Outerside

[NY 211 215]

Potential GCR Site

Introduction

Outerside is one of the best localities for the fauna of the *hirundo* Zone, the uppermost graptolite zone of the Arenig, and is the type locality for several fossil species. It is also one of the few localities in the Lake District at which the base of the Llanvirn Series can be located.

Outerside, a hill 6 km WSW of Keswick ('5' in (Figure 11.1)), exposes the upper parts of the Kirk Stile Formation. The beds are here affected by the Crummock Water metamorphic aureole, the northern boundary of which passes round the south side of the hill. The Causey Pike Fault, a major tear fault, lies less than 1 km to the south. Outerside has long been known as a collecting locality for late Arenig graptolites. The fauna, which comprises about 20 species, was taken to exemplify the *hirundo* Zone in the revised concept of Fortey *et al.* (1990, p. 128), and a more limited faunal assemblage from nearby was referred to the basal Llanvirn *artus* Zone (Fortey *et al.,* 1990, p. 130).

Description

The strata at Outerside are laminated mudstones and siltstones but differ from typical Kirk Stile Formation strata in their grey-green colour and the dense, fine, dark spotting, induced by meta-somatism associated with the Crummock Water aureole immediately to the south. Dip and strike are variable, but whereas the dip is generally west to south-west, the beds appear to young to the east. Slumped beds and mass-flow deposits are a sporadic feature of the higher Kirk Stile Formation, and an example of debrite on the south flank of Outerside was figured by Cooper *et al.* (1995, fig. 8).

Large screes of Kirk Stile Formation have formed on the north-west side of the hill [NY 211 215]–[NY 213 217], and these are the source of most of the fossils from Outerside. The graptolites are commonly preserved as greenish impressions of low relief, and many are poorly preserved; nevertheless, large collections have been made and several species have their type locality here. Examples are *Didymograptus protobifidus* Elles, *D. nicholsoni planus* Elles and Wood, *D. v-fractus volucer* Nicholson, *Cryptograptus hopkinsoni* (Nicholson) and *Dichograptus separatus* Elles. Other significant graptolites present are *Aulograptus cucullus* (Bulman), *Cryptograptus antennarius* (Hall), *Expansograptus sparsus* (Hopkinson), numerous diplograptids (*Eoglyptograptus, Undulograptus*) and one specimen of *Bergstroemograptus.* Several examples of *Tetragraptus* spp. and *Loganograptus logani* (Hall) are recorded. Outerside is one of the syntype localities of the phyllocarid arthropod *Caryocaris wrightii* Salter, and well-preserved carapaces have been collected (Rushton and Williams, 1997, p. 107, fig. 1b).

Exposures on the eastern face of Outerside around [NY 214 215] have yielded far fewer fossils, but these include several *Didymograptus spinulosus* Perner, with other species including *Undulograptus austrodentatus* (Harris and Keble) and *U. cumbrensis* (Bulman).

Interpretation

Although Elles (1933) thought that her *gibberulus* Subzone was present at Outerside, no specimens supporting this notion are known. However, Jackson (1962) agreed with Elles in considering that the main fauna from the scree on the north-west face of Outerside represents the *hirundo* Zone, and this was followed by Fortey *et al.* (1990). The *hirundo* Zone is now correlated approximately with the lower Darriwilian of the Australasian sequence, namely a slightly higher level than that proposed by Fortey *et at* (1990) and more in keeping with the correlation proposed by Mitchell and Maletz (1995). Apart from the distinctive *Aulograptus,* the only pendent didymograptids are rare examples of *D. protobifidus* (type locality), which occurs here much higher than the Chewtonian horizon of Australasian and North American records

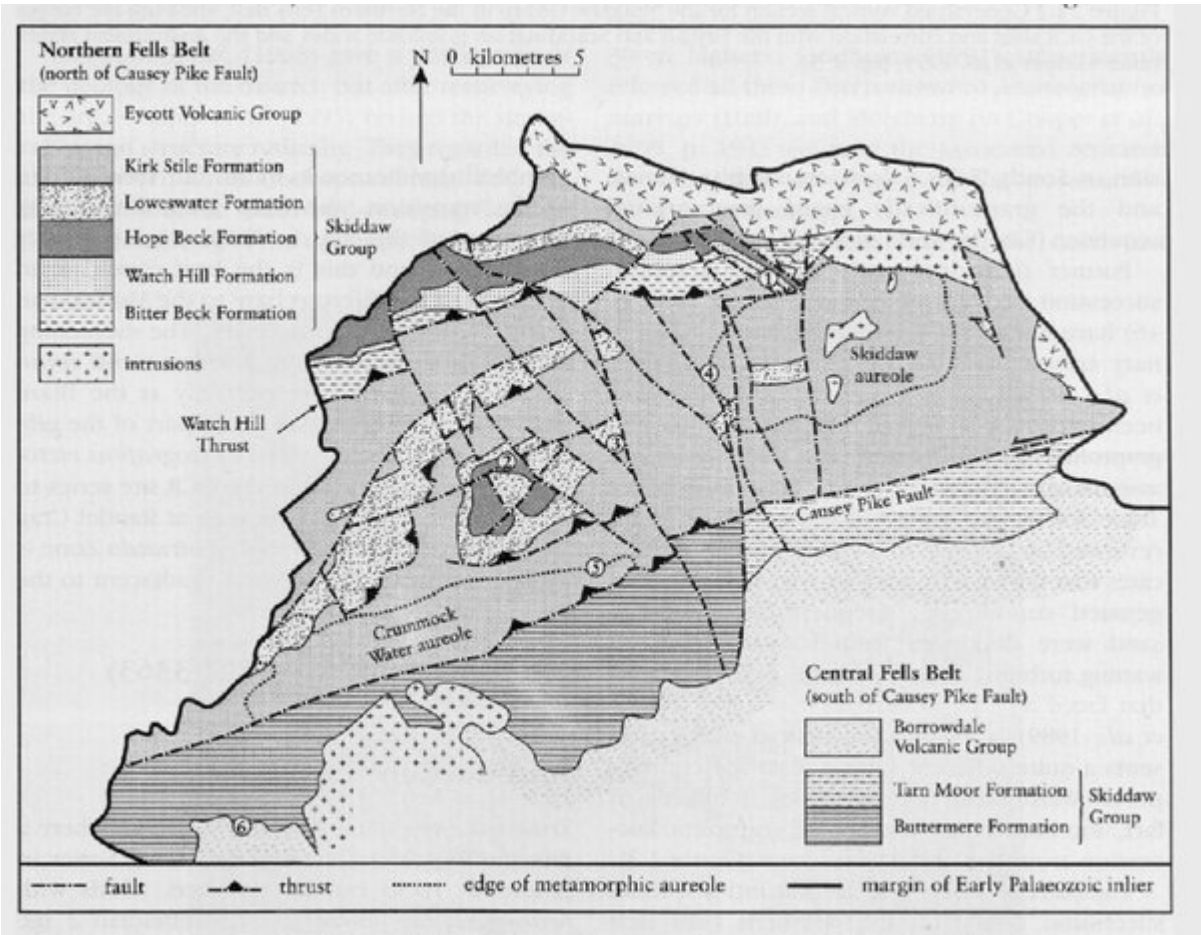
of this species. Faunas of the *hirundo* Zone are distributed around the north side of the Skiddaw massif (Jackson, 1962) to Hazelhurst by Souther Fell in the east, where the section passes from Arenig to Llanvirn in graptolitic strata (Fortey *et al.,* 1990, p. 130).

The fauna from the east face of Outerside is taken to be basal Llanvirn (*artus* Zone) on account of the several examples of *D. spinulosus* found there, thus supporting Elles' (1933) contention that Llanvirn strata are developed at Outerside. Fortey and Owens (1987, fig. 41a) suggested that the trilobite *Gastropolus obtusicaudatus* (Hicks) from Outerside might also be from the basal Llanvirn there.

Conclusions

Diverse graptolite faunas from Outerside exemplify a development of the uppermost Arenig *hirundo* Zone in the upper part of the Kirk Stile Formation and show also the lowest part of the Llanvirn *artus* Zone. These faunas play an important part in the stratigraphy of the Skiddaw Group and internationally in correlating the Arenig–Llanvirn boundary with the Australasian graptolitic scheme.

References



(Figure 11.1) Geological sketch-map of the Skiddaw Group in the main outcrop of the English Lake District, after Cooper et al. (1995, fig. 2). GCR localities: 1, Trusmadoor; 2, Blaze Bridge and Scawgill Quarry; 3, Barf; 4, Randel Crag; 5, Outerside; 6, River Calder (Tremadoc, Chapter 7).