Rowlee Bridge, Ashop Valley, Derbyshire

[SK 150 894]

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Introduction

On the right (southern) bank of the River Ashop, 130 m upstream from Rowlee Bridge (Figure 5.13) and (Figure 5.43) and 2 km before the east-flowing river enters the Ladybower Reservoir in Derbyshire, there is an exposure, 3 m high, of the highest Edale Shales (Alportian (H_2)) with the lowest Mam Tor Beds (Kinderscoutian (R_1)) of Namurian, (Upper Carboniferous) age.

Description

The exposure shows sharp, symmetrical, straight-limbed folds. Similar but less well-exposed structures exist in the Edale Shales and Mam Tor Beds in Edale, the Derwent valley and its tributary valleys including Abbey Brook and Ouzelden Clough, and in the Hope valley. Trenches excavated for the foundations of the Howden and Derwent dams exposed a single large fold in each case, decreasing in magnitude with depth (Lapworth, 1911; Sandeman, 1918; Fearnsides *et al.,* 1932) (Figure 5.44). Photographs of the trenches excavated during Sandeman's (pre-1910) construction of these dams and exhibited by Thompson in 1949 show that at the Howden Dam this fold is a 'crumple' in the form of a 'double V' fault in the strata. This extends to at least 15 m below the ground surface, but reduces with depth. At the Derwent Dam there is a similar crumple, but the crumpling is less complex: it takes the form of a simple 'V'; and at the bottom of the trench (about 15 m deep) the movement had largely died out (Thompson, 1949).

A more detailed investigation was undertaken on construction of the Ladybower Dam in the 1930s and 1940s, with a large number of vertical borings across the valley along the line of the dam (Hill, 1949). These revealed the presence of an enormous crumple extending down from the valley bottom for at least 58 m vertically (Figure 5.44). Thompson (1949) commented that the crumples occur throughout the Derwent and Ashop valleys.

Interpretation

It may be inferred, therefore, that a similar crumple lies beneath the Ashop valley at Rowlee Bridge, in which case the folding observed at the site represents accommodation of the surface strata to a larger event that took place at greater depth.

Thompson's (1949) explanation for the crumples was that since the strata in the hillsides and at the bottom of the valleys consists of a succession of beds of shale and sandstone, the weight of the hillsides had compressed the shale and had caused it to flow towards the valleys, where the stress had been relieved by crumpling. In the case of the Ladybower Dam site the process had gone a little further, and the fold had become an overthrust fault. The reduction of the structure with depth distinguishes it from an ordinary geological fault. Stevenson and Gaunt (1971) came to broadly similar conclusions.

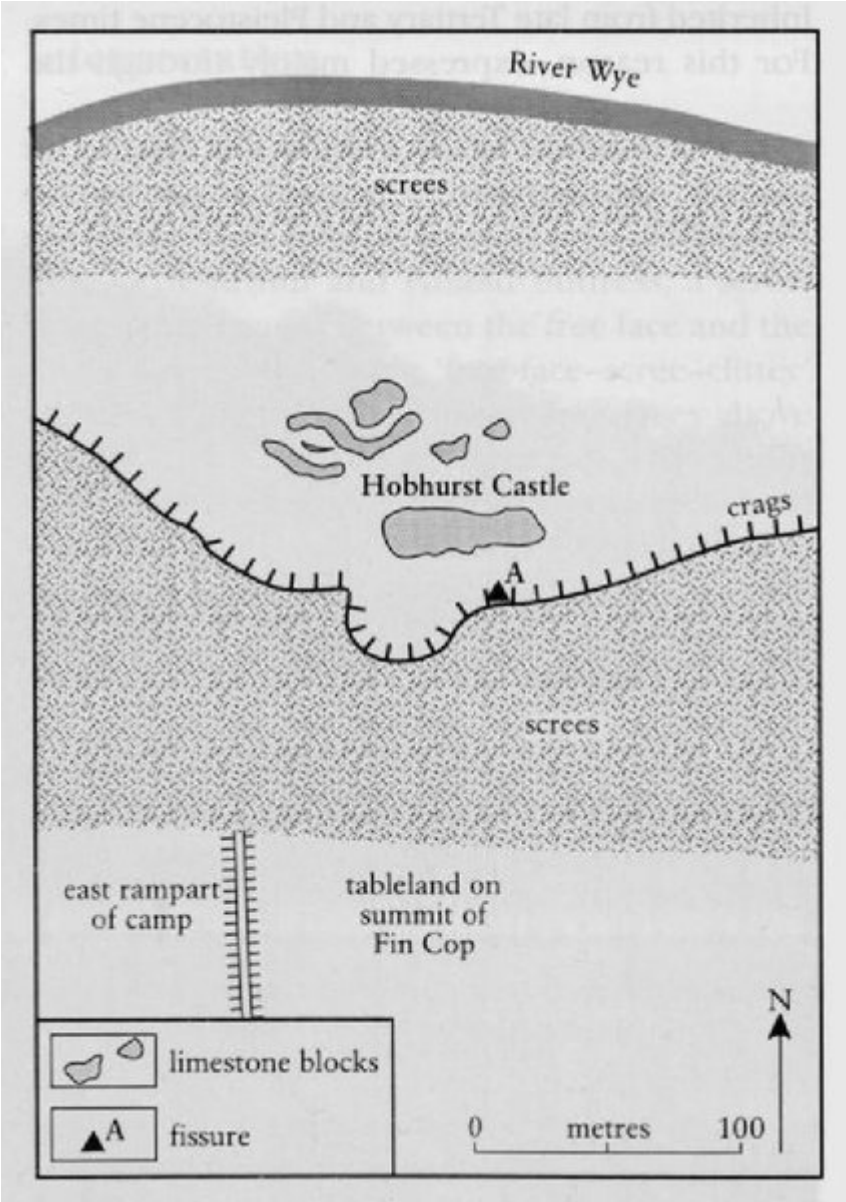
These structures have many similarities to those described in Northamptonshire by Hollingworth *et al.* (1944) and by Hollingworth and Taylor (1951); they are believed to have resulted from the pressure exerted on predominantly argillaceous strata by superimposed beds inducing lateral movements or 'squeezing out' of the argillaceous strata into the adjacent load-free valley areas, producing compression folds and thrusts (Stevenson and Gaunt, 1971). Movements caused in this way would be possible wherever valley-deepening exposed the top of any substantial thickness of shale, but would be greatly facilitated by thawing of ground-ice following a glacial or periglacial phase.

Conclusions

The site is at some risk from normal fluvial erosion processes. The River Ashop runs at the foot of the exposure itself, and clearly it is eroding the exposure. This would not matter but for the position of the exposure on a short promontory 3 m high, standing in the floodplain of the river. The promontory is a salient from what appears to be a river terrace, but it is only 5 m across, and when the river has eroded 5 m into it, the promontory and the site will have ceased to exist. The River Ashop does not, however, experience continuous natural flow levels at this point; about 200 m upvalley a variable proportion of its flow is from time-to-time taken into a concrete channel and thence by tunnel to the Rivelin valley as part of the water supply for Sheffield (Wood, 1949). This may be responsible for the site's survival thus far.

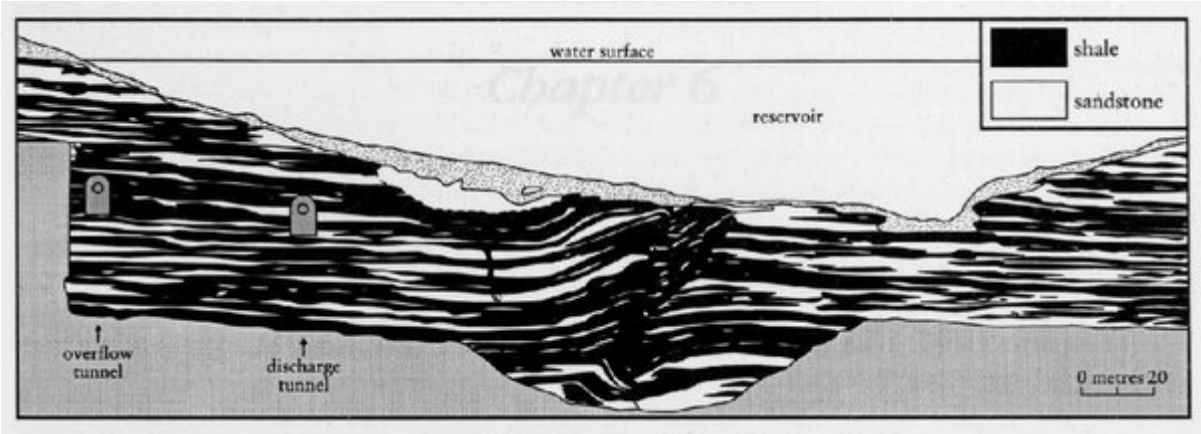
In the absence of a clear exposure associating valley-bulging with cambers and gulls in the Northampton ironstone field (the good ones have all been backfilled), the Rowlee Bridge exposure provides the clearest example of valley-bulge structures currently accessible in Great Britain.

References



(Figure 5.13) Sketch plan of Hob's House (Hobhurst Castle). 'A' is the mouth of the fissure in the cliff-top, probably a camber structure or landslide 'labyrinth'.

(Figure 5.43) Valley-bulge structures exposed in the Rowlee Bridge section, in the Ashop Valley, Derbyshire. The sharp, symmetrical folds are one of the most remarkable examples of compressional folding ever recorded. The folds are due to the extrusion of clays and ductile flow in bedded strata, often called valley-bulging. (Photo: R.G. Cooper.)



(Figure 5.44) Section through valley-floor crumple (according to Thompson (1949)), at Ladybower Reservoir. After Hill (1949).