
Trusmadoor

[NY 2777 3363]

Potential GCR Site

Introduction

Trusmadoor is the only place in Britain where a passage from the Tremadoc to Arenig Series in graptolitic rocks can be observed. Beds with *Araneograptus murrayi* of Lancefieldian 2 age are overlain by faunas that can be correlated with the *approximatus* Zone of Lancefieldian 3 age and the base of the Bendigonian (Be 1). Each fauna is accompanied by acritarch floras that allow correlation with other sites in Britain and elsewhere. It is a key site for the correlation of the series boundary in Britain.

The base of the Arenig Series in England and Wales is commonly marked by an unconformity overlain by transgressive sandstone beds, but two transitional sequences have been reported (Fortey *et al.*, 1991). Of these, the section at Trusmadoor, a col between Great Cockup and Meal Fell in the northern Lake District, is important because of the presence of graptolites that are widespread outside Britain. Jackson (1979) identified the early Arenig graptolite *Didymograptus protobalticus* Mosen from the southern end of the section, and in 1985 Rushton collected the late Tremadoc *Dictyonema pulchellum* Hall from the northern end and pointed out the potential of the site for identifying the base of the Arenig. Fortey *et al.* (1991) reported the results of further investigations.

Eastwood *et al.* (1968) gave a description of the geology of the district, but after resurveying the area Cooper *et al.* (1995) revised the stratigraphy and structure radically. They regarded the area between Great Cockup and Meal Fell as a faulted slice of the southward-younging Skiddaw Group, consisting of the upper part of the Watch Hill Formation passing up into the base of the Hope Beck Formation.

Description

The Skiddaw Group sediments consist of grey mudstones, with sandstone beds about 10 cm (occasionally up to 30 cm) thick. The thicker sandstones commonly show upwardly fining graded bedding, cross-lamination, small-scale slumps, convolute lamination and microfaulting. The mudstones are bioturbated and show burrows on bedding-planes.

At the north-west end of Trusmadoor [NY 2777 3363], 20 m of mudstones, with sandstone beds up to 30 cm thick, strike at around 280° and dip to the south at about 45°. These are taken to be part of the Watch Hill Formation. The cleavage here is parallel to bedding. From these beds Rushton (1985) reported *Dictyonema pulchellum* (Figure 11.3), associated with an acritarch flora, and fragments of large specimens of *Dictyonema* sp. from mudstones about 30 m higher. Lindholm (1991) subsequently referred all these *Dictyonema* to *Araneograptus murrayi* (Hall), and Molyneux (in Cooper *et al.*, 1995, p. 191) assigned the associated acritarch flora to 'sub-assemblage 3' of the *messaooudii-trifidum* Assemblage.

After an unexposed interval, the north-east side of the col shows extensive exposures of mudstone with interbedded sandstone, in which the cleavage is steeper than the bedding; a few fragmentary graptolites have been found [NY 279 355]. A further interval of poor exposure on the north-east side of Trusmadoor is followed by large exposures of mudstone, in which the dip of the cleavage is close to that of the bedding. These beds, near the junction of Trusmadoor and Burntod Gill [NY 2795 3339], yield *Clonograptus multiplex* (Nicholson), *Didymograptus protobalticus*, *D. rigoletto* Maletz, Rushton and Lindholm, and *Tetragraptus* species, including a single specimen of *T. (Pendeograptus) cf. fruticosus* (Hall). Acritarch floras from here are assigned to sub-assemblage 5 of the *messaooudii-trifidum* Assemblage. From outcrops and scree on the south-west side of the col [NY 2775 3355] (apparently in the same beds), *D. protobalticus* and *C. multiplex* and a single cyclopygid trilobite have been found.

In the provisional range chart given by Fortey *et al.* (1991, fig. 2), the records of *Didymograptus (sensu lato) cf vicinus* and *D. cf. protobalticus* are now both assigned to *D. protobalticus*, and *D. (sensu lato) sp. nov.* is now described as *D. rigoletto* (Maletz *et al.*, 1991).

Interpretation

Although the section at Trusmadoor is not fully exposed and the graptolites are sparse, it is an important section for the correlation of the lower part of the Skiddaw Group, because it relates the graptolitic and acritarch sequences. The *messaoudii–tryidum* acritarch floras can be related to those from other parts of the Lake District (Cooper *et al.*, 1995) and from South Wales, the Isle of Man, Spain (Molyneux and Rushton, 1988) and Rügen, north Germany (Servais and Katzung, 1993), allowing regional correlations and the possibility of wider correlation on the margins of Gondwana. The graptolites can be related to the Scandinavian and Australasian successions, as shown in (Figure 11.2).

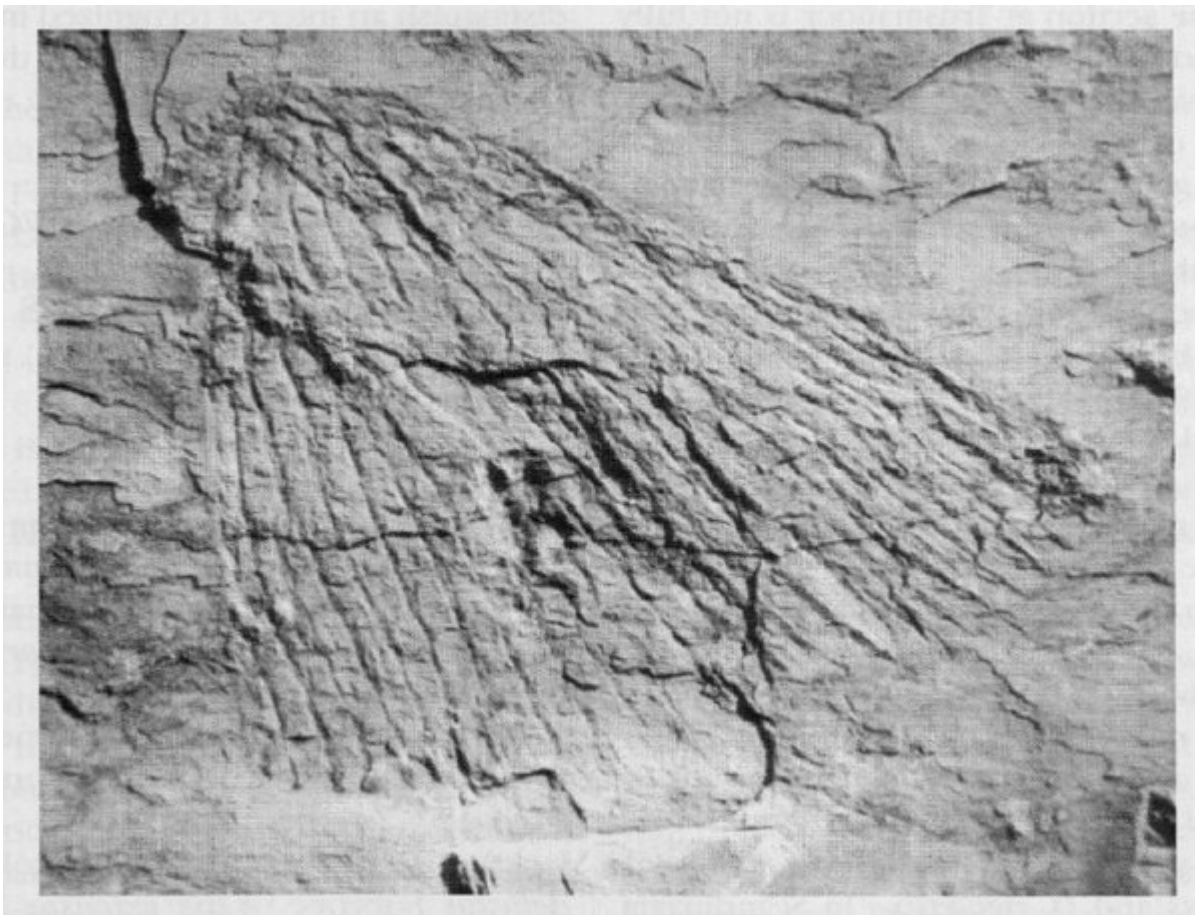
The northern end of the Trusmadoor section has yielded only *Araneograptus murrayi* (eight specimens) and is correlated with La2 and with the *murrayi* and/or *copiosus* zones. The southern end has yielded *Didymograptus (sensu lato) protobalticus* and *D. rigoletto*. In Scandinavia the ranges of these overlap at the top of the *phyllograptoides* Zone and within the range of *Tetragraptus* of the *approximatus* group (Maletz *et al.*, 1991), just below the *balticus* Zone. Correlation with the Australasian succession is more indirect, but the presence of *Pendeograptus cf fruticosus* associated with correlatives of *Z. approximatus* suggests a level near the base of the Bendigonian (see the Balcreuchan Port site report).

Therefore, as well as offering the prospect of identifying the Tremadoc–Arenig boundary in graptolitic rocks in Britain, the Trusmadoor section also affords valuable ties, just below and just above the base of the Arenig, between the acritarch zonation developed locally and the graptolite successions developed abroad. Horizons that could be used to characterize a correlatable base of the Arenig Series, namely the base of the *phyllograptoides* Zone or of the *approximatus* Zone (Lancefieldian 3 division), are not yet identified in the section, but presumably fall within the poorly fossiliferous sand-rich interval in the middle of the section, or the adjoining unexposed beds.

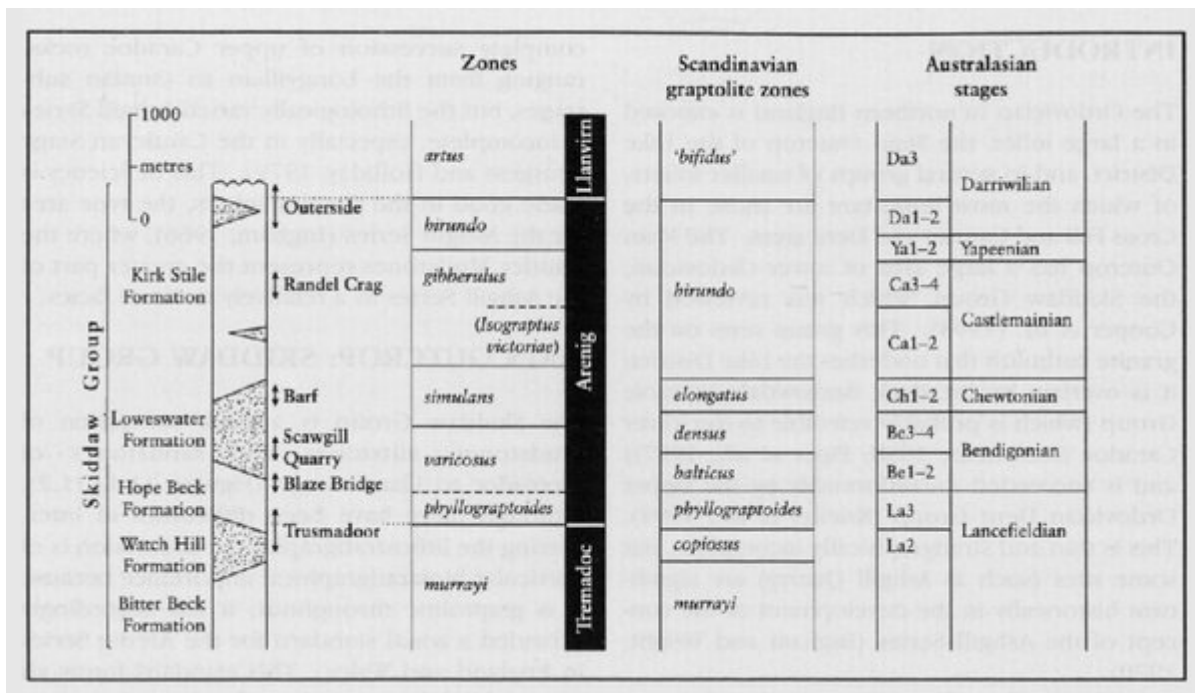
Conclusions

Trusmadoor is a site of international importance. It is uniquely valuable because it is the only site in England and Wales that contains assemblages of graptolites and acritarchs that distinguish an interval recognized in many other parts of the world as marking the boundary between the Tremadoc and Arenig epochs.

[References](#)



(Figure 11.3) *Araneograptus murrayi* (Hall), x 1, from the uppermost Tremadoc strata at Trusmadoor.



(Figure 11.2) Generalized vertical section for the Skiddaw Group in the Northern Fells Belt, showing the ranges of the GCR sites and correlation with the British and Scandinavian graptolite zones and the Australasian stages (after Cooper et al. 1995, figs 2, 3).