

# MASS MOVEMENT CAVES IN NORTHERN ENGLAND

by

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## ABSTRACT

The geographical distribution of mass movement caves north of the Peak District National Park is reviewed along with recent scientific work undertaken on these sites. They are much more widespread than solutional caves and offer opportunities to expand speleological research into areas with no karst features.

## INTRODUCTION

It is now over 25 years since Roger Cooper published his account of the occurrence and distribution of mass movement caves in Great Britain (Cooper, 1983). Since that time a number of new sites have been explored and scientific studies undertaken. It is the purpose of this paper to draw attention to the number, variety and geographical distribution of mass movement caves in Northern England, that is those occurring north of the Peak District National Park (Figure 1 and Table 1).

Mass movement caves occur when a block of bedrock, isolated by a natural fracture from the surrounding hill side, has moved a short distance towards a valley under the influence of gravity, leaving an open gap in the strata. In sedimentary rocks, they usually occur in areas where massive, well jointed rock is underlain by incompetent strata (Self, 1985). They can also form in igneous and metamorphic rocks by stress relief across faults, cleavage planes and sheeting joints. In order to form a cave rather than an open fissure a roof is needed. This may be an offsetting of the controlling fracture on a bedding plane or by jammed blocks. Mass movement caves may be distinguished from solutional caves by a number of features. They are characterised by narrow, high rift type passages and have a rectilinear plan, straight line passages with abrupt corners. Passage widths change abruptly at cross joints. Usually ledges on one wall match with overhangs on the opposite wall – referred to as ‘fit features’ by Halliwell (1980). They do not contain streams or any features seen in karst caves produced by flowing water. Boulders are often jammed at different levels in the passages.

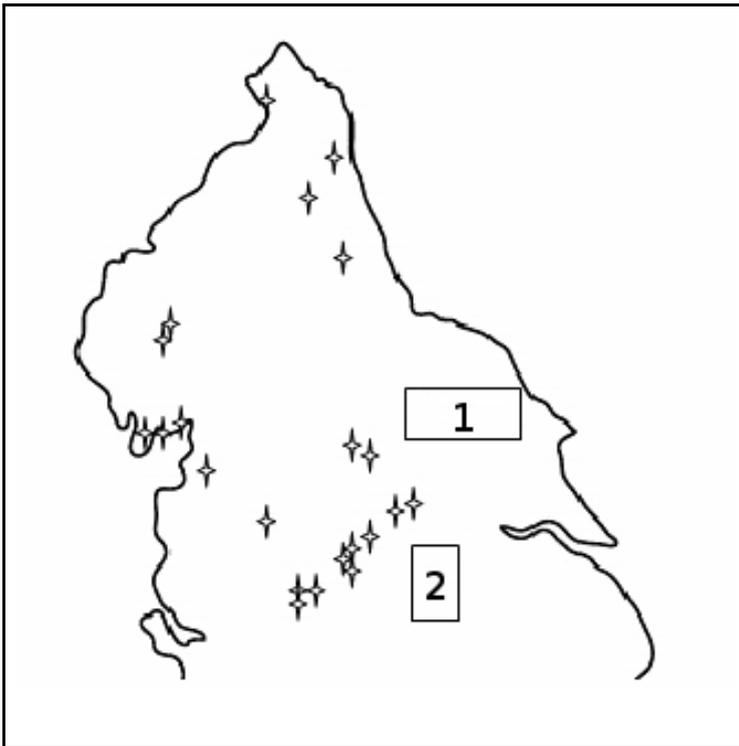
## CAVES IN LOWER PALAEOZOIC STRATA

Doves Nest Crag in Borrowdale (Baum and Hewison, 2000) and Deer Bield Crag in Far Easedale (Armstrong, *et al.* 1989) both contain extensive fissure networks where the cliff face has slipped forward. Both caves occur in Andesitic lavas and tuffs of Ordovician age Borrowdale Volcanic Group. Doves Nest Caves consist of 90 m of passage covering a vertical range of 30 m. The area around Deer Bield Crag has been the site of a number of large rock falls over the last decade and the area is still best avoided due to loose rock. Holland (1967)

describes fissures up to 9 m deep adjacent to a disused clay pit in the Ordovician Coniston Limestone Group strata west of Dalton in Furness (Spider Holes).

### CAVES IN CARBONIFEROUS STRATA

Examples do occur in the Carboniferous Limestones of the Pennines such as Whitcliffe Scar Caves on the northern bank of Swaledale about 4 miles west of Richmond, the most extensive, Gels Pot, being 100 m long and 17 m deep (Ryder, 1976a). A cluster occurs in the Morecambe Bay region, possibly due to the over steepened slopes of the fault bounded limestone outcrops.



**Figure 1.** Outline map of the north of England showing the location of mass movement caves. 1: North York Moors; 2: Magnesian Limestone of the Went and Don Valleys.

Burton Well Cliff Cave is a 20 m long rift varying between crawling and walking size parallel to a cliff face. Haverbank Slip Cave is 7 m long rift associated with collapse features in a small cliff (Brook, *et al.* 1994). Humphrey Head Slip Caves are three small caves 13 m, 6 m and 16 m long listed in Brook, *et al.* (1994) though Holland (1967) mentions the occurrence of four caves, probably slip caves in the area without giving specific details.

Many more examples are found in Carboniferous age sandstones, a number of which occur in the area around Saddleworth Moor in Lancashire. Diggle

Wigglepit is a series of narrow rifts and awkward climbs 61 m long and 20 m deep. Fairy Holes is 46 m long and 11 m deep. Accounts of early explorations refer to a lower series which has been blocked since the 19<sup>th</sup> century (Ryder 1976b). Twin Shafts are vertical rifts with a maximum depth of 11m and Warm Holes is 10 m long and 25 m deep (Halliwell. 1974; Halliwell. 1980).

Three caves, the longest being 30 m, occur in disused quarries to the east of the A666 approximately 2 miles south of Darwen in the Cadshaw Valley, Lancashire (Cordingley, 1974). The longest is Cadshaw Cavern, a 30 m long series of low crawls. Turton Pot is 18 m long and is entered by a 3.5m vertical drop and a low crawl leads to a roof collapse. Prior to December

1972 this could be passed to a chamber where a tight squeeze formed the limit of exploration. The shortest is Constriction Cave (erroneously spelled Construction Cave in Cordingley, 1974). Toms Bells Cave is on the northern flank of the Calder Valley in Yorkshire at Hardcastle Crag. It consists of 65 m of passage including a 7 m pitch. A number of other caves are reputed to occur in the area but they consist of crawls beneath detached boulders rather than true mass movement caves.

Pan Holes near Bingley in Airedale is 200 m long and 26 m deep (Leedal, 1950; Anon, 1969 and Brook, *et al.* 1988), with low crawls linking at different levels into high rift passages. A number of caves occur in the classic tor of Almscliff Crag overlooking Wharfedale including Almscliff Crag Cave (Brook, *et al.* 1988; Bass, 1990), but these are not mass movement caves. There is no sign of relative movement between the passage walls on these sites and the sides of the joints have widened by a combination of solution and mechanical weathering as part of the tor formation process. A 38 m long mass movement cave (Cateran Hole) is described from the Fell Sandstone in Northumberland by Ryder (1987) and Mullan (1989). Cateran Rift is another such cave in the area 15m long and 5 m deep. High Cove, Huel Crag Rifts and The Wannu Byer are all short caves associated with valley side slip features (Ryder, 1987).

#### CAVES IN PERMIAN STRATA

An account of the caves in the Magnesian limestone is given in Brook *et al.* (1988). Many of the caves listed are mass movement caves though a number of karstic caves are also known. The most extensive mass movement system explored so far is Smeaton Pot on the southern side of the valley of the River Went near Wentbridge (Speight, 1976 and 1979; Shooter, 1994). It is 300 m long and 34 m deep. Went Edge Rift, 30 m long and 12m deep, occurs in the same quarry as Smeaton Pot but they are not physically connected. Rumours of deep rifts opening up as a result of mining subsidence and being rapidly filled often circulate. Nearcliff Wood Rift, 88 m long and 12 m deep, and Cadeby Pot, 12 m long, near Conisborough (Speight, 1976, Ryder and Cooper, 1974) are part of a group associated with the valley of the River Don. Other examples in the area include Eanch Rift Cave and Short Rift Cave. Farnham Cave, 110 m long and 18 m deep, near Knaresborough (Lowe, 1974 and 1978) is associated with the valley of the River Nidd. Other deeply incised river valleys crossing the Permian outcrop such as Wharfedale may well also have associated mass movement caves awaiting discovery. Houghton le Springs Rifts north east of Durham are a line of rifts 800 m long and possibly 30 m deep at the top of an escarpment south of the River Wear (Brook, *et al.* 1988).

#### CAVES IN JURASSIC STRATA

The North York Moors contains by far the largest number of mass movement caves of any area in the north of England. The caves are known locally as windypits. The first attempt to review the occurrence of the windypits was by Fitton and Mitchell (1950). A further review of the caves was published by Cooper, *et al.* (1976) followed by a detailed account of the windypits of Duncombe Park, Helmsley (Cooper, *et al.* 1982). Since these accounts many more caves in the region have been explored and the known systems extended. This activity resulted in the publication of a cave guide book covering both the mass movement and karstic caves of the area (Gibbs, 2003).

In all, 41 mass movement caves are listed. The longest is Bucklands Windypit in the valley of the River Rye north-east of Helmsley at 375 m long and 38 m deep. Overall in the area there are 5 systems more than 100 m long (Antofts, Ashberry 1 and 2, Bucklands, Noddle End and Slip Gill) and a further 5 more than 50 m long (Blood, Boltby 1, Gowerdale 2, Motts and Old Fat and Past It Pot). Two windypit sites, Bucklands Windypit and Peak Scar, are listed and described in the Geological Conservation Review volume on mass movement sites in Great Britain (Cooper, 2007a and 2007b).

Cooper (2007a, 1980) describes three major types of mechanisms acting in succession which may explain the formation of mass movement caves: 1, Splitting mechanism, fissures must form before they can be widened; 2, Sliding mechanisms, the initial translation movement seems to be effectively horizontal; 3, tilting mechanisms, the tilting towards the valley of the detached blocks. The example Cooper uses to illustrate this possible sequence is at Peak Scar. His mechanisms may explain the formation of single rifts rather than some of the more complex cave plans but perhaps the more complex caves in the North York Moors are examples of Gull tears as described by Self (2008) from the Cotswolds. It may be, however, that there are more joint sets available for mass movement in the North York Moors area than in the Cotswolds.

## AGES

As with all caves, actually dating the cave is not simple and it is the contents of the cave which are studied. Uranium series dates from extensive speleothem deposits in caves on the North York Moors provided a cluster of dates around 200 ka (MIS 7) from Antofts Windypit and dates ranging from 98 to 124 ka from Noddle End windypit, Antofts windypit and a sediment filled fissure in Spaunton Quarry (Murphy and Lundberg, 2008). This study shows that some of the known caves predate the late Pleistocene.

| <i>Cave Name</i>         | <i>Grid ref.</i> | <i>Survey</i>             |
|--------------------------|------------------|---------------------------|
| Doves Nest Cave          | NY253114         |                           |
| Deer Biold Cave          | NY305094         |                           |
| Spider Holes             | SD219757         |                           |
| Whitcliffe Scar Caves    | NZ131020         | Ryder, 1976a              |
| Burton Well Cliff Cave   | SD471750         |                           |
| Haverbank Slip Cave      | SD482801         |                           |
| Humphrey Head Slip Caves | SD390741         |                           |
| Diggle Wiggle Pit        | SE017076         | Ryder, 1976b              |
| Fairy Holes              | SE015047         | Ryder, 1976b              |
| Twin Shafts              | SE015046         | Ryder, 1976b              |
| Warm Holes               | SE02350170       | Halliwell, 1980           |
| Constriction Cave        | SD707180         |                           |
| Turton Pot               | SD707180         |                           |
| Cadshaw Cavern           | SD707180         |                           |
| Tom Bells Cave           | SD978291         |                           |
| Pan Holes                | SE084392         | Leedal, 1950              |
| Almscliff Crag Cave      | SE267490         |                           |
| Cateran Hole             | NU102237         | Ryder, 1987; Mullan, 1989 |
| Cateran Rift             | NU102232         |                           |
| High Cove                | NY953958         |                           |

|                           |          |   |
|---------------------------|----------|---|
| Huel Crag Rifts           | NY829995 |   |
| Wanny Byer (The)          | NY934835 | Ryder, 1987   |
| Smeaton Pot               | SE499172 | Shooter, 1994                                       |
| Went Edge Rift            | SE498171 | Speight, 1976 and 1979                              |
| Nearcliff Wood Rift       | SK527995 | Speight, 1976; Ryder and Cooper, 1974               |
| Cadeby Pot                | SK516996 | Speight, 1976                                       |
| Earnch Rift Cave          | SK528993 |   |
| Short Rift Cave           | SK528993 |   |
| Farnham Cave              | SE353603 | Lowe, 1974 and 1978                                 |
| Houghton Le Springs Rifts | NZ345505 |   |
| Bucklands windypit        | SE787828 | Cooper, <i>et al.</i> 1982; Cooper, 2007b           |
| Antofts windypit          | SE582829 | Cooper, <i>et al.</i> 1982; Gibbs and Stewart, 2003 |
| Ashberry windypit (1&2)   | SE570850 | Cooper, <i>et al.</i> 1976                          |
| Noddle End windypit       | SE526886 | Cooper, <i>et al.</i> 1976; Gibbs and Stewart, 2003 |
| Slip Gill Windypit        | SE575835 | Cooper, <i>et al.</i> 1976                          |
| Blood Windypit            | SE565799 | Coghlan, 1973                                       |
| Boltby 1                  | SE507863 | Gibbs and Stewart, 2003                             |
| Gowerdale 2               | SE518889 | Cooper, <i>et al.</i> 1976                          |
| Motts Hole                | SE518889 | Cooper, <i>et al.</i> 1976                          |
| Old Fat and Past It Pot   | SE869850 | Gibbs and Stewart, 2003                             |

**Table 1.** Cave locations given in the order they are referred to in the text.

## ARCHAEOLOGY

Four of the North York Moors windypits (Antofts, Ashberry, Bucklands and Slip Gill windypits) in the valley of the River Rye, north east of Helmsley are famous for their archaeological deposits including human and animal remains, pottery and lithic artifacts (Ryder, 2008; Cooper, *et al.* 1976 and 1982; Hayes, 1987). The question as to why such remains are limited to sites in the Rye Valley is intriguing. Human remains were recovered from a cave at Wentbridge on the Magnesian Limestone but the present location and age of the remains are not known (Speight 1976). Tom Bells Cave, Hardcastle Crags received the attention of Victorian antiquarians and a human skull was recovered (Chamberlain and Williams, 2001).

## CONCLUSIONS

Although there are far fewer mass movement caves than karst caves in Northern England, they occur over a much wider geographical area. Future study of these features will potentially provide proxy paleoclimate records from other areas than just those underlain by carbonate strata. The potential is shown by the recovery of human remains from two such caves. Some of the reasons why these caves received relatively little attention from cavers and scientists are neatly summed up by Cooper (1983) as, compared with many solutional caves they tend to be unspectacular, short, dirty and sometimes unstable.

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