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# Stronchrubie Cliff

[NC 254 213]–[NC 250 193]

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## Introduction

The Assynt district of the Moine Thrust Belt is justly famous for its large-scale thrust structures with three-dimensional geometries that can be inferred from the geological maps and cross-sections of the area (e.g. Peach *et al.*, 1907; British Geological Survey, 2007). The major thrust sheets that are represented in the more-mountainous parts of the district are generally well exposed. However, evidence for the internal structure of imbricate thrust systems is only rarely seen. Exceptions to this are the sections immediately south of Inchnadamph, represented by the Stronchrubie Cliff and Traligill Burn GCR sites (Figure 5.24). Together, these two sites provide a useful insight into thrust structures developed exclusively within Durness Group carbonate rocks. Both sites lie within the lower imbricate zone of the central Assynt area, and the basal thrust to this imbricate system, the Sole Thrust, lies just beneath the Stronchrubie Cliff.

Although examples of imbricate thrusts are probably best displayed in the Foinaven and Beinn Liath Mhor GCR sites, these Assynt localities have been visited frequently by geological field parties, not least because of their ready accessibility to the Inchnadamph Hotel (e.g. MacGregor and Phemister, 1948; Johnson and Parsons, 1979). The Stronchrubie Cliff is especially helpful because its geological structure is well appreciated from the A837 road (Figure 5.25). The area is also of great importance for its caves and karst geomorphology (Waltham *et al.*, 1997), and for occurrences of sills of the North-west Highlands Minor Intrusion Suite that were intruded prior to thrusting (Parsons, 1999; Goodenough *et al.*, 2006).

## Description

The A837 road just south of Inchnadamph runs along a bench of poorly exposed ground characteristic of the underlying Fucoïd Beds. These strata, together with the overlying Salterella Grit, comprise the An t-Sron Formation and form the upper part of the undeformed foreland Cambro–Ordovician succession in this area. Above and east of the road is the 120 m-high escarpment of Stronchrubie Cliff that provides a continuous 2 km-long section (Figure 5.25). The structure of the southern part of the cliff as seen from the road seems deceptively simple, since it is evidently a near-strike section. The lower part of the escarpment contains rocks of the lowest formation of the Durness Group, the Ghrudaïdh Formation. These dolostones, together with a laterally continuous sill of vogesite (hornblende-rich lamprophyre), dip gently to the ESE. The upper part of the cliff contains carbonate rocks of the Eilean Dubh Formation; although this formation succeeds the Ghrudaïdh Formation stratigraphically, these strata dip more steeply at 50°–60° to the ESE, indicating a structural discontinuity between the two formations. This discontinuity is the Sole Thrust. The relationship between the two dip domains is most clear on the northern wall of a broad natural amphitheatre in the Stronchrubie cliff-line between [NC 252 209] and [NC 254 207] (Johnson and Parsons, 1979; Butler, 1988b) (Figure 5.24), (Figure 5.26).

Above the Sole Thrust, individual thrusts of the imbricate zone may be inferred by identifying bedding cut-offs. These discordances represent ramps, and in the amphitheatre these ramps lie in the footwall to each inferred imbricate thrust. Seven such thrust slices can be identified (Figure 5.24), with bedding becoming increasingly steep in the more-internal and structurally higher slices. Imbricate thrusts may also be identified from bedding cut-offs in the northern Stronchrubie cliffs [NC 253 212]–[NC 254 214]. This section trends almost perpendicular to the inferred direction of thrusting so that the ramps are presumably lateral or oblique (Figure 5.26). Higher thrust slices can be traced and are visibly folded by underlying imbricate structures, indicative of 'piggy-back' thrusting.

## Interpretation

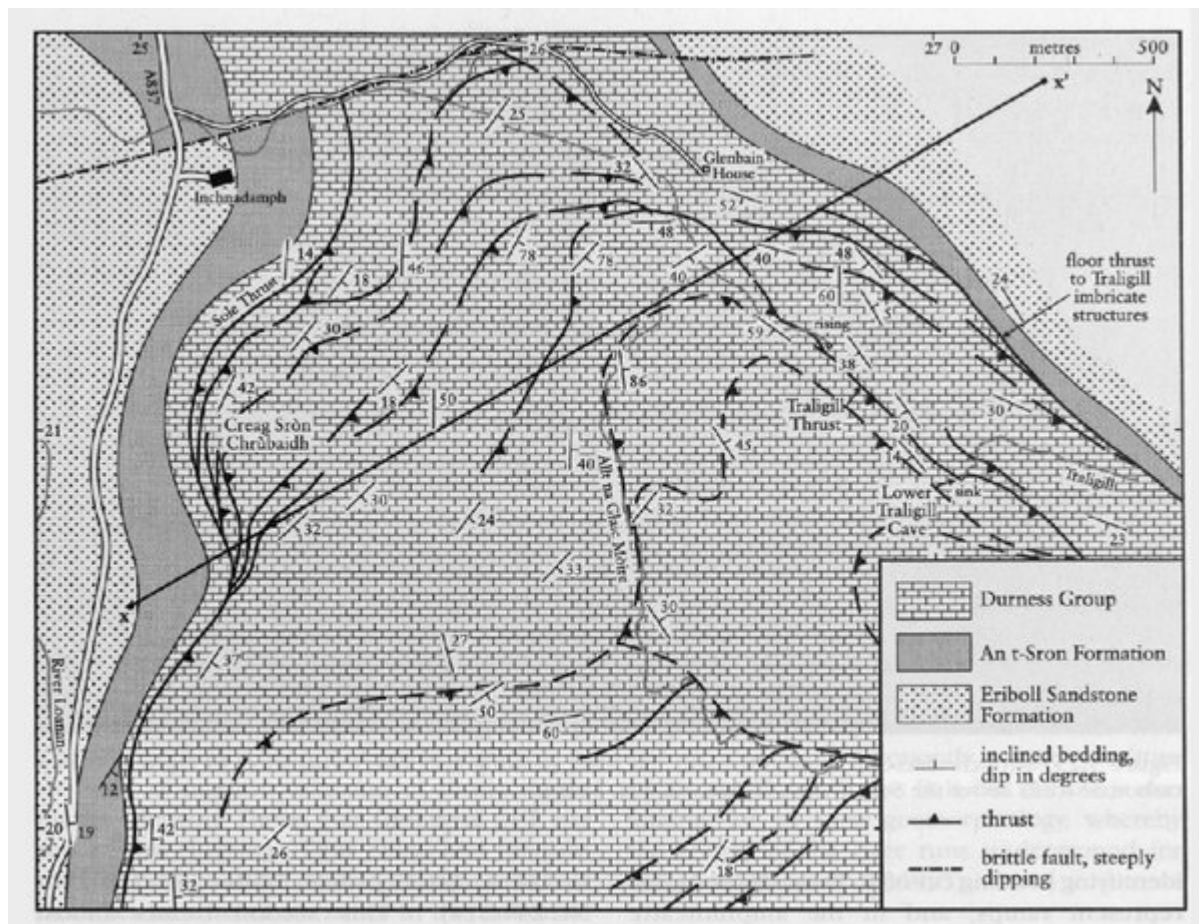
The imbricate thrusts in the Stronchrubie cliffs are all interpreted as splays from the Sole Thrust that acted as the floor thrust. Although this basal thrust is not exposed, its presence is readily inferred because the underlying strata are clearly not involved in the imbrication. A more-complete three-dimensional picture of this imbricate system can be gained by considering outcrops in the Traligill Valley (Figure 5.24), (Figure 5.25) (see 'Interpretation', Traligill Burn GCR site report, this chapter).

The linkages between major thrusts and imbricate systems in the Inchnadamph district have long been controversial. Peach *et al.* (1907) joined the Glencoul Thrust to the Ben More Thrust by running it across the Allt Poll an Droighinn, an arrangement also followed essentially by Christie (1963). This view was contested by Bailey (1935), who considered the Glencoul Thrust to terminate roughly at the Allt Poll an Droighinn, well north of Valley. The Glencoul–Ben More linkage is untenable in the light of modern estimates of displacement on the Glencoul Thrust (see Glencoul GCR site report, this chapter). Thus Elliott and Johnson (1980) proposed that the Glencoul Thrust branches into imbricate zones in the carbonate rocks to the south of the Traligill Valley. A more-radical solution was proposed by Coward (1982, 1984b) who considered the base of the Glencoul Thrust Sheet and the fault exposed in the Traligill Burn GCR site to be extensional features that cut across the Glencoul Thrust and imbricate zones.

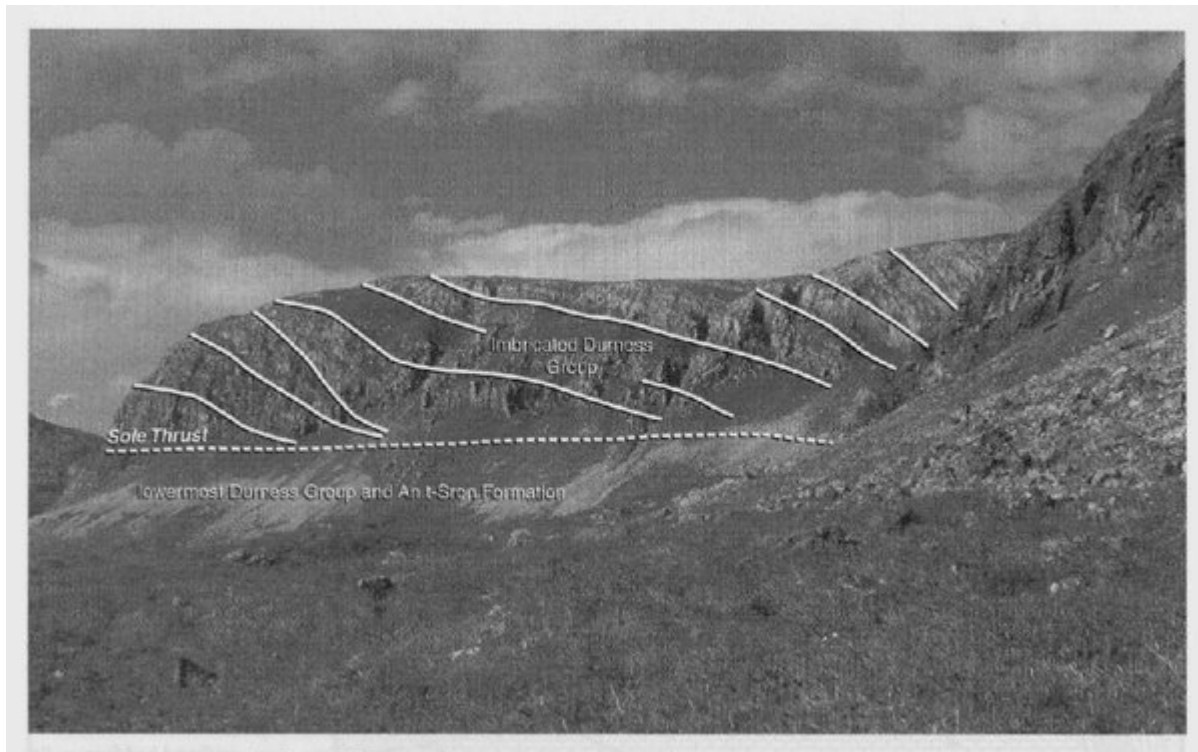
## Conclusions

The thrust structures admirably exposed in the carbonate rocks of the Durness Group to the south and east of Inchnadamph represent duplexes that are detached along the Sole Thrust and accommodate displacements arising from the Glencoul Thrust. The Stronchrubie Cliff GCR site provides an important insight into the internal architecture of bedding and thrusts within the lower part of a duplex. Together with the nearby GCR sites at Traligill Burn and Skiag Bridge, the site is representative of the most westerly, structurally lowest, imbricate structures in Assynt. These areas are critically important for understanding the three-dimensional geometry of these imbricate structures and their relationship to the major Glencoul Thrust. They also have a more-general value for elucidating how displacements transfer across thrust systems. The Stronchrubie Cliff GCR site is nationally important and remains excellent for teaching purposes.

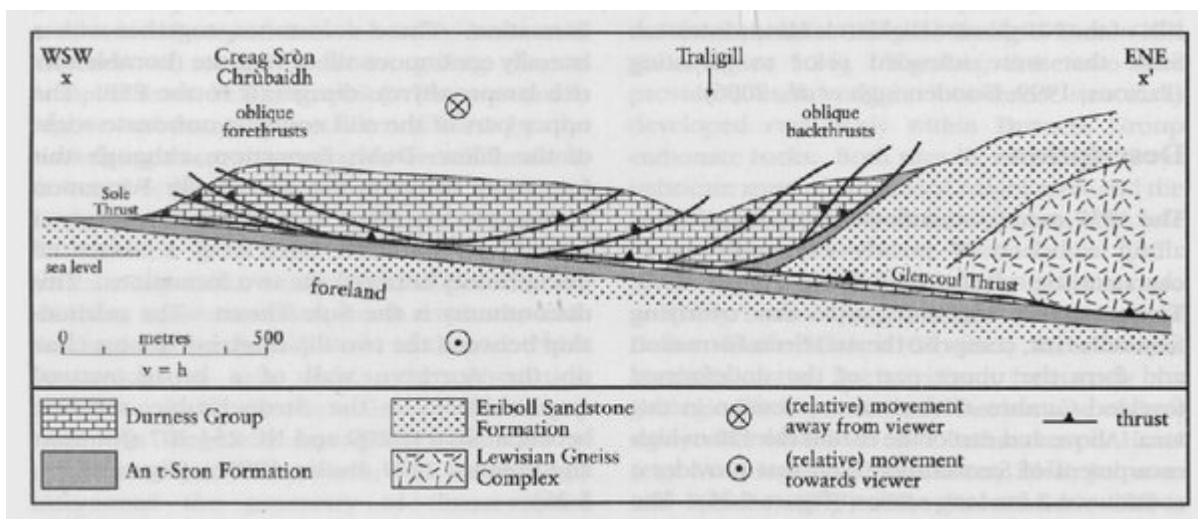
## References



(Figure 5.24) Map of the area south-east of Inchnadamph showing the relationship between the Stronchrubie Cliff and Traligill Burn GCR sites. Structure in Durness Group rocks modified from British Geological Survey (2007).



(Figure 5.25) Stronchrubie Cliff, viewed towards the NNE, showing imbricate thrust slices of Durness Group carbonate rocks above the Sole Thrust. (Photo: R.W.H. Butler.)



(Figure 5.26) Cross-section ( $x-x'$  on Figure 5.24) drawn near-orthogonal to the inferred thrust transport direction, illustrating the thrust geometries at the Stronchrubie Cliff and Traligill Burn GCR sites.