
Stump Cross Caves

[SE 089 632]–[SE 092 635]

Highlights

The Stump Cross and Mongo Gill Caves contain a complex of active and abandoned passages closely related to geological structure within a plunging anticline crossed by faults and mineral veins. Calcite flowstones and fossiliferous clastic sediments record climate fluctuations during the late Pleistocene.

Introduction

The two cave systems of Stump Cross Caverns and Mongo Gill Hole are connected into a network with 5800 m of mapped passage. These all lie beneath the western end of Greenhow Hill, between Wharfedale and Nidderdale (Figure 3.1). The Dinantian limestone is heavily faulted and mineralized in a small inlier on the crest of an anticline, which is orientated almost east-west, immediately north of the North Craven Fault (Dunham and Stubblefield, 1945). The caves lie under the northern limb of the fold, where the limestone dips north and north-east at 15–30°. From the north and east, streams off the higher outcrop of the Namurian Grassington Grit sink into the limestone, and drain through the caves to the Timpony Joint resurgence in the floor of Dry Gill west of Stump Cross. The caves are largely accessible through mined shafts which intersected them when veins rich in lead ore were worked early in the last century.

The cave geomorphology is briefly reviewed by O'Connor *et al.* (1974), and subsequent speleo-them dates have been obtained by Sutcliffe *et al.* (1985), Atkinson *et al.* (1986), Baker (1993) and Baker *et al.* (1996). The caves of Stump Cross were described by Cook (1950) and those of Mongo Gill by Judson (1964), and all the passages are documented in Brook *et al.* (1988).

Description

The combined cave system of Stump Cross Caverns and Mongo Gill Hole has a complex of passages (Figure 3.10) which roughly fall into three major levels of development, all within an altitude range of 370–317 m. Part of the upper level is operated as a show cave at the Stump Cross end of the system.

The upper, show cave, level has short sections of large phreatic tube containing extensive sediment deposits and a fine array of speleothems. Most of these fragments of old passage end in major collapses, some of which contain debris run in from the surface. Reindeer Cavern and the Wolverine Cave are named after the many bones of *Rangifer tarandus* and *Gulo gulo*, respectively, found in the sediments washed into them from surface fissures now impenetrably choked. Calcite stalagmites and flowstones from this upper level range in age up to 170 000 years (Sutcliffe *et al.* 1985; Atkinson *et al.* 1986; Baker *et al.* 1995c). Keep Chamber is an isolated fragment of this same passage level, well decorated with calcite and now only reached through a mined shaft. An upstream continuation of the abandoned level heads east through the Heaven passage, through some major chokes containing slumped clay, and into larger passages, with another mined entrance through Shackle Shaft. The upper level continues through Mongo Gill Hole, which has some of the largest tunnels and old phreatic chambers in the system. These are locally modified by roof collapse, and contain extensive clastic sediment fills; they also have very beautiful calcite deposits, which were more abundant before the caves were invaded by the lead miners. The eastern end of Mongo Gill Hole swings round with the strike, to pass beneath Dry Gill to the only natural entrance in a doline shakehole.

The middle level of the cave system is a much more extensive, abandoned phreatic network of rifts, developed along joints and mineral veins, with sections of phreatic tube on some beddings. Most of these passages are at least half filled with fluvio-glacial sediments, which are locally covered and interlayered with stalagmite.

The lower level of Stump Cross Caverns consists of constricted streamway canyons interrupted by short flooded sections. It drains from the Upper Stream Passage, south beneath the western end of the high level networks, and is fed by impenetrable sinks along the northern edge of the limestone outcrop. Water sinking in the upper reaches of Dry Gill drains through a low level streamway in Mongo Gill Hole (Figure 3.10); this also has alternating vadose and phreatic sections, but is now only active in flood conditions since the lead miners drove adits to lower the water table. The downstream end of the active system, behind the rising of Timpony Joint, remains permanently flooded.

Interpretation

The Stump Cross caves closely reflect the geological structure. The main abandoned trunk passages carried drainage to the west by following the strike of the bedding in a sweep around the anticline, which plunges east; this pattern is still recognizable in the remnants of choked and truncated passages shown on the cave survey (Figure 3.10). The main original cave drainage was through Mongo Gill Hole, but the old inlets and the earliest resurgence passages at high level were removed by glaciation (Judson, 1964). The modern drainage route through the lower levels of Mongo Gill has sections of vadose streamway between shallow phreatic loops aligned on joints and bedding planes.

Most of the phreatic passages follow the bedding but are aligned on the closely spaced fractures, and the mineral veins, within the limestone. The middle level of Stump Cross Caverns was formed partly by drainage from sinks in the north, which was ponded as it flowed against the dip to reach the main conduits and the outlets in Dry Gill. The main network of joint rifts was formed by this slow moving water, and rejuvenated sections are being entrenched by the modern streams between downloops which are still flooded. At the resurgence, the flow is up the dip from a phreatic loop.

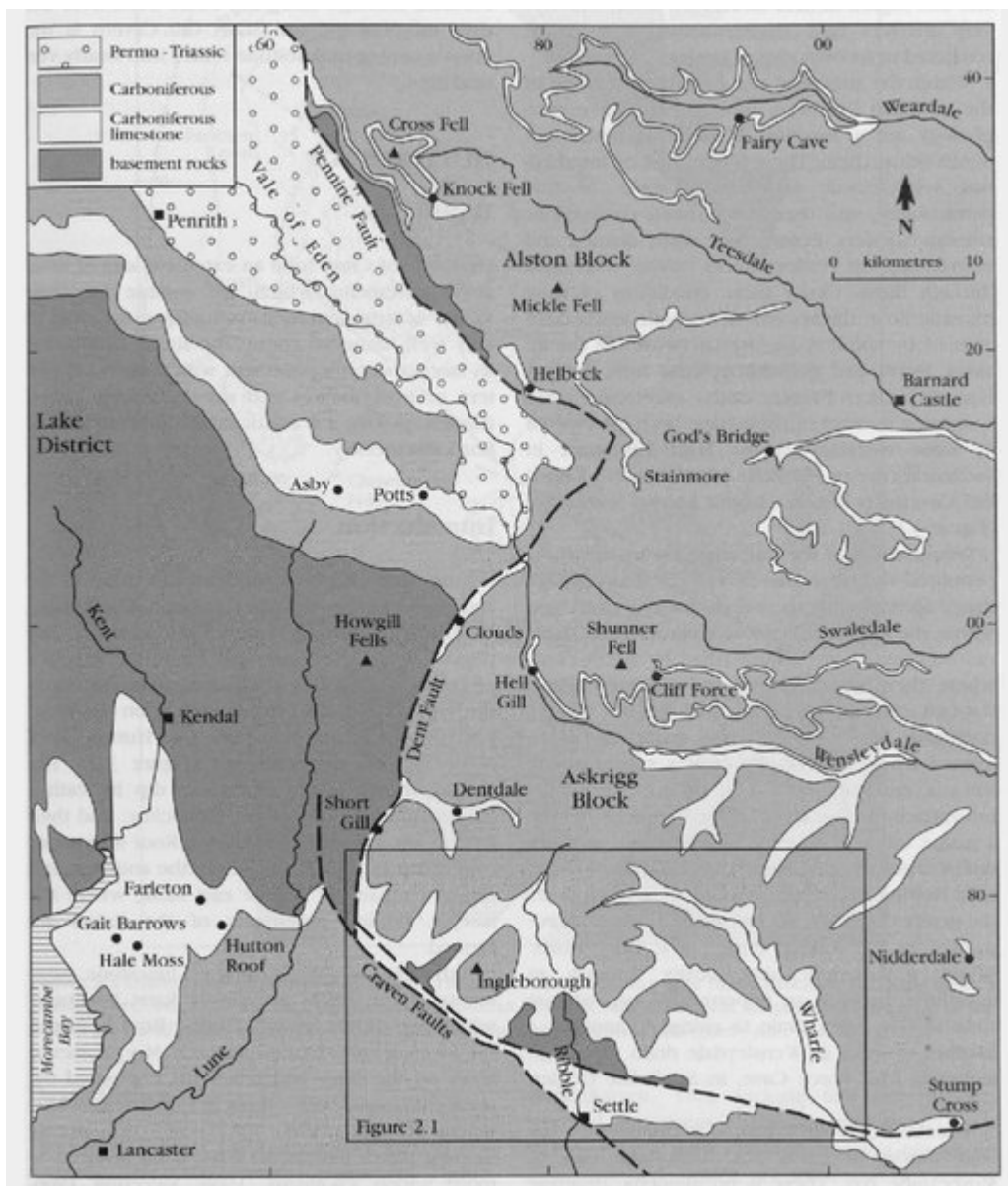
The sequence of passage levels and their subsequent modification indicate a long history of cave development, dated by speleothems from the early Devensian, and with older phreatic phases which must date back at least as far as the Hoxnian. Further dating of the older flowstones and their intercalated fluvio-glacial sediments should be most significant at this site where the caves lie under the interfluvium between two of the glaciated dales — Wharfedale and Nidderdale.

The speleothem dates already obtained imply that the expansion of the Devensian ice sheet into the area did not occur until after 26 000 years ago, which is contemporary with the ice advance over the Assynt karst. Stalagmite growth through the last 170 000 years, in the Wolverine Cave of Stump Cross, occurred only during interstadial phases, and ceased during full glacials and also during the interglacials (Figure 3.11). These interruptions are attributed to permafrost expansion during the glacial stages, and to flooding of the system during the warm stages; the latter are unusual, as most other sites have calcite deposition correlating with times of maximum solar insolation (Baker *et al.*, 1996).

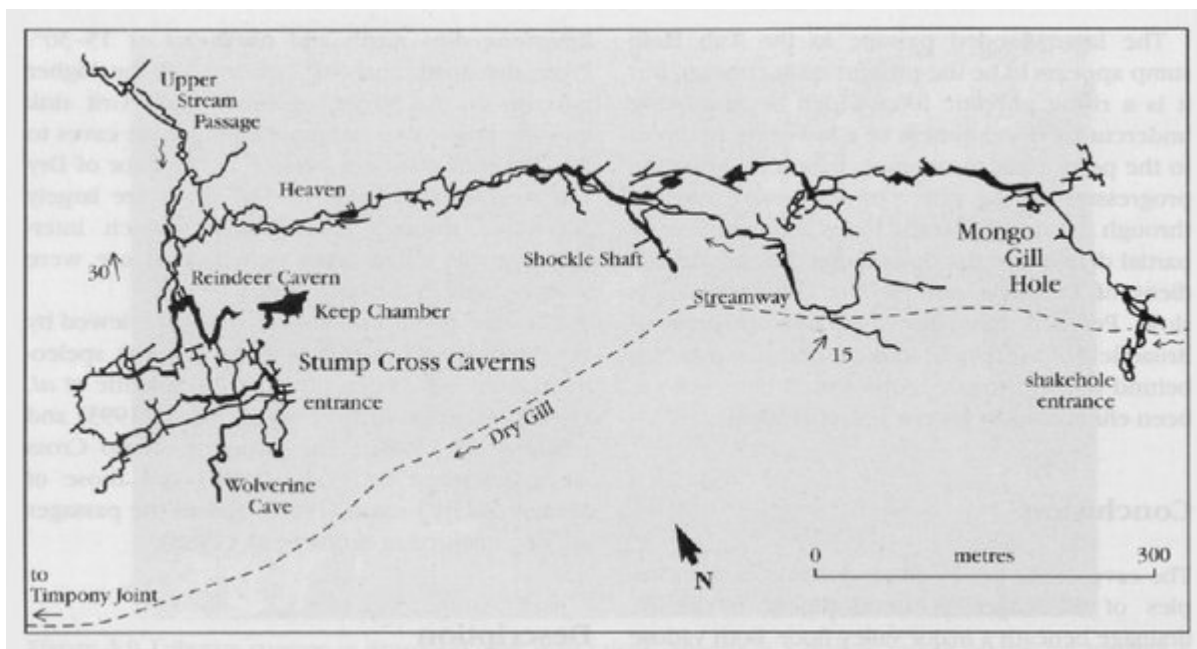
Conclusion

The caves of Stump Cross and Mongo Gill are part of a complex, largely phreatic system, developed in folded Great Scar Limestone with close control by the geological structure. Some passages were drained only recently by mining activities. Others are much older and rejuvenated, and have considerable geomorphic significance for their interfluvium location. Dated flowstones in Stump Cross Caverns record an unusual history of intermittent growth during the late Pleistocene, interrupted by both freezing and flooding.

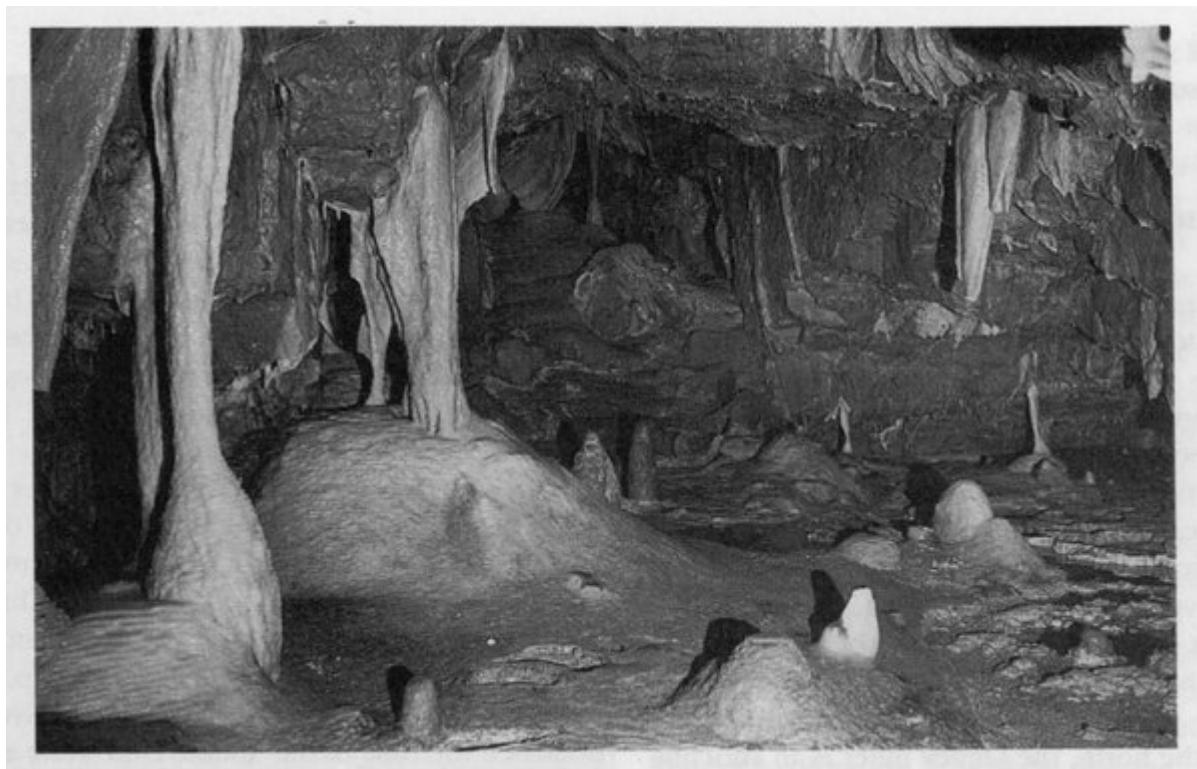
[References](#)



(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).



(Figure 3.10) Outline map of the cave passages in Stump Cross Caverns and Mongo Gill Hole (from survey by Craven Pothole Club).



(Figure 3.11) Thick flowstone deposits in a suite dated to 83 000 ka in the Wolverine Cave in Stump Cross Caverns. (Photo: A.C. Waltham.)