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# Blackden Brook

## Highlights

Blackden Brook has the best known sequence of Shale Grit and Grindslow Shale formations in its type area, and shows the transition from basin to delta top conditions as the Kinderscout delta pro-grades southwards.

## Introduction

This small tributary [SK 115 884]–[SK 130 893] of the River Ashop descending from Edale Moor, 6 km NNW of Castleton, Derbyshire, exposes a fine section between the Mam Tor sandstones and the Kinderscout Grit. The geology here has been dealt with by Jackson (1927), Walker (1966a, 1966b) and Collinson (1969, 1970).

## Description

The exposed sequence here is about 300 m thick, and belongs mostly to the Shale Grit and Grindslow Shales formations (Figure 9.11). Near the top are pebbly grits of the Kinderscout Formation, but as these beds are seen better at other localities (e.g. Standedge Road Cutting), they will not be dealt with further here.

Jackson (1927) proposed the names Shale Grit and Grindslow Shales, based on sequences in this part of north Derbyshire. It can often be difficult to separate them and Walker (1966a) proposed that they should be united under a single name, the Alport 'Group'. However, most authors continue to recognize the separation.

The Shale Grit beds are 210 m thick here. The base of the formation is not exposed in the brook, but the general field relationships suggest that the lowest exposed strata lie not far above the Mam Tor beds. Particularly in the lower part of the formation, distal turbidite sandstones, identical to those of the Mam Tor Formation, form a prominent part of the succession; these are referred to by Walker (1966a) as Facies A. However, sandstone units, referred to as Facies C by Walker (1966a), become increasingly important going up through the Shale Grit beds (the base of the lowest Facies C sandstone is taken as the base of the Shale Grit Formation). Like Facies A, these units are fining-upwards and have an erosive base, often with sole structures. The main distinguishing feature is the thickness of the Facies C beds (60 cm thick), and that occasionally they show a channel morphology. Collinson and Walker (1967) claim that there are some cases of Facies C beds grading laterally into Facies A beds, and the genesis of the two types are clearly closely related. According to Walker (1966a), the Facies A represents more proximal turbidites, formed in submarine fans immediately in front of the fluvial delta front.

The Shale Grit Formation also includes some beds of mudstone, over 60 cm thick, but these argillaceous units form a less prominent part of the sequence than in the Mam Tor Formation. According to Walker (1966a), they represent basinal mud deposits, formed during quiet intervals between the activities of the turbidity currents.

The overlying Grindslow Shales Formation is much finer grained. The lower 60 m is dominated by mudstones, with some turbidite deposits. Very near the base, the turbidites are thin beds of sandstone, but more typically they occur as large, sandstone-filled channels. According to Collinson (1970) this part of the Grindslow Shales was formed on the delta front or slope. The finer sediment was deposited below wave base from suspension, escaping any significant reworking, but which was periodically cut by channels caused by turbidity currents.

The upper part of the Grindslow Shales is superficially similar to the lower beds described in the previous paragraph, with large sandstone-filled channels in an otherwise fine-grained sequence. However, the finer-grained parts of the sequence are siltstones and show evidence of extensive burrowing. There are also bands showing ripple cross-lamination, which Collinson (1970) interpreted in terms of traction current activity. The channels are larger than in the lower part of the formation, and are filled with coarser and 'cleaner' sandstones, showing no evidence of grading. The upper part of the Grindslow Shales is thus taken to be deposits of the distal part of the delta top; the siltstones being interdistributary bay

deposits, and the sandstones fluvial channel deposits (Collinson, 1970).

No fossils have been found here, but work by Jackson (1927), Bisat and Hudson (1943) and Hudson and Cotton (1943, 1945) indicate that that Shale Grit and Grindslow Shale formations lie between the Reticulatum and Gracile marine bands. The entire sequence thus belongs to the middle part of the upper Kinderscoutian.

## **Interpretation**

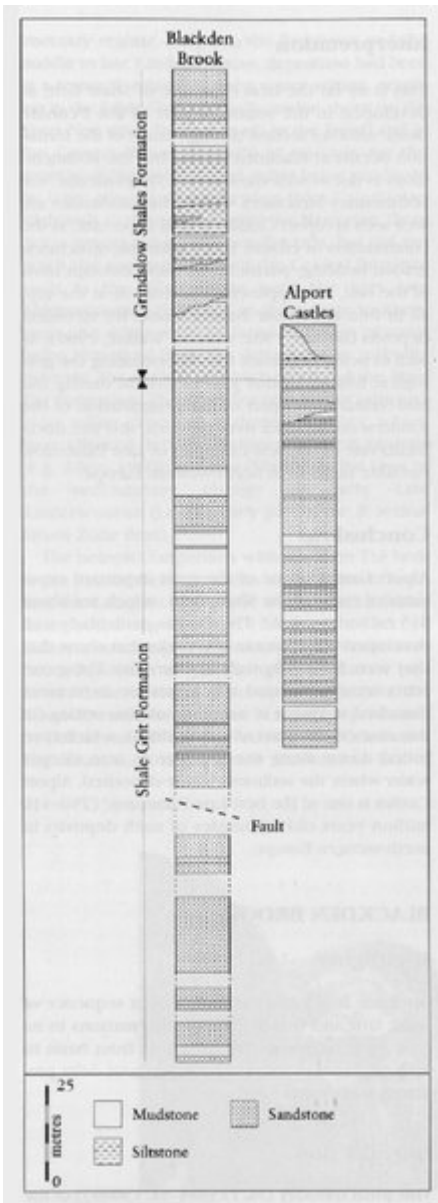
This is the best exposure of the Shale Grit and Grindslow Shale formations in its type area. The best alternative site is probably the Grindsbrook section on the other side of Edale Moor (Collinson and Walker, 1967), but this does not show such a complete succession of the Shale Grit, nor the upper, delta top facies association of the Grindslow Shale. An extensive exposure of Shale Grit can be seen at Alport Castles, showing some details not visible here, but it does not expose the Grindslow Shale.

The sequence at Blackden Brook clearly reveals the transition from distal turbidites, to proximal turbidites/submarine fan deposits, to delta front, and eventually to delta top deposits. When seen together with the nearby River Noe and Mam Tor sites, it is possible to chart the progressive southwards progradation of the Kinderscout delta over this part of the Pennine Basin. Such turbidite-fronted deltas are the major type of basin-fill in the Central Province during the Namurian (Collinson, 1988), and other examples of the migration of such a delta over an area are known in the Pendleian of the Craven Basin (Baines, 1977) and the Marsdenian of the North Staffordshire Basin (Jones, 1980). However, this example from the Kinderscoutian of the southern Pennine Basin is on the whole better exposed, and has certainly been the subject of far more intensive investigation.

## **Conclusions**

Blackden Brook is the best known exposure of rocks of the Shale Grit and Grindslow Shale formations. These rocks, which are about 318 million years old, are the remains of sediments that formed as a large river delta (known to geologists as the Kinderscout delta) migrated southwards over this area.

## **References**



(Figure 9.11) Shale Grit and Grindslow Shale formations exposed at Blackden Brook and Alport Castles. After Walker (1966a).