Sarclet, Caithness

[ND 353 431]–[ND 354 435]

Potential GCR site

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Introduction

The cliff sections on either side of The Haven, Sarclet provide good exposure of conglomerates and sandstones of the Lower Devonian Sarclet Group. Fluvial and probable aeolian lithofacies are overlain to the north by mudstone marking a major lacustrine transgression. A spectacular aspect of the section is the presence of deformed sheets overlying bed-parallel basal detachments, with other dislocation planes cutting bedding at a low angle. The deformation is likely to be of tectonic origin, but its age is uncertain. Field guides to the site are provided by Armstrong *et al.* (1978a) and Trewin (1993), and much detail is contained in a PhD thesis by Donovan (1970).

Good exposure of Lower Devonian strata is rare in the northern part of the Orcadian Basin. The Sarclet site is therefore of regional importance as an example of an otherwise poorly represented part of the stratigraphy, providing data necessary for an overview of the tectonics and palaeogeography of the basin. The broad geological setting of the site is given by Johnstone and Mykura (1989) and Mykura (1991).

Description

From the village of Sarclet a steep track leads down into The Haven, a long-abandoned base for herring fishing. Sarclet Head is a rugged promontory on the south side of The Haven. The cliffs around the headland and those extending north from The Haven provide extensive exposure through the Sarclet Conglomerate and Sarclet Sandstone formations of the Sarclet Group. These occupy the broad hinge zone of a large, open anticline that plunges gently towards the north-west and which is broken up locally by intersecting N–S- and ENE–WSW-trending fault sets (Figure 2.58). To the north and west, the Sarclet Sandstone Formation is overlain by mudstone and sandstone of the Ulbster/Riera Geo and Ulbster/Ires Geo formations. A spore assemblage from the latter was assigned a late Emsian (Early Devonian) age (Collins and Donovan, 1977). The strata in the Sarclet section lie on the northern limb of the regional anticline and dip consistently north-west between 20° and 30°, so that 150 m of beds are present.

The lowest strata seen are polymictic conglomerate lenses and pebbly sandstones of the Sarclet Conglomerate Formation that form Sarclet Head, the southern margin of the site. The conglomerates are poorly sorted and contain clasts of granite, schist, quartzite and basalt, the last generally abundant and dominant in some lenses, together with sandstone intraclasts. The clasts are mostly subrounded pebbles, but range up to 30 cm boulders. The junction with the overlying Sarclet Sandstone Formation is transitional, with the proportion of pebbly beds diminishing over a few tens of metres.

The cliffs surrounding The Haven and extending to the north are of reddish brown, medium-grained sandstone in parallel-sided beds up to 50 cm thick. Many of the parallel beds are internally cross-laminated, others contain wispy mud laminae or parallel lamination defined by size variation in the rounded sand grains (Trewin, 1993). The sandstones are quartz-cemented and extensively fractured in some parts. They are also affected by dislocation planes cutting across the sequence at low or moderate angles, and locally by chaotically deformed units overlying basal, bed-parallel slide planes (Figure 2.59). In the latter examples, the degree of deformation decreases upwards from the basal detachment, immediately above which the sandstone is highly fractured with abundant small quartz veins.

The coastal outcrop of the Sarclet Sandstone Formation is terminated in the north by faulting at Riera Geo [ND 354 439], where thinly bedded, greenish mudstones and grey, calcareous siltstones of the Ulbster/Riera Geo Mudstone Formation

are thrown down to the north.

Interpretation

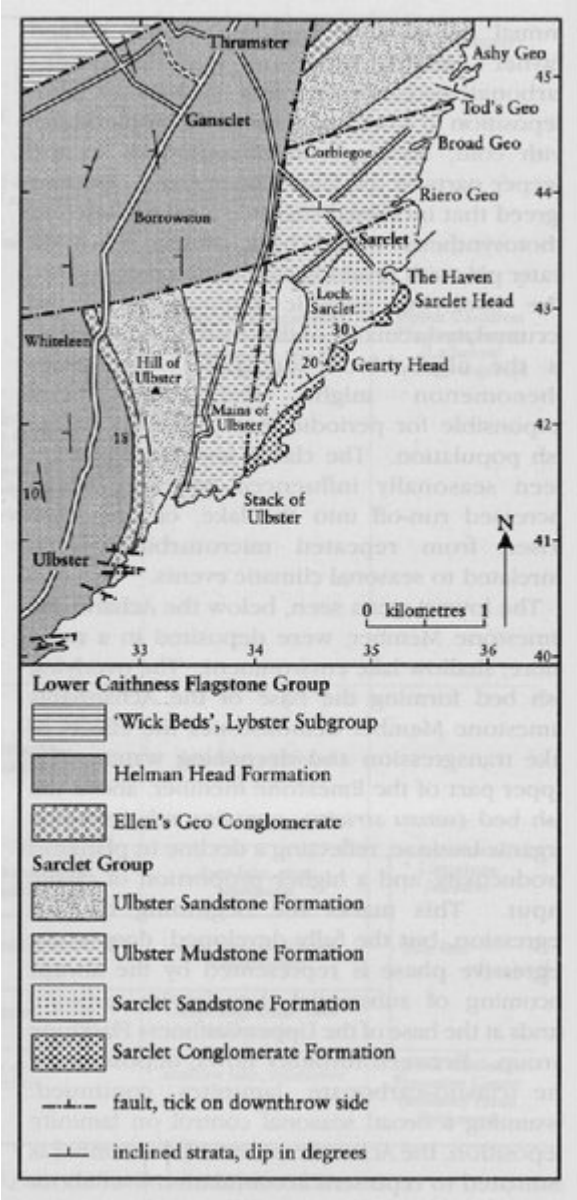
The lowest strata seen in the site area, the conglomerates and pebbly sandstones of the Sarclet Conglomerate Formation, are alluvial-fan deposits laid down by braided streams. The abundance of basalt detritus is of particular significance, suggesting a nearby area of contemporaneous volcanism (Trewin, 1993), which, from the evidence of the palaeocurrent indicators (Johnstone and Mykura, 1989; Mykura, 1991), lay to the southeast. Some of the overlying Sarclet Sandstone Formation may also have a fluvial origin, Mykura (1991) noting evidence for increased meandering of the rivers with time. However, Trewin (1993) noted that the wispy lamination defined by thin, irregular mud laminae resembles aeolian adhesion ripples. The lamination produced by size sorting of rounded sand grains provides further evidence for deposition by aeolian processes. Higher in the succession, the thinly bedded mudstones and calcareous siltstones of the Ulbster/Riera Geo Formation record deposition in a shallow lacustrine environment, and represent one of the earliest, significant lake transgressions in the Orcadian Basin.

Of particular interest at this site is the localised deformation of beds in the Sarclet Sandstone Formation above bed-parallel slide surfaces (Figure 2.59). The overall appearance is suggestive of synsedimentary sheet slumping, but the most deformed sandstone is fractured and quartz-veined, and was clearly lithified when deformed (Trewin, 1993). The age of the deformation at Sarclet therefore remains uncertain.

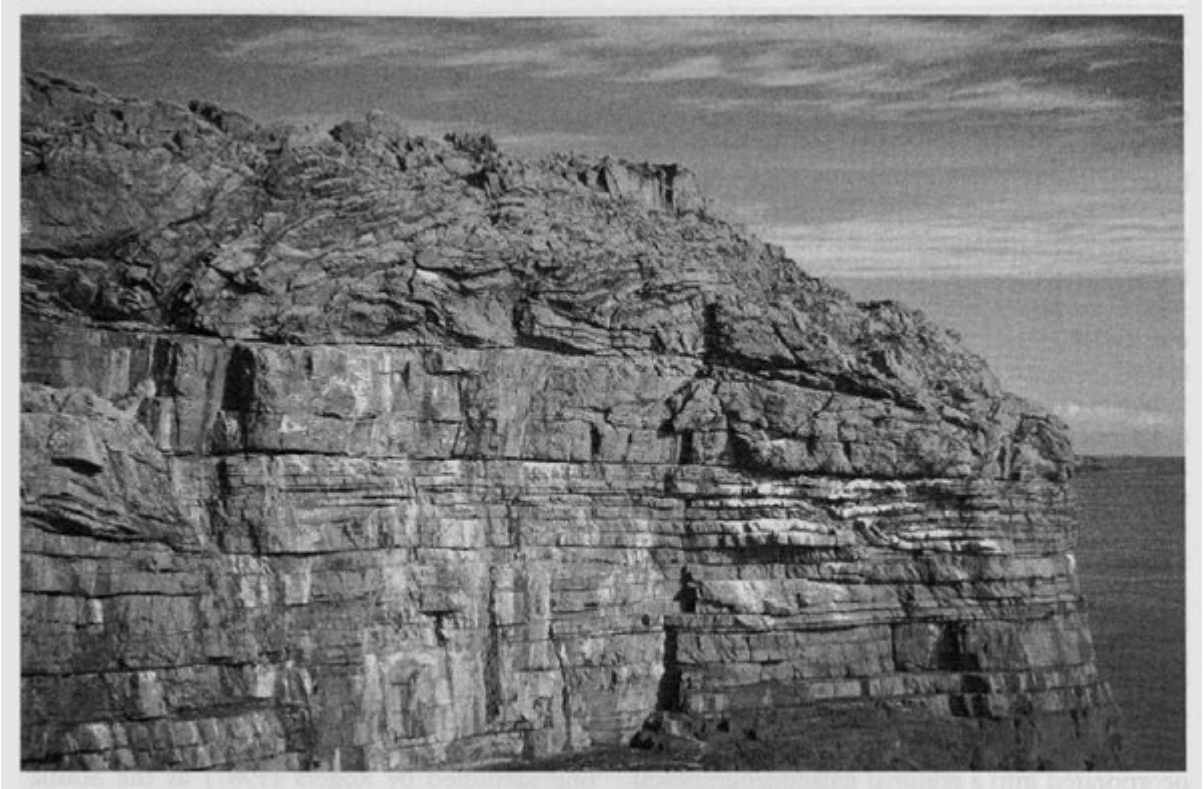
Conclusions

The Sarclet site provides good exposure through a section representative of the Lower Devonian Sarclet Group. The site is of regional importance as outcrop of Lower Devonian strata is rare within Caithness and the northern part of the Orcadian Basin. Alluvial-fan conglomerates form the base of the exposed succession, with an upwards transition to sandstones that may be either fluvial or aeolian in origin, or formed by a combination of both processes. The Sarclet Sandstone Formation is cut by numerous low-angle dislocation planes and contains chaotically deformed sheets resting on bed-parallel detachment planes. The origin of this deformation is unclear, with both synsedimentary and post-lithification tectonic indicators, and its timing also remains uncertain. Overlying the Sarclet Group, mudstones and calcareous siltstones of the Ulbster/Riera Geo Mudstone Formation represent a major lacustrine transgression, one of the earliest significant lake developments in the Orcadian Basin.

References



(Figure 2.58) Geological map of the Sarclet area. After British Geological Survey 1:50 000 Sheet 110 (Scotland), Latheron (1985).



(Figure 2.59) Sarclet Sandstone Formation. Deformed sandstones rest on a bedding-parallel detachment; a low-angle dislocation cuts the regularly bedded sandstone below the detachment. (Photo: P. Stone.)