leads off opposite to where the entrance crawl drops into a roomier trench. This was not a very satisfactory site as it is not clear that there is much flow in this pool except in wet conditions.

12 Feb 1983 -

Control detectors placed at God's Bridge, Hurtle Pot and Midge Hole. Water conditions low.

19 Feb 1983 -

Control detectors removed. Water still low. All detectors were negative.

12 Mar 1983 -

Detectors placed at God's Bridge, Midge Hole and Hurtle Pot. 3 pints of dye introduced at Ellerbeck Hole. Water conditions low.

19 Mar 1983 -

Detectors retrieved from God's Bridge, neither appeared convincingly positive. Midge Hole was too wet to enter. The detectors in Hurtle Pot had disappeared.

10 Apr 1983 -

Detectors in Midge Hole collected. Both negative.

16 Apr 1983 -

Detectors placed in God's Bridge, Hurtle Pot and Midge Hole. 1 gallon of dye introduced at Great Douk.

23 Apr 1983 -

Detectors at God's Bridge and Hurtle Pot retrieved. Those at God's Bridge were positive, those at Hurtle Pot negative. Good flow of water during test.

30 Apr 1983 -

Detectors at Midge Hole retrieved. All were negative.

30 May 1983 -

Detectors placed in Hurtle Pot, Joint Hole, Midge Hole, Meregill Skit and God's Bridge. 1 gallon of dye put down Hardrawkin the next day. Conditions dry, but heavy rain within a day.

4 June 1983 -

Detectors retrieved from all sites. Those at Joint Hole and God's Bridge were positive, those at Midge Hole, Meregill Skit and Hurtle Pot were negative.

2 July 1983 -

Detectors placed in Joint Hole, God's Bridge, Meregill Skit and the lower streamway in Roaring Hole.  $\frac{1}{3}$  to  $\frac{1}{2}$  lb of Leucophor powder introduced at Sunset Hole.

10 July 1983 -

Detectors at Meregill Skit, Joint Hole, Roaring Hole and God's Bridge removed. Those at Roaring Hole and Meregill Skit were faintly positive, those at Joint Hole and God's Bridge negative. The latter were out of the water when collected and either this or the dilution between Meregill Skit and God's Bridge could have accounted for the result.

27 Aug 1983 -

Detectors placed in God's Bridge, Joint Hole and Meregill Skit. 1 gallon of dye put down Meregill Hole in the stream just below the Aven Entrance. The Mere was full, but water in the resurgence was very low.

30 Aug 1983 -

Detectors retrieved from God's Bridge, Joint Hole and Meregill Skit 64 hours after dye was introduced. All were negative. This contrasts with the YGS test which came through in a day.

25 Sep 1983 -

Rest of detectors retrieved from God's Bridge, Joint Hole and Meregill Skit. Those at God's Bridge and Meregill Skit were positive, Joint Hole negative. Heavy rain in the intervening period.

4 Mar 1984 -

Detectors placed in Joint Hole (in 3rd sump), Hurtle Pot and God's Bridge. 1 gallon of dye introduced at Ellerbeck Hole.

18 Mar 1984 -

Retrieved detectors from God's Bridge, these were positive.

25 Mar 1984 -

Removed detectors from Hurtle Pot. These were positive. Good flow of water during the test.

## Method

The method was basically that outlined in the Yorkshire Subterranean Journal No. 2 pp 46-49. Cotton wool was placed in small plastic bags which had had holes punched in them with a normal handpunch. These were tied on to diver's "Snoopy Loops" (loops of inner tube with a loop of diving line attached) and the Snoopy Loops wrapped around a convenient boulder. Where possible the bags were covered with other boulders. These detectors proved extremely robust, the only ones that were lost weren't placed by me and I suspect that they were incorrectly placed. If the site was poorly supplied with boulders (such as Meregill Skit) the bags were attached to a diver's lead weight; this seemed to work equally well.

Originally stockings were used in preference to plastic bags. This was stopped though when a control detector left in a bowl of water for a week developed a thin fluorescent film on it. This despite the fact that the stocking showed no obvious signs of fluorescence when tested under UV light prior to the construction of the detector. A similar wad of cotton wool in a plastic bag showed no fluorescence. All the tests outlined in this article were done with plastic bags.

To try to minimise the possibility of contamination the detectors were inspected under a UV lamp prior to placing and, wherever possible, the dye and the detectors were handled by two different people. Two detectors were placed at each location. When one of these was removed for testing it was replaced by another detector. On the tests that were positive this was a useful check on whether all the dye had flowed through or whether the site was still contaminated.

Generally positive results were unmistakable with large fluorescent blotches round the holes in the bags. The dye did not penetrate very far into the cotton wool so there is a danger of the fluorescence being hidden by dirt if the detector was left in too long. Few detectors were left in for more than a month for this reason. The only poor result was from the one at Roaring Hole where Leucophor powder was used. A solution seems to be the best way of introducing the dye. The dye used for the rest of the tests was Photine CS dissolved in Diethyl Glycol Monoethanolamine and water E=90.

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