Stile End

[NY 471 049]–[NY 476 051]

Introduction

Stile End is historically important, being the eponymous locality for the lowest formation in the Dent Group overlying the eroded Borrowdale Volcanic Group in the south-east of the Lake District. The age of the Stile End Formation has been debated but is now recognized as being mid-Cautleyan rather than Actonian, and this fact has been used to demonstrate that the southern Lake District was an upstanding horst during the late Caradoc and early Ashgill while the Borrowdale Volcanic Group in the North Pennines was being overstepped from the north.

The Stile End Formation is the basal unit of the Dent Group in the south-eastern part of the Lake District. Harkness and Nicholson (1877, p. 662) applied the term 'Stile End Grassing Beds' to the 'ashy silts' below the Yarlside Volcanic Formation. The subsequent history of the unit was summarized by McNamara (1979a), Lawrence *et al.* (1986) and Kneller *et al.* (1994). Marr (1892), Dean (1963c) and others widened the concept of the 'Stile End Beds' to include all the strata between the Borrowdale Volcanic Group and Yarlside Formation. McNamara (1979a) separated a lower unit largely of coarse clastic material derived from the Borrowdale Volcanic Group, termed the 'Longsleddale Formation', from the 'Stile End Formation' of Harkness and Nicholson (1877). He defined the type section of both formations to the NNW of Stockdale Farm, 1.5 km north-east of the Stile End site. The two units were described in detail by Lawrence *et al.* (1986) as members of the 'Coniston Limestone Formation'. In the most recent stratigraphical revision (Kneller *et al.,* 1994), the Longsleddale Member was redefined as the basal member of the Stile End Formation, within the newly defined Dent Group. Kneller *et at* (1994) also reverted to historical usage in naming the overlying Yarlside Volcanic Formation, in contrast to the term Stockdale Rhyolite used by Millward and Lawrence (1985) and Lawrence *et al.* (1986).

Dean (1963c, fig. 4) published a geological map showing the location of fossiliferous localities within the Stile End Formation to the ENE of Stile End Farm, including the present site. The site forms part of the 1:25 000 Geological Survey Kentmere and Crook sheet (Lawrence *et al.,* 1986) and is also included in the detailed map of the Yarlside Formation published by Millward and Lawrence (1985, fig. 2).

Description and interpretation

The site covers the small exposures of dark-grey calcareous siltstones of the upper part of the Stile End Formation, which include Dean's (1963c) fossil localities AA–D and McNamara's (1979a) locality 11. Dean described trilobites and brachiopods from the site and from the Stile End Formation elsewhere and considered them to indicate a late Caradoc (Actonian) age. In contrast, McNamara (1979a, p. 47) argued for the now-accepted Cautleyan Zone 2 age, which is also commensurate with the age of the oldest parts of the Dent Group elsewhere in the southern Lake District. This revision of the age of the Stile End Formation (including the basal Longsleddale Member) resulted in a reassessment of the timing of the resumption of deposition over the eroded Borrowdale Volcanic Group in the southern Lake District and, by plotting changing shorelines through time, the recognition of the area as a positive, horst-like, structure in both the late Caradoc and the early Ashgill (Ingham and McNamara, 1978, p. 125).

The Yarlside Volcanic Formation crops out to the immediate south of the site and extends eastwards some 12 km to Shap Wells. It was reinterpreted by Millward and Lawrence (1985) as a rheomorphic ignimbrite rather than a line of coeval lava flows. Kneller *et al.* (1994) suggested that the Stile End and Yarlside formations were developed in a local embayment in the Borrowdale Volcanic Group. They also noted an episode of emergence evinced by clasts reworked from the top of the Yarlside Formation into the conglomeratic base of the overlying Kirkley Bank Formation.

Conclusions

This site gives its name to the Stile End Formation, the lowest beds overlying the eroded Borrowdale Volcanic Group in the south-eastern Lake District. The age of this unit has been debated but is now recognized as mid-Cautleyan, which helps demonstrate that the southern Lake District was an upstanding block during the late Caradoc and early Ashgill while the Borrowdale Volcanic Group in the North Pennines was being progressively drowned from the north.

References