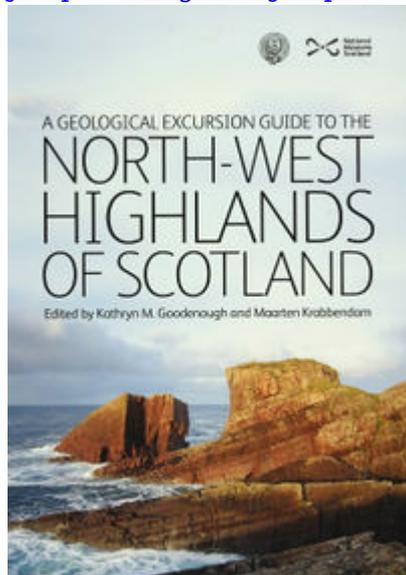


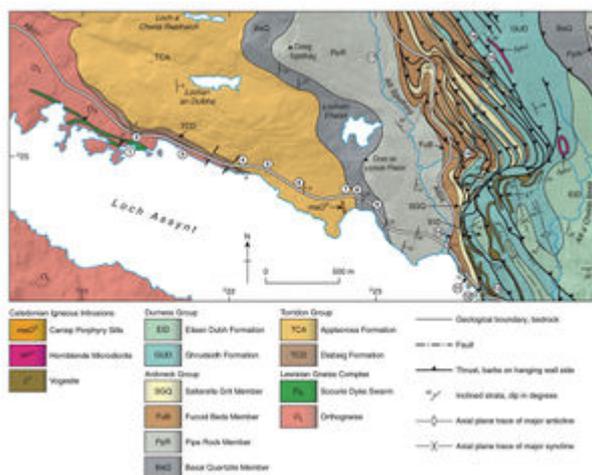
# Stratigraphy and structure of the Achmore Duplex and adjacent foreland, North-west Highlands - an excursion

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Geological map of the Loch Assynt area, after British Geological Survey (2007), showing the localities described in Excursion 1.

[File:EGS NWH FIG 018.jpg](#)

Large bedding surface within the Pipe Rock Member at Locality 1.17 [NC 2310 2540] with dense concentrations of Skolithos and

Monocraterion overlain by a distinctive, pale-weathering 5m-thick massive bed which forms a distinctive marker horizon a short distance below the top of the Eriboll Formation. The yellow rule in the dotted circle is one metre. (Photograph: © M. P. Smith)

[File:EGS NWH FIG 019.jpg](#)

A bedding plane with abundant Monocraterion burrows immediately below the massive bed in Allt Sgiathaig, at Locality 1.17. The conical tops of the burrows are seen from above. (Photograph: © M. P. Smith)

**Excursion 1B from: Goodenough, Kathryn M. and Krabbendam, Maartin (Editors) [A geological excursion guide to the North-west Highlands of Scotland](#). Edinburgh : Edinburgh Geological Society in association with NMS Enterprises Limited, 2011.**

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## Introduction

Park in the first car-park on the left [NC 234 248] on the road to Kylesku and Scourie from Skiag Bridge. From the lay-by, walk up the road to a gate on the right [NC 2349 2514] and then walk eastwards along a grassy track to a ford over a small stream [NC 2366 2509]. Proceed up the stream, which may be a dry bed or (very) wet. CAUTION: please do not hammer at any of the localities, this is a popular excursion and hammer scarring is becoming evident.

The Sole Thrust lies below the ford in the boggy ground, and most of the excursion is within a duplex developed beneath the Glencoul Thrust sheet. The stratigraphy of the horses within the duplex comprises the Fucoïd Beds and Salterella Grit members of the An t-Sròn Formation (Ardvreck

Group) and the lower part of the Ghrudaidh Formation (Durness Group). The duplex is of large scale, with a vertical distance of around 150m from floor thrust to roof thrust, but the local stratigraphy means that each individual horse is very thin, and the bounding thrusts are rarely separated by more than a few tens of metres.

## **Locality 1.14 Imbricates in the stream section west of Achmore Farm. [NC 2366 2509 to NC 2369 2528]**

At the ford, where a grassy track crosses the small stream [NC 2366 2509], the Salterella Grit Member forms the base of a waterfall and is conformably overlain by the Ghrudaidh Formation. In contrast to the foreland section along the lochside, the base of the Ghrudaidh Formation here comprises 2m of dark grey dolomitic siltstone that is superficially similar to some parts of the Fucoïd Beds Member. This is overlain by typical buff grey weathering dolostones but, at the top of the second cascade, orange-weathering dolomitic siltstones of the Fucoïd Beds Member are thrust over the Ghrudaidh Formation to the left of the waterfall (all directions given looking upstream). The thrust plane is exposed and dips at 28° towards the north-east.

Continuing up the stream, the Fucoïd Beds – Salterella Grit – Ghrudaidh Formation succession is repeated by a number of small thrusts. Some horses do not contain all three units; for instance, the Fucoïd Beds Member is thrust over the Salterella Grit at [NC 2368 2518]. At a sharp left hand bend where the Salterella Grit Member crosses the stream [NC 2369 2518], the topographic expression of the duplex across the hillside becomes clearly visible. The bedding is steeply dipping, and ridges of Salterella Grit Member trend NW-SE. Behind some of the ridges are trenches that contain the Ghrudaidh Formation, evidenced by the vegetation and the presence of shake holes, together with scattered outcrops of the shaley base of the formation and the more typical overlying dolostones. Within the shaley base at [NC 2367 2520] is the key fossil locality from which Huselbee and Thomas (1998) described *Olenellus lapworthi* and *Salterella maccullochi*, indicating a *Bonnia-Olenellus* biozone (late Early Cambrian to earliest Middle Cambrian) age for the base of the Durness Group. Above each trench, a steep bank of Fucoïd Beds Member leads up to the next ridge of Salterella Grit Member. The stream flows along the trenches on the uphill side of the ridges, before cutting through the Salterella Grit and cascading down the steep banks.

Several more horses are crossed to a fence [NC 2369 2528], from where there is an excellent view across Loch Assynt to the 'double unconformity' (see Excursion 16). Above this point, the exposure becomes more sporadic.

## **Locality 1.15 [NC 2381 2558]**

Follow the stream northwards to where it emerges from a small rising. Above this point the stream bed is dry, with occasional collapses into the underlying karst drainage. This is indicative of a change in the character of the duplex – above this point the horses are entirely composed of carbonates of the Durness Group, without the An t-Sròn Formation units seen at lower structural levels.

## **Locality 1.16 [NC 2363 2570]**

From a short distance downstream of Locality 1.15, follow the last ridge of Salterella Grit Member north-westwards to another stream that offers a further section through the lower part of the duplex. On the way to this stream the highest point of the ridge offers an excellent viewpoint from which to survey the geology of Loch Assynt.

To the north-east, on Glas Bheinn (776m), the Eriboll Formation sequence is repeated by a number of thrusts. The Glencoul Thrust occurs at the break in slope below the quartzite screes. To the south-west, the famous 'double unconformity' can be seen on the hill of Beinn Gharbh (539m), with Lewisian gneisses overlain by Torridon Group units that are in turn overlain by quartz arenites of the Ardvreck Group (the latter intruded by sheets of Canisp Porphyry). To the west lies the foreland, with the dip slope of the Eriboll Formation unconformably overlying the arkoses of the Applecross Formation (Torridon Group) on Quinag.

At [NC 2363 2570], the ridge of Salterella Grit Member that has been followed across the moor crosses a second stream. The Fucoïd Beds Member is thrust over this unit and a short distance upstream, the carbonate-dominated duplex begins. Proceed downstream (all directions now refer to looking downstream).

The stream descends back through the imbricated sedimentary sequence, with the same topographic features as at Location 14, but with rather fewer exposures of Ghrudaidh Formation dolostones. Farther downstream, thick units of Fucoïd Beds Member with variable strike values and abrupt discontinuities in dip provide evidence for internal thrusts within this member. The reason for the contrast in stratigraphical composition of the horses in the first stream (Locality 1.14) with that seen here lies in the presence of a low angle lateral ramp, such that the older units are progressively cut out south-eastward between the two streams.

At the foot of a steep descent just above the road is a 5m waterfall with a birch tree. The dip of the Fucoïd Beds Member in the waterfall is  $52^\circ$ , whereas a few metres lower down the valley, across a bounding thrust, the same unit has the gentle dips of the foreland. The Salterella Grit Member crops out by the culvert under the road, and between this and the last out-crop of Fucoïd Beds Member lies the floor thrust of the Achmore Duplex

- the Sole Thrust. This relationship is also seen slightly farther down the road [NC 2340 2546] and the Sole Thrust then lies a short distance above the road for several hundred metres down the hill. Good sedimentary structures are seen in the Salterella Grit Member in a small roadside quarry [NC 2340 2539]. Metre-scale planar tabular cross-bedding is well-exposed in the 3D outcrop, with laminae sharply defined by heavy minerals, though *Salterella* is scarce. Current directions are mainly directed towards the east and south-east. Topographically below and to the west of the quarry lies the foreland.

From the quarry, cross the road to rejoin the stream and follow it downstream. The same, foreland, Salterella Grit Member is seen across the deeply incised stream valley beneath a rowan tree, and directly below this lies an outcrop of foreland Fucoïd Beds Member. Farther downstream, close to the junction of the stream with Allt Sgiathaig, are outcrops of the Pipe Rock Member.

## **Locality 1.17 [NC 2310 2540]**

From the stream junction, walk north-west up the Allt Sgiathaig across more or less continuously exposed Pipe Rock Member, passing one bedding surface [NC 2316 2533] with very well-developed *Monocraterion* - a burrow system similar to *Skolithos* but with a distinctive cone or 'trumpet' at the top of the burrow. Continue past a sharp bend and waterfall to where the stream flows over large bedding surfaces with a two-tiered cliff forming the east bank. On the west bank [NC 2305 2548] are bedding surfaces with fine calibre *Skolithos* and small *Monocraterion* (2-3cm tops with 0.5cm diameter burrows). The bedding has a maximum thickness of 20-40cm and is wedge-shaped at outcrop-scale. Wavy set boundaries indicate the presence of ripples on top of the dunes.

Recross to the east bank and climb to the top of the first tier of outcrop. The bedding surface

contains densely packed *Skolithos* and occasional *Monocraterion*. Above this prominent surface are two further beds with *Skolithos*, but these are overlain by a 30cm bed and then a 5m-thick massive bed, first recognised by Peach *et al.* (1907), which forms the second tier. This pale-weathering massive bed forms a distinctive marker horizon a short distance below the top of the Eriboll Formation, recognisable along much of the Cambro-Ordovician outcrop belt from Loch Eriboll in the north to the Isle of Skye, and represents a sequence boundary within the formation. Although most of the bed is structureless, the top surface contains planar lamination, ripple lamination and dewatering structures. The massive bed is overlain by a more heterolithic succession of interbedded sandstones and silty mudstones, representing the maximum flooding surface. The sandstones are planar-laminated and cross-bedded and contain red *Skolithos* in a red matrix. Several of the beds exhibit shearing of the *Skolithos* burrows (top to the NW). The 1.5m heterolithic succession is overlain by typical Pipe Rock Member before outcrop is lost.

Walk down the bedding plane on the top of the massive bed to rejoin the Allt Sgiathag and return to the lay-by, which is visible ahead. If time permits, it is worth driving northwards over the pass towards Kylesku, where a viewpoint at Newton (Locality 16.10) provides an excellent view down Loch Glencoul and context for the structural position of the Achmore Duplex beneath the Glencoul Thrust.

## References

At all times follow: [The Scottish Access Code](#) and [Code of conduct for geological field work](#)

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