
Loch Ranza, North Newton and Cock of Arran, Isle of Arran

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Geological Society of Glasgow Excursion Itineraries

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(Cover photograph) Permian dune-bedded sandstone southeast of the Cock of Arran. These cross-bedded sandstones bear a close resemblance to those of the Corrie Sandstone member of the Brodick Beds that crop out on the shore between Corrie and Brodick Bay.

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This is a minor revision of Excursion 7: Loch Ranza, North Newton and Cock of Arran. pp. 126–132, published originally in: J.G. MacDonald & A. Herriot (eds), 1983. Macgregor's Excursion Guide to the Geology of Arran. 3rd edition. Geological Society of Glasgow.

Loch Ranza, North Newton & Cock of Arran

The objects of this excursion are:

1. To continue the examination of the Dalradian schists, on the north margin of the north Arran granite mass;
2. To examine the classic unconformity on the shore of North Newton;
3. To study the land-slipped masses at An Scriodan and Permian sandstones and breccias at the Cock of Arran.

Locality 1. Lodge Farm [NR 9386 5059]

There are good exposures of dark-grey, gritty Dalradian schists, dipping northwards at steep angles (up to 50°) at this locality. Note that in passing along the shore towards locality 2 the northerly dip continues for a short distance but at the same time there is a decrease in the grain size of the schists and much small-scale folding and contortion becomes evident. Beyond the axis of the Catacol Synform (Figure 1) the inclination of the schists is generally to the SE.

Locality 2. South Newton [NR 9331 5116]

Here the steep southeasterly inclination is well seen in massive, greenish-grey, gritty schists with some darker slaty layers, all much folded. The rocks closely resemble those exposed on the south shore of Loch Ranza near the pier [close to Coillemore Point]. Boulders of pale grey sandstone, probably of Carboniferous age, are scattered along the shore towards Newton Point. Cowie (1905, 157–158) recorded at this locality the occurrence of a "shoal" or band of rock fragments including types similar to those in the "cairn" at Catacol (locality 5a) but without any of the red shaley crinoidal limestone recorded there.

Locality 3. Newton Point [NR 9308 5152]

Here good examples of graded bedding occur in coarse-grained or gritty beds, inclined to the SSE at angles of 30° to 40°. Along the shore to the NE greenish or greenish-grey micaceous schists crop out.

Locality 4. Hutton's Unconformity [NR 9340 5195]

About 500 m NE of Newton Point is the well known unconformity recognised by James Hutton as long ago as 1787. The locality extends from the Allt Beithe southwards along the shore for over 330m. Reddish and yellowish sandstone, associated with beds of pale-coloured, sometimes nodular cornstone, rests with marked discordance upon the schists (Figure 2). These strata, at one time referred to the New Red Sandstone (sic) were later assigned to the Calciferous Sandstone Series, the lowest subdivision of the Carboniferous succession (Gunn 1903, 52; Tyrrell 1928, 47). It has also been suggested that their lithology would place them more fittingly in the upper part of the Upper Old Red Sandstone. [The variation in colour and the presence of cornstone makes it much more likely that they belong to the Kinneswood Formation, the lowermost sub-division of the Lower Carboniferous in the western Midland Valley of Scotland (see the Corrie Shore excursion).] At the SW end the sandstone beds dip north-northwestward at about 30°, while the underlying schists are inclined to the SSW at angles between 40° and 50°. The schists must have been close to vertical at the time of deposition of the sandstones and cornstones.

The recognition of the North Newton unconformity provides a striking example of Hutton's genius and insight. It was described by him in Volume 1 of his *Theory of the Earth* (1795, 429) and additional details are contained in Volume 3 (1899, 235–236). The following quotation is taken from the latter.

"Here the first thing that occurs is the immediate junction of the inclined strata of schistus and the other strata, which here appear to be a composition of sandstone and limestone; these strata are equally inclined with the schistus but in the opposite direction. These two different types of stratified bodies rise to meet each other; they are somewhat confused at the immediate junction, but some of the sandstone or calcareous strata overlap the ends of the alpine schistus."

Other unconformities recognised by Hutton in Scotland are those in the River Jed, near Jedburgh, and at Siccar Point on the Berwickshire coast. Such examples of discordance in the geological succession were to him convincing evidence of cycles of change in the operations of nature, proofs of a "succession of worlds" following one another throughout geological time. An account of Hutton's life and work was published in volume 63, part 4 of the *Transactions of the Royal Society of Edinburgh* in 1950, in commemoration of the 150th anniversary of his death.

View looking SW towards Loch Ranza. Dalradian schist crops out in the foreground. Above the schist, beds of sandstone dip towards the sea. Careful inspection of the "somewhat confused" rock at the plane of the unconformity reveals evidence that the upturned beds of schist were probably subjected to prolonged sub-aerial weathering prior to the deposition of the Kinneswood Formation.

Locality 5. North Newton Dyke [NR 9380 5225]

Farther along the coast to the NE, towards Rudha Creagan Dubh, the principal rock types are coarse grained, sometimes pebbly schists with prevailing southeasterly dips. The graded bedding seen on many of the rock faces shows, however, that the succession is inverted. In passing note the prominent, NW–SE trending tholeiitic dolerite dyke that crosses the shore immediately to the NE of Allt Beithe.

Localities 6-7. Fairy Dell [NR 9432 5229], [NR 9450 5180]

At the picturesque hollow known as the Fairy Dell the schists end against a fault that separates them from Carboniferous rocks that crop out in a wedge-shaped strip that extends up the Allt Mòr for about 1 km from the shore. The wedge is about 200m wide at the coast but narrows inland. White sandstone and subordinate shale crop out at intervals in the lower part of the burn and at one point on the right bank (locality 7) as reddish limestone with crinoids fragments and ribbed brachiopods including productacean brachiopods. The Carboniferous rocks are bounded on their east side by another fault beyond which Permian sandstones and breccias crop out. On the left bank of the burn, about 460m up from the shore, there is a good example of fault-breccia.

Locality 8 An Scriodan [NR 9454 5232]

To the east of the Fairy Dell the next 200 m or so of shore is occupied by Permian Sandstones and conglomerates. The generally north-northwesterly dip of these beds is approximately the same as the angle of slope of the hillside. The

succession here consists of massive beds of bright red sandstone, cross-bedded and containing intercalations of conglomerate which become more numerous in the upper part. The sandstones and conglomerates closely resemble the Corrie Sandstone (see Corrie Shore itinerary) with which they may be equated. The predominating pebbles (clasts) in the conglomerates are schists of various types, quartzite and vein quartz.

Locality 9 An Scriodan rock falls [NR 9509 5235]

The well-known land-slipped area, An Scriodan, features slipped and fallen masses of Permian sandstone and conglomerate that have covered the raised beach platform for a distance of about 640m. These rock falls, which are associated with deep rents and gashes in the hillside above, are said to have taken place over 250 years ago. Great care should be taken in negotiating this part of the coast.

Locality 10. Cock of Arran [NR 9579 5213]

This is the name given to a large block of sandstone, some 6 m in length and 3–3.5 m in height, resting on the beach. Its upper part has been broken off, but originally, when seen from the sea, it is said to have had a fanciful resemblance to a crowing cockerel. It is situated about 27 m north of a spring near the remains of some old dwellings. Close to the Cock a few Tertiary dykes cut the Permian sandstone. One of these, 1.2m in width, with a northeast–southwest trend, projects above the surface for most of its exposed length.

Locality 11. Base of Permian [NR 9656 5164]

Between Locality 10 and the base of the Permian fine examples of dune bedding and other sedimentary structures characteristic of deposition in an arid environment can be examined (Clemmensen & Abrahamsen 1983). The resemblance of these rocks to the basal Permian in the Corrie area provides justification for their correlation with the Corrie Sandstone. However, the presence of thin layers of fine grained sedimentary rocks with mud cracks and a mud slide breccia provides evidence that the arid desert conditions during which they were deposited were occasionally punctuated by flash floods. The lowermost conglomerate beds in the sequence contain fragments of fossil bearing limestone. The fauna recorded includes corals, brachiopods, gastropods and crinoid columnals. This provides clear evidence that the limestone clasts were derived from the underlying Carboniferous strata that crop out to the east of this locality.

Coal Measures (Upper Carboniferous) strata crop out to the southeast of the Permian unconformity. Gunn (1903) records the occurrence of plant remains (*Calamites*, *Cordaitea*, *Mariopteris*, *Neuropteris* and *Sphenophyllum*) in beds approximately 18m and 66m southeast of the unconformity. The thickness of the Coal Measures here is estimated to be between about 76m and 90.7m the latter from a detailed section by Leitch (1942, 149) who records a 3.7 m thick coarse white sandstone with a quartz conglomerate at the base (cf. the Coal Measures succession at Corrie). The varied sedimentary characteristics of these Coal measures strata point to deposition under deltaic conditions. The prevalence of disturbed bedding, much twisted, contorted and overfolded, is much greater here than at Corrie. This is most likely to have resulted from de-watering associated with the rapid loading of unconsolidated water-saturated deposits by sandy sediments laid down during flood conditions. Another contrast with Corrie is the scarcity of bedded mudstones. The only 'mussel' [non-marine bivalve] shell recorded here by Leitch indicates a horizon low in the *modiolaris* zone, or possibly in the *ovalis* zone.

Locality 12. Corrie Limestone [NR 9656 5164]

The presence of white sandstone with subordinate red mudstone beds marks the change from the Coal Measures into older strata. The presence of the lateral equivalent of the Corrie Limestone at the base indicates that these strata most likely belong to the Lower Limestone Formation. All or most of the Namurian succession appears to be missing so a major non- sequence can be inferred between the Lower Carboniferous and the Upper Carboniferous Coal Measures at this locality. [The Macgregor Guide did not include a description of the Carboniferous rocks that crop out on the shore to the southeast but indicate that a route back to Loch Ranza can be taken via a hill path from Cock Farm to Glen Chalmadale. The following paragraph was added to the third edition of the Macgregor guide (1983.)]

If time permits the excursion may be extended by about 1 km to the SE along the coast to look for the giant myriapod trail preserved in a sandstone bed in the Limestone Coal Group near Laggan (Briggs, Rolfe and Brannan 1979). A replica of the trail, along with a reconstruction of the 1 m long millipede-like *Arthropleura*, which is thought to have made it, can be seen in the Arran Nature Centre at Brodick. The original trail, over 6m in length and 36cm in width, runs east–west across the surface of a sandstone bed that crops out in the old quarry above the remains of the salt-pans harbour north-west of Laggan grid ref. [NR 972 511]. On no account should any attempt be made to collect material here as hammering would only lead to the destruction of this remarkable trace fossil.

On the return journey to Loch Ranza follow the old track that runs from Cock Farm towards locality 13, noting that it crosses the fault line separating the Carboniferous succession from the Dalradian.

Locality 13. SW of Cock Farm [NR 9626 5097]

Near this locality there are scattered outcrops of pebbly grits inclined to the SSW at angles of 30° to 35°. Cross the hillside to locality 14. Between those localities the grits become less coarse and show a transitional junction with the Loch Ranza Slate Group. A similar interbedded junction occurs between localities 14 and 15 [see fig 4, page 23 of third edition].

Locality 14. Old Slate Quarries [NR 9631 5036]

Here there are two old quarries in beds belonging to the Loch Ranza Slate Group. Note that the inclination is now east-northeastwards at about 15°. This change in direction of dip marks the crossing of the axial trace of the Catacol Synform. The rocks that crop out in the old quarries are thin-bedded, mainly fine-grained slates showing pale greenish-grey to dark- grey banding. Some bands, however, are rough and gritty. The slates were worked on a small scale towards the end of the eighteenth century for local use at North Newton and Loch Ranza.

Locality 15. Allt Challean [NR 9552 5059]

Examine sections in the Allt Chailean and beside the track. Strongly cleaved schistose grits are inclined generally at 16° to 20° towards the ENE.

Locality 16. Allt Eadraaidh [NR 9479 5048]

Greenish-grey grits with intercalated slates are inclined to the NE. Good sections occur in the little burn joining Glen Chalmadale from the north, 650 m NE of Ballarie Bridge, as well as in the main stream itself.

Locality 17. Lower Glen Chalmadale [NR 9455 5014]

There are a number of exposures here alongside and above the old track showing banded greenish-grey and grey, gritty and often coarse grained schists inclined to the northeast at angles up to 60°.

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Figures

(Front cover)

(Cover photograph) Permian dune-bedded sandstone southeast of the Cock of Arran. These cross-bedded sandstones bear a close resemblance to those of the Corrie Sandstone member of the Brodick Beds that crop out on the shore between Corrie and Brodick Bay.

(Figure 1) Geological map of the area around Loch Ranza. [This map was published as (Figure 13) in the 1983 edition of Macgregor's excursion guide but a key has been included along with other minor additions. Since publication of the guide in 1983 the stratigraphy of the Carboniferous in the Midland Valley of Scotland has been revised. (see (Figure 2) in the Corrie Shore itinerary for a more extensive up-to-date stratigraphy).]

(Figure 2) Hutton's Unconformity.



(Cover photograph) Permian dune-bedded sandstone southeast of the Cock of Arran. These cross-bedded sandstones bear a close resemblance to those of the Corrie Sandstone member of the Brodick Beds that crop out on the shore between Corrie and Brodick Bay.

Isle of Arran LOCH RANZA, NORTH NEWTON AND COCK OF ARRAN

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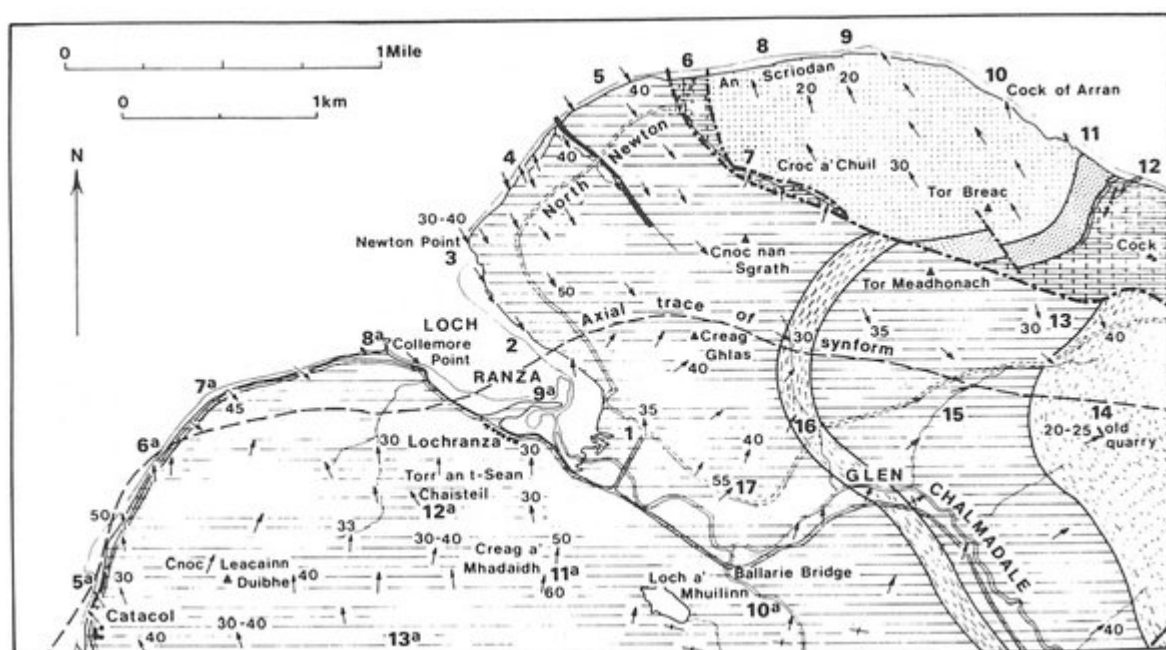
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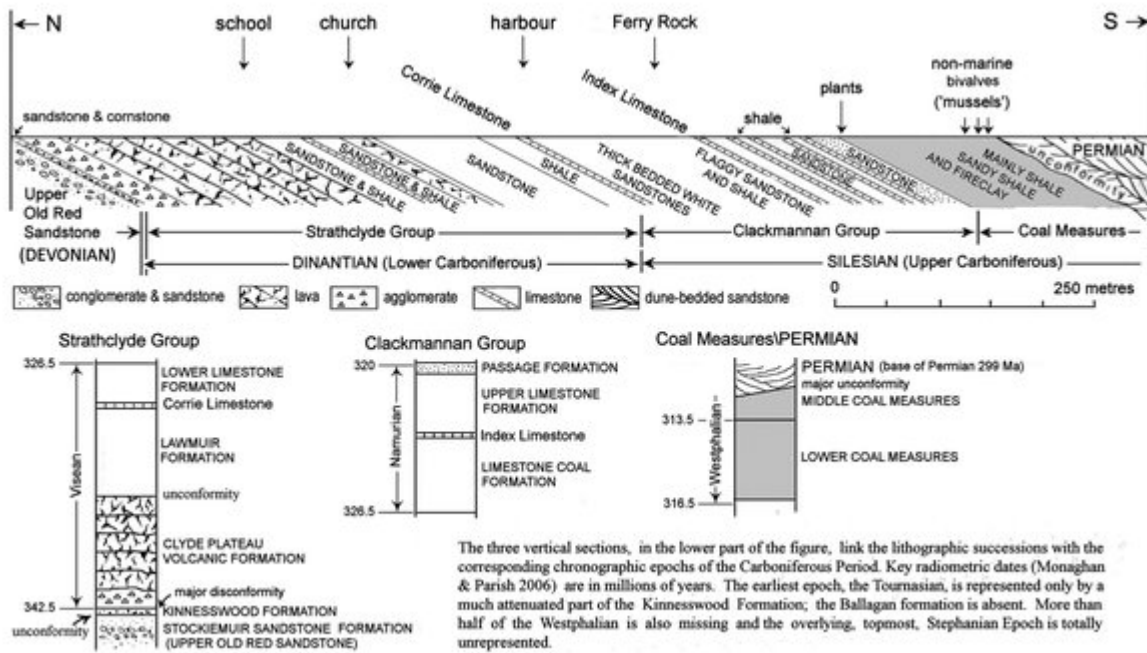
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(Figure 13) Geological sketch-map of the Loch Ranza–Cock of Arran area to illustrate Excursions 8 and 9. For key see Figure 5.



(Figure 2) Diagrammatic cross-section and vertical sections (dates in millions of years) of the succession cropping out along the shore at Corrie. The three vertical sections, in the lower part of the figure, link the lithographic successions with the corresponding chronographic epochs of the Carboniferous Period. Key radiometric dates (Monaghan & Parish 2006) are in millions of years. The earliest epoch, the Tournasian, is represented only by a much attenuated part of the Kinnesswood Formation; the Ballagan formation is absent. More than half of the Westphalian is also missing and the overlying, topmost, Stephanian Epoch is totally unrepresented.