Skelghyll Beck

[NY 3964 0320]–[NY 3935 0293]

Introduction

The stream of 'Skelgill Beck' was selected by Marr and Nicholson (1888) as the type section of their 'Skelgill stage', the lower unit of the 'Stockdale-Shale series'. These beds had previously been referred to as the 'Graptolitic Mudstones', following Aveline and Hughes (1872), but Marr and Nicholson (1888, p. 659) considered that this term did not distinguish them sufficiently from other graptolitic beds in the district. More recently, Kneller *et al.* (1994) have formalized this lithostratigraphical unit as the Skelgill Formation, the lower formation of the Stockdale Group.

South-west of the Brathay Fault, for example in the area around Yewdale Beck, the Skelgill Formation is 40 m thick, but to the east of the fault it reaches only 28 m (Hutt, 1974). In the latter region, the lower part of the formation, spanning the *persculptus, acuminatus* and most of the *atavus* biozones, is represented by a 127–178 mm bed of pale calcareous mudstone, the Spengill Member of Scott and Kneller (1990). A particularly well-exposed continuous section through the Skelgill Formation is displayed in Skelghyll Beck at Skelghyll Lower Bridge [NY 3964 0320], where a footpath crosses the stream (Figure 3.53). Here all the graptolite biozones from *atavus* to *sedgwickii* were recognized by Hutt (1974), who also provided a measured log of the section (Figure 3.54). The formation, therefore, spans the Rhuddanian and Aeronian stages.

The GCR site of Skelghyll Beck follows the stream course south-westwards from Skelghyll Upper Bridge, which carries the Hundreds Road from Troutbeck, past the Lower Bridge to the point where the ground becomes marshy and exposure is lost. The stream flows approximately parallel to the strike of the beds, so that the various horizons in the Skelgill Formation are repeatedly exposed in the banks. This site is of importance as the type locality of the Skelgill Formation and for its extensive graptolite fauna.

The Skelghyll section is the type locality for a number of fossil taxa, including the trilobites *Acernaspis glabra* (Marr and Nicholson, 1888), *Youngia moroides* (Marr and Nicholson, 1888), *Scotoharpes judex* (Marr and Nicholson, 1888) and *Raphiophorus aloniensis* (Marr and Nicholson, 1888) (see Curtis and Lane, 1997–8), the brachiopod *Plectatrypa flexuosa* (Marr and Nicholson, 1888) and the graptolites *Glyptograptus sinuatus sinuatus* (Nicholson, 1869), *Diplograptus diminutus* Elles and Wood, 1907, and *Monograptus argenteus* (Nicholson, 1869).

Description

A very full description of the strata exposed in Skelghyll Beck was provided by Marr and Nicholson (1888), and a long list of graptolite localities and horizons was given by Hutt (1974, localities 18–52; see also (Figure 3.54)). The cliff on the left bank at the Lower Bridge exhibits the best continuous section (Figure 3.55), and was highlighted by Marr and Nicholson and by Hutt. At this point, the stream flows over the highest beds of the Ashgill Formation, which contains characteristic brachiopods. Immediately above is a hard bed of poorly calcareous mudstone, which represents the Spengill Member. The bed is 0.23 m thick and massive, contains a considerable quantity of disseminated pyrite, and in places yields shelly fossils, principally the brachiopod *Atrypa flexuosa.* On top of this, black mudstones yield graptolites of the *atavus* Biozone, showing that the base of the Silurian occurs within the Spengill Member. The overlying section through the Skelgill Formation alternates between dark graptolitic shales/mudstones and poorly graptolitic paler mudstones with calcareous nodules (Figure 3.54). Planes with slickensides attest to faulting at several levels, particularly in the *triangulatus* Bioione, some 4 m from the base of the formatidn. About 8 m above the base, within the *argenteus* Biozone, is a prominent 6 mm pale-green band (the 'green streak'; (Figure 3.56)), which has been widely recognized elsewhere in the Lake District and in Wales. The highest beds yield graptolites of the *sedgwickii* Biozone.

Graptolites are not always easy to collect from the cliff section itself, but excellently preserved specimens occur in other exposures in the stream banks. The faunas are diverse, with the lowest beds particularly characterized by swarms of

Dimorphograptus confertus confertus and abundant monograptids of the *Monograptus revolutus–M. austerus* group (Marr and Nicholson, 1888). The *triangulatus* Biozone is marked by numerous specimens of *M. triangulatus jimbriatus,* with *M. triangulatus triangulatus* largely absent; this suggests that only the upper part of the biozone is represented by graptolitic beds, with the lower part represented by pale beds succeeding the strata of the *typhus* Biozone (Hutt, 1974).

The middle part of the Skelgill Formation is almost continuously exposed between the two bridges. These beds comprise blue mudstones with nodule bands (A*b*2 and A*b*4 of Marr and Nicholson, 1888) and are mostly poor in graptolites, but yield triblobites (*?Johntempleia* and *Eolenaspis* in Ab2, *Acernaspis glabra, Youngia moroides* and *Scotoharpes judex* in A*b*4), brachiopods and orthocones. The 30 cm bed of black mudstone (A*b*3) that separates the blue mudstone horizons contains the 'green streak' and has yielded a very rich and diverse graptolite fauna, including well-preserved specimens of *Monograptus argenteus.*

The upper blue mudstone (A*b*4) grades upwards into a unit of finely laminated shales, 2.5 m thick, which again contains a rich graptolite fauna, characterized by very abundant *Monograptus convolutus.* This is followed by 1.25 m of blue mudstone lacking graptolites, but with a few brachiopods (the 'Barren Band' of Marr and Nicholson, 1888), above which another graptolite band occurs, characterized by numerous specimens of *Campograptus clingani.* The succeeding blue mudstones contain a variety of trilobites, among which *Raphiophorus aloniensis* is particularly characteristic, and these are overlain by 1 m of predominantly black mudstones crowded with graptolites, including abundant *Stimulograptus sedgwickii* and *Lagarograptus tenuis.* Above these are the uppermost beds of the Skelgill Formation, comprising poorly fossiliferous blue mudstones some 3 m thick. Pale-green shales of the lowermost Browgill Formation can be found in the moorland by the Lower Bridge, but the actual junction is not evident at this point; elsewhere in the gill the junction can be seen to be abrupt (Marr and Nicholson, 1888).

Interpretation

The Lake District Basin was situated on the northern part of Avalonia, where it succeeded the mid-Ordovician development of an island arc system (see Chapter 1). The Skelghyll section is situated immediately east of the Brathay Fault, and was interpreted as occupying a relatively shallow-water position on the footwall block of the fault (Hutt, 1974; Rickards, 1978; (Figure 3.52)). This resulted in condensed deposition in the latest Ordovician and earliest Silurian, with the 0.23 m of the Spengill Member equivalent to 16 m of black shales to the west, for example at Yewdale Beck. Although very thin, and possibly containing non-sequences, there is no direct evidence of the development of a hardground within the Spengill Member (Rickards, 1988). By the time of deposition of shales belonging to the high *atavus* Biozone, the block had become swamped by sediment, and the succeeding succession is more comparable with that to the west, although sedimentation rates throughout deposition of the Skelgill Formation remained lower.

The alternation between graptolitic black shales and paler graptolite-poor mudstones reflects changing bottom conditions, from anaerobic to aerobic. This variation may be related to influxes of carbonaceous matter, perhaps algal (Rickards, 1978), or may have been influenced by sea-level or climatic fluctuations. The patterns seen in Skelghyll are maintained coevally throughout the Lake District Basin, and can also be identified in Wales and in the Southern Uplands of Scotland (Rickards, 1978). One band, the 'green streak', is also widely recognized in the Lake District and Wales; it is apparently not a bentonite, but has the same geochemistry as the black shales, simply lacking the pyrite and carbonaceous matter (Rickards, 1964; Spencer, 1966).

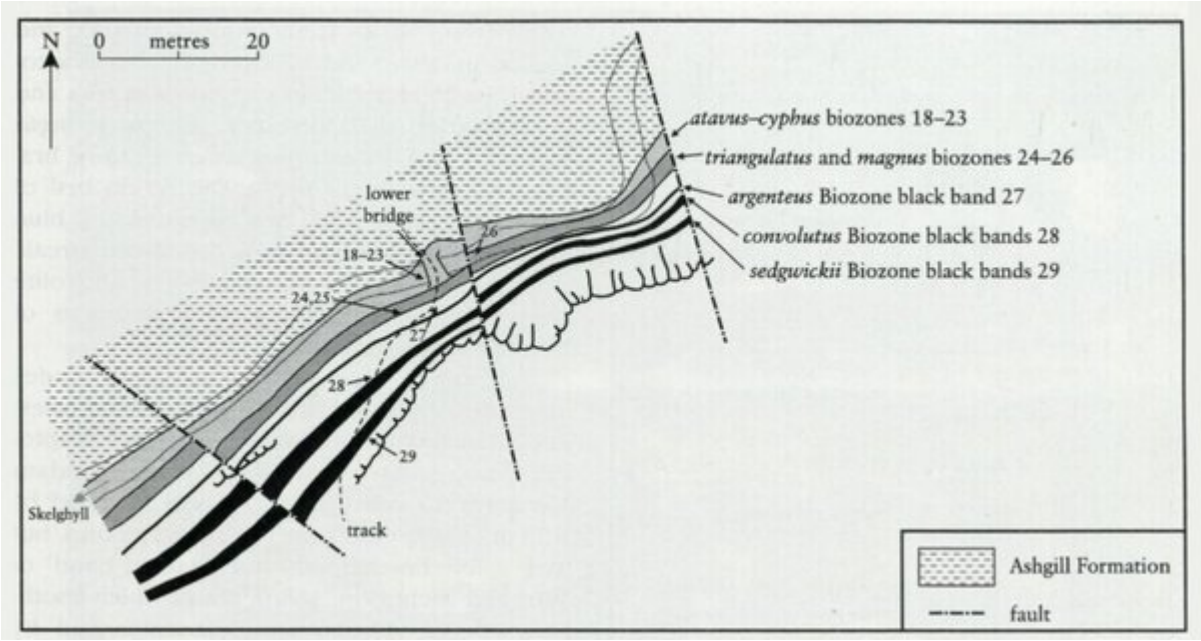
Together with the GCR sites in Yewdale Beck, Brow Gill Beck and Spen Gill, this site provides a representative coverage of the Llandovery stratigraphy of the English Lake District.

Conclusions

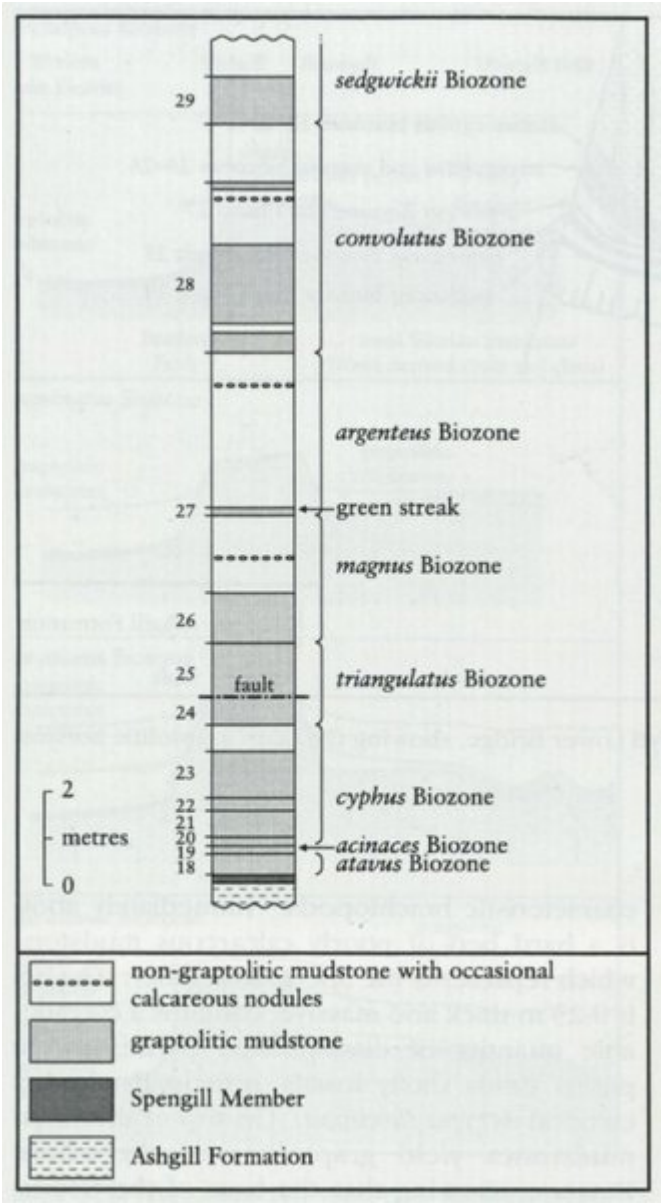
The stream banks of Skelghyll Beck display a continuous, well-exposed section through black shales and pale mudstones of Rhuddanian and Aeronian age. These are referred to the Skelgill Formation, for which this is the type locality. At the base a thin, condensed, hard calcareous mudstone represents the Spengill Member, which can be contrasted with coeval black graptolitic shales to the west, around Yewdale Beck. The remainder of the Skelgill

Formation is highly fossiliferous, with many black shale horizons providing very rich and diverse graptolite faunas. The paler mudstones 'yield shelly fossils, including trilobites, and the section is the type locality for several important graptolite and trilobite species. The section is, therefore, of primary importance for local lithostratigraphy and for national and international biostratigraphy.

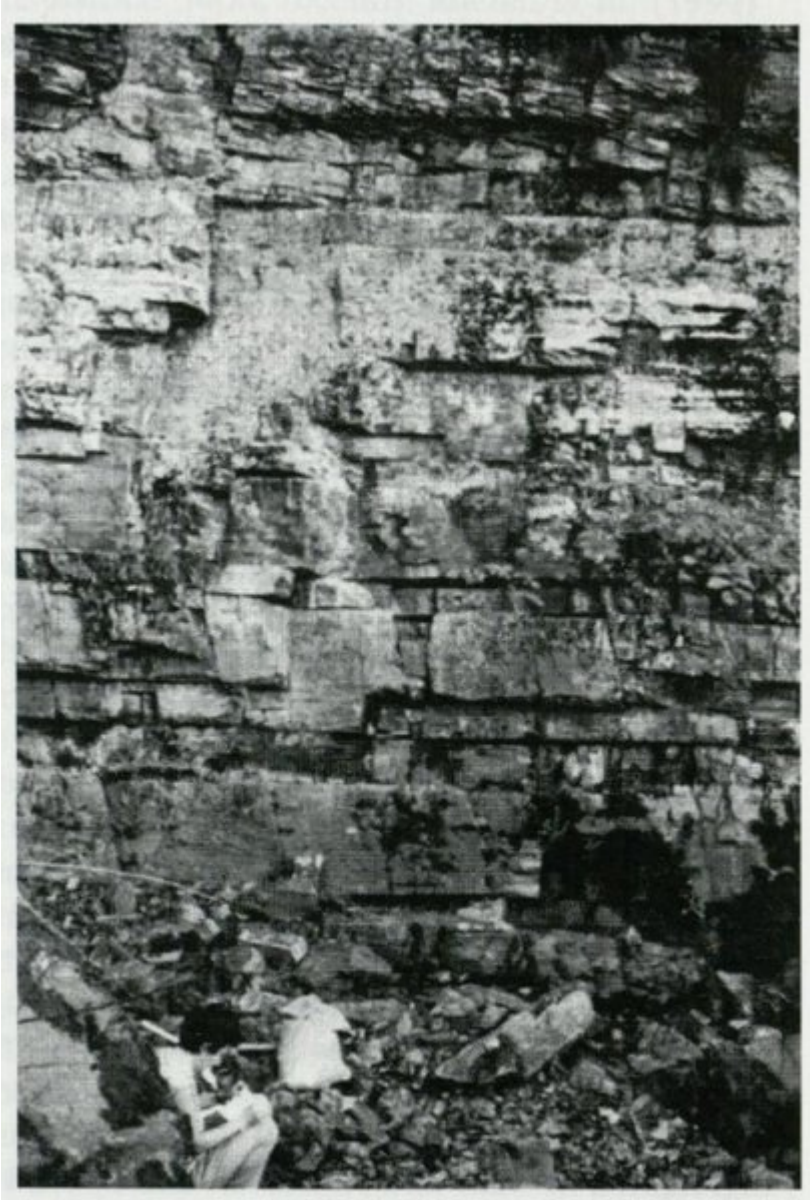
References



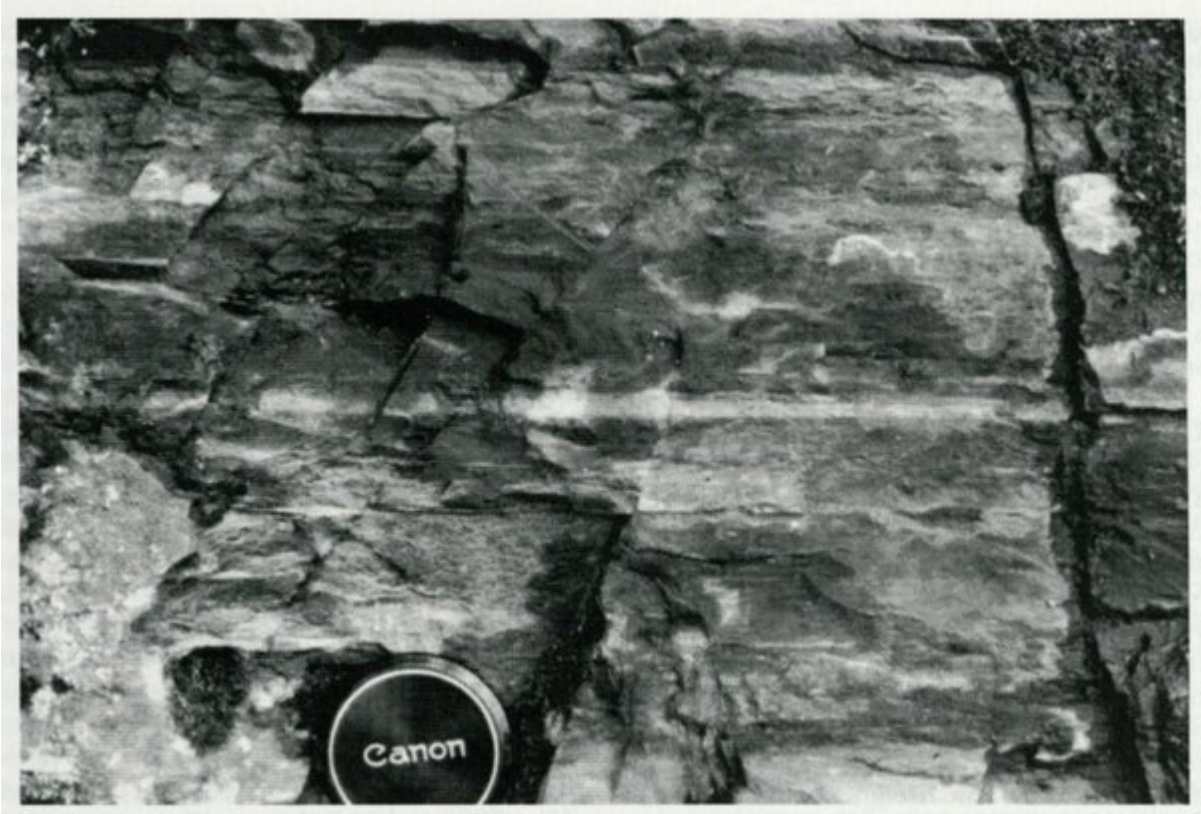
(Figure 3.53) Geological map of the area around Skelghyll Lower Bridge, showing the main graptolitic horizons within the Skelgill Formation (after Hutt, 1974).



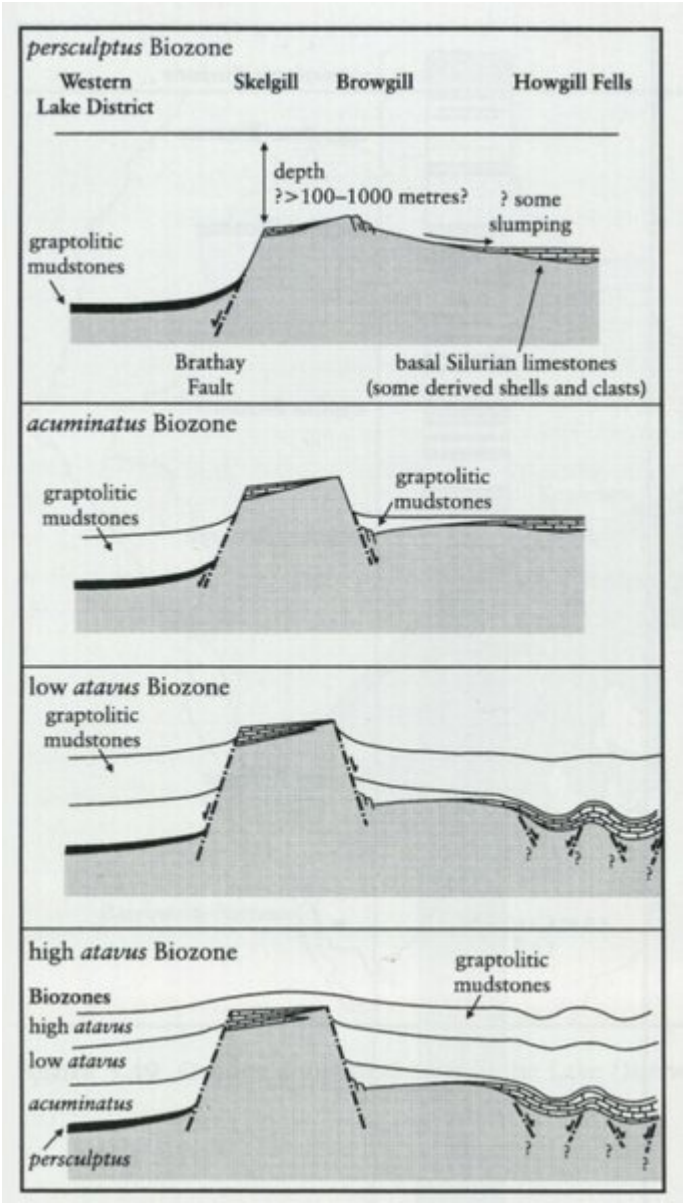
(Figure 3.54) Sedimentary log of the succession of the Skelgill Formation at Skelghyll Lower Bridge, showing the graptolite biozonation and the positions of the main graptolitic horizons (after Hutt, 1974).



(Figure 3.55) The Lower Bridge section, Skelghyll Beck. (Photo: R.B. Rickards.)



(Figure 3.56) The 'green streak' within the argenteus Biozone, Lower Bridge section, Skelghyll Beck. (Photo: R.B. Rickards.)



(Figure 3.52) Reconstucted west-east sections across the Lake District, showing the development of the depositional environment during the early Llandovery (after Rickards, 1978).