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# Short Gill Cavern

[SD 670 847]

## Highlights

The caves in Short Gill are the finest and most easily accessible of those formed in the nearly vertical limestone adjacent to the Dent Fault. Their tall rift passages along bedding planes are an unusual expression of stratigraphic controls on cave development.

## Introduction

Short Gill Cavern lies under the eastern slopes of Barbondale, south-west of Dent (Figure 3.1). Short Gill is a tributary stream to Barkin Beck, which drains the glaciated trough of Barbondale along the line of the Dent Fault. Silurian mudstones and slates form the hills west of the fault. Carboniferous limestone crops out on the east side, and the upper slopes of Barbon High Fell consist of almost horizontal Yoredale limestones and shales. Drainage from these slopes feeds the streams, including Short Gill, which drain onto the narrow outcrop of Great Scar Limestone adjacent to the fault; nearly all of them have short associated cave systems. The Great Scar Limestone is steeply inclined against the fault, and the steepest dips of 75–90° are exposed in the narrow gorge of Short Gill. The Barbondale caves have been described by Sutcliffe (1974) and very briefly by Brook *et al.* (1994).

## Description

The entrance to Short Gill Cave is through a narrow fissure in the floor of the gill, which is active only in times of flood. The entrance fissure drops into an abandoned phreatic tube, which is choked beneath the gill, but continues north only partially blocked by sediment banks, deep gour pools and a fine stalagmite false floor. It joins the main stream passage, carrying water from sinks at Short Gill Pot and south of the gill. This continues as a high narrow rift along the strike of the nearly vertical bedding. A high-level passage in the roof is choked with speleothems, and the stream enters a vadose canyon which zigzags to cut across the bedding. This descends to a sump where the flooded passage must head south, cutting further across the bedding and passing beneath the lower course of Short Gill to reach the resurgence in the floor of Barbondale.

The other significant cave in this site is Short Gill Pot, a short distance to the east, a 34 m deep rift developed along a washed-out vertical shale bed. Over most of its length it is 1–2 m wide, with some wider sections due to solutional enlargement. Water sinking here must subsequently utilize joints to cross through the bedding, to emerge at the upstream sump in Short Gill Cave.

## Interpretation

These caves have developed in a structural setting, unusual in Britain, where water has drained down the vertical bedding to enter rift conduits along the strike. Drainage has then escaped via joint fissures cutting across the strike, to reach a resurgence in the valley floor which is also aligned on the strike. Shale beds lie on the main bedding planes utilized by the cave, and their mechanical removal has contributed to passage enlargement. Short Gill Pot is a nearly vertical rift 34 m deep in the bed of Short Gill, and is formed in a washed out shale bed with only limited solutional excavation of the limestone walls.

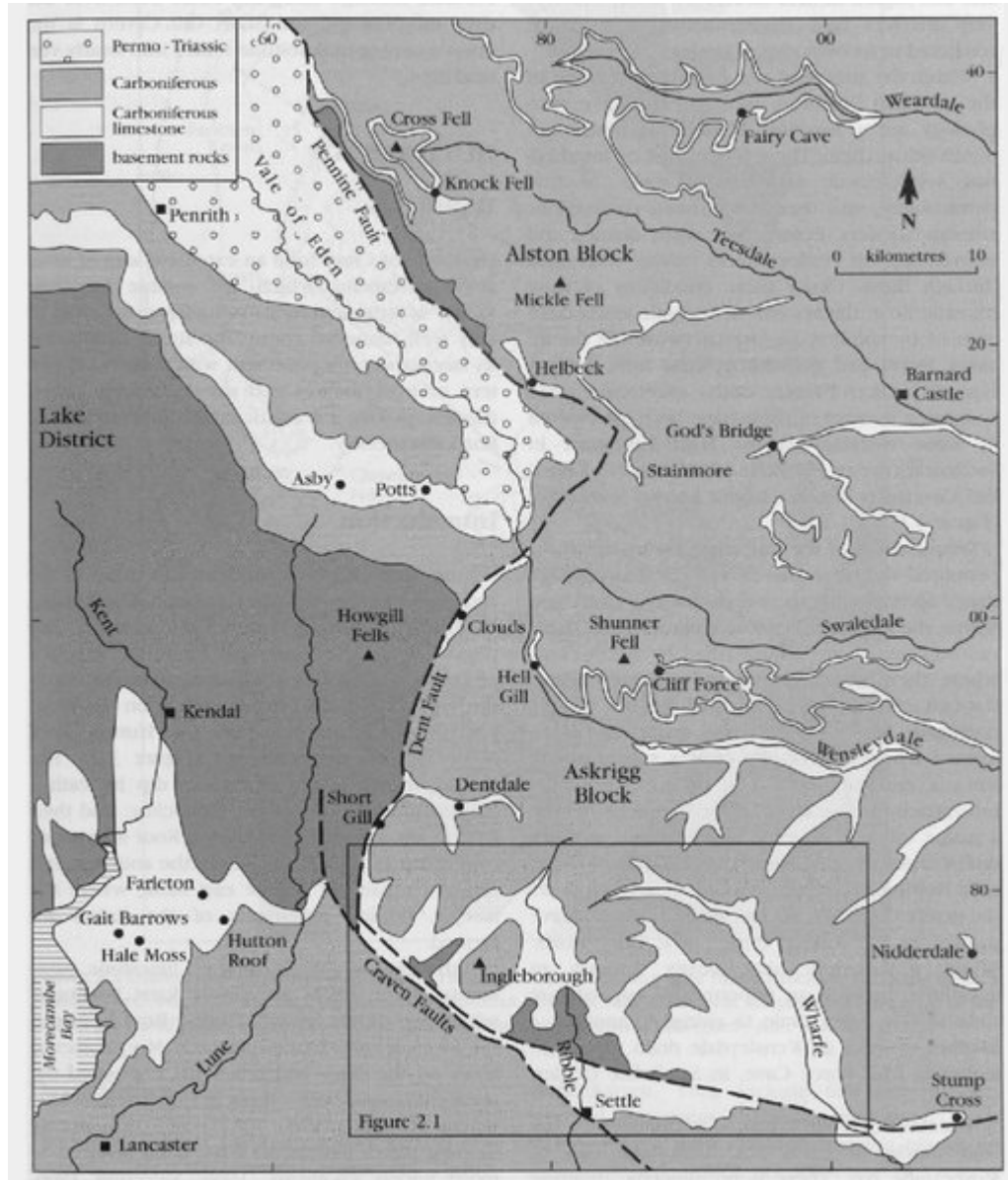
The relict phreatic tube in the entrance series of Short Gill Cave lies 20 m above the level of the Barbondale floor. Its alternating clastic and calcite sediment sequence, though undated, suggests that its history extends back into the Pleistocene, predating valley floor excavation to the present depth. Alternatively, it could have developed within a phreatic perched behind the vertical limestone beds which clearly have lower transmissivity across their bedding than along the

strike.

## Conclusion

The caves and potholes of Short Gill are the finest of a small group in Barbondale, which are the only caves in Britain developed in nearly vertical limestone. Their morphology of vertical rifts along bedding planes and shale beds is therefore distinctive, and the shafts and strike conduits, both developed on the bedding, are an unusual expression of stratigraphic control over cave development.

## References



(Figure 3.1) Outline map of the karst regions in the northern Pennines, with locations referred to in the text. The other Carboniferous rocks are the non-carbonates of the Orton Group and Yoredale facies of the Dinantian, and the Namurian, but they include thin bands of limestone with lesser karst features not shown on this map. The Carboniferous limestone includes the Dinantian Great Scar Limestone, the Yoredale limestones with significant karst, and the Main or Great Limestone of Namurian age. The basement rocks are Lower Palaeozoic non-carbonates. Details and locations in the southern Dales are shown in (Figure 2.1).