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# Cockwood Gorge

## Highlights

Cockwood Gorge is the best available, continuous sequence through the upper Kinderscoutian and lower Marsdenian. It has also provided important fossil bivalves, that were probably ancestral to the non-marine bivalves of the Coal Measures.

## Introduction

This section along Sabden Brook [SD 747 341]–[SD 750 350], between Cock Bridge and Parkhead, 7 km north of Accrington, Lancashire, shows an almost complete sequence from the lower Kinderscout Grit to the Revidge Grit, as developed in the Craven Basin. The geology of the site is described by Earp *et al.* (1961), whilst aspects of the palaeontology are dealt with by Eagar (1977).

## Description

### Lithostratigraphy

The sequence here is about 180 m thick. The lower part of the section is in coarse sandstones, thought to be the lower member of the Kinderscout Grit Formation (Earp *et al.*, 1961). This is overlain by about 19 m of mainly shales and thin sandstones, one of the latter being gainster-like and overlain in turn by a thin coal. The shales are dark grey to black, and include two marine bands with limestone bunnions.

There then follows 40 m of medium to coarse sandstones, belonging to the upper member of the Kinderscout Grit. It is a typical development of this member, with occasional coarse, pebbly horizons, and showing a variety of bed forms, including massive, cross-bedded and flaggy.

The succeeding 110 m see a return to more argillaceous strata. They can be divided into two discrete cycles. Both have marine shales at the base, the lower one 15 m thick and with abundant limestone bunnions, the upper one only 0.1 m thick. Above each marine band, the cycles fine upwards from fine grey, carbonaceous sandstones, through siltstones into shales. The more sandy units often include compressed plant stems.

The top of the section passes up into a coarse-grained, pebbly sandstone with an erosive base, belonging to the Revidge Grit Formation.

### Biostratigraphy

Biostratigraphically diagnostic fossils have only been reported from the four marine bands (Hodson, 1942; Earp *et al.*, 1961). The lowest band, immediately above the lower Kinderscout Grit, yields *Reticuloceras reticulatum* (Phillips), *R. davisii* Bisat and *Dunbarella speciosa* (Jackson), while the upper one yields *Reticuloceras coreticulatum* Bisat, *R. reticulatum*, *Vallites striolatum*, *Posidonia obliquata*, *P. minor*, *Pseudocatastropoceras rawsoni*, *Anthracoceratites* sp. and turreted gastropods. On the face of it, the lower of these bands suggests the *R. reticulatum* Subzone. However, the Reticulatum Marine Band containing this subzone normally occurs below the lower Kinderscout Grit, whereas the marine band at Cockwood Gorge is above it. Instead, the record of *R. reticulatum* probably refers to the so-called 'late form' of that species, which is often associated with *R. coreticulatum* Bisat. It is, therefore, possible that the two marine bands between the leaves of the Kinderscout Grit both belong to the *R. coreticulatum* Subzone.

The 15 m of marine strata overlying the Kinderscout Grit can be divided into two parts. The lower part contains a diverse assemblage of shallow marine bivalves, including *Sanguinolites variabilis* M'Coy, *Cf. Sanguinolites* sp., *Aviculopecten* aff. *delepinei* Demanet and *Modiolus* sp. The *Sanguinolites* have been studied in detail by Eagar (1977), who has shown a

continuous range in shell morphology similar to that found in the non-marine *Carbonicola* of higher strata. Eagar argued that the non-marine bivalves, that are so abundant in the Coal Measures, originated from *Sanguinolites* ancestors probably some time in the late Kinderscoutian.

The upper part of these marine strata contains a deeper-water assemblage, including *Bilinguites gracilis* Bisat (both 'early' and 'late' forms), *Caneyella rugata*, *Anthracoseratites deansi*, *Dunbarella speciosa* (Jackson) and *Orthoceras* sp. (Hodson, 1942; Earp *et al.*, 1961). It clearly belongs to the *B. gracilis* Zone, normally taken to mark the base of the Marsdenian Stage. In this case, however, it is not clear whether the stage boundary should be placed at the base of the ammonoid-bearing interval, or at the base of the entire marine unit.

The topmost marine band is only very thin due to much of the horizon being slumped out, but has yielded the goniatite *Bilinguites bilinguis* (Salter), thus indicating middle Marsdenian.

## Interpretation

This site provides an important, more or less complete section through the upper Kinderscoutian and lower Marsdenian of the Central Province. Other sites demonstrate parts of the sequence. For instance, the Coreticulatum Marine Band can be seen at Crimsworth Dean, and the Gracilis and Bilinguis marine bands at Park Clough, Rake Dike and Pule Hill. However, this is the only place where the sequence can be observed as a whole. The cyclicity in the fine-grained strata above the Kinderscout Grit is of particular interest, demonstrating the essentially shallow-water nature of much of these deposits, and thus contrasting with the marine-basinal deposition seen lower in the Millstone Grit. Also of interest is that it shows aspects of these strata specific to the Craven Basin, in particular the Revidge Grit and how it relates to the underlying Kinderscout Grit.

This has also proved to be one of the best sites for studying the marginal marine bivalves found in the Millstone Grit. The diverse assemblage found here is ideally suited to the morphometric-type study undertaken by Eagar (1977), and has provided vital data for understanding how the non-marine *Carbonicola* assemblages of the lower Westphalian evolved from their *Sanguinolites* marine ancestors.

## Conclusions

Cockwood Gorge shows the best available, continuous sequence through rocks of late Kinderscoutian to early Marsdenian age (about 315 million years old) in northern England. The site has yielded important fossil shells of bivalves, that were probably ancestral to the freshwater bivalves that formed a major component of the faunas of the later Coal Measures swamp forests.

## [References](#)