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## Chapter 12 Scotland: Cambrian and Ordovician of the Hebridean Terrane

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### Introduction

The Hebridean Terrane is a fragment of the Laurentian craton and is made up of Archean and early Proterozoic gneiss (Lewisian Gneiss), overlain unconformably by thick unmetamorphosed Torridonian sedimentary rocks of later Proterozoic age. These rocks were peneplaned and formed a broad but shallow marine shelf, upon which a thick Cambrian–Ordovician succession was deposited. In places this succession was later involved in the movements of the Moine thrust zone, probably during later parts of the Ordovician.

The Cambrian rocks form a narrow outcrop, mainly of arenaceous rocks, extending with uniform stratigraphy for nearly 200 km, from Eriboll in the north to Skye in the south (Figure 12.1). Overlying these conformably are Durness Group carbonates of Cambrian to Ordovician age; their outcrop is less continuous than that of the arenaceous beds, partly through erosion and partly because in many places they have been scraped off by the Moine Thrust complex. The Durness Group is most completely preserved in a half-graben at Durness.

There is a long history of research in the region: the complications of the structure defied ready interpretation and led to acrimonious debates during the 19th century. Oldroyd (1990) has given a fascinating account of these, their resolution and the aftermath, together with a list of relevant literature.

The Geological Survey's detailed mapping of the north-west Scottish Highlands, described by Oldroyd (1990, p. 265) as 'one of the outstanding pieces of geological work accomplished in the nineteenth century', formed the basis of all subsequent work. A full account is given in Peach *et al.* (1907), a work that proved so comprehensive that for many years little new research was undertaken on the Cambrian and Ordovician rocks. Pioneer sedimentological studies (e.g. by Swett and Smit, 1972) have been revised and extended by McKie (1990a, 1993). There have been important new studies of the lower parts of the Durness Group (Nicholas, 1994; Wright and Knight, 1995; Huselbee and Thomas, 1998), whilst new work on faunas from the upper parts of the group is valuable for correlation. Fortey (1992) wrote on the trilobites, but much other work is still unpublished; however, Drs D.H. Evans and M.P. Smith have kindly made the results of their work available in advance of publication. Geological guides to various sections have been published, e.g. by Macgregor and Phemister (1972) and Bell and Harris (1986).

The Cambrian–Ordovician succession is of great importance. The uniform and recognizable stratigraphy formed a basis for the mapping and interpretation of what is in general a very complicated and intractable region. The rocks furnish evidence that enables palaeogeographical and environmental interpretations and yield fossils that provide constraints on the geological history of the craton margin and on the timing of movements on the Moine Thrust belt. The faunas are exclusively of warm-water Laurentian type and, having nothing in common with coeval cooler-water faunas in England and Wales, gave some of the first-described and best evidence for the former existence of the barrier to migration known as the Iapetus Ocean.

The stratigraphical succession adopted here is shown in (Figure 12.2). It follows McKie (1990a), except that his 'Lower Member' is replaced by the old name 'False Bedded Quartzite', treated as a member. The principal divisions of the Durness Group (which have been individually mapped) are treated as formations, following Cowie *et al.* (1972), not members.

The fullest stratigraphical succession is seen at Durness and Balnakeil, but the arenaceous basal part is better exposed and interpreted at the historic site at An t-Sròn. The most important fossil localities in the Fucoïd Beds are at Fuaran Mor, where the trilobites are the most complete and varied, and at Loch Awe, where they are the most numerous, if fragmentary. The site at Ord is of special interest because it shows the lateral persistence of the stratigraphical sequence to the south-westerly limit of its exposure.

## References



(Figure 12.1) Distribution of Cambrian and Ordovician rocks in Scotland, showing the general location of key sites.

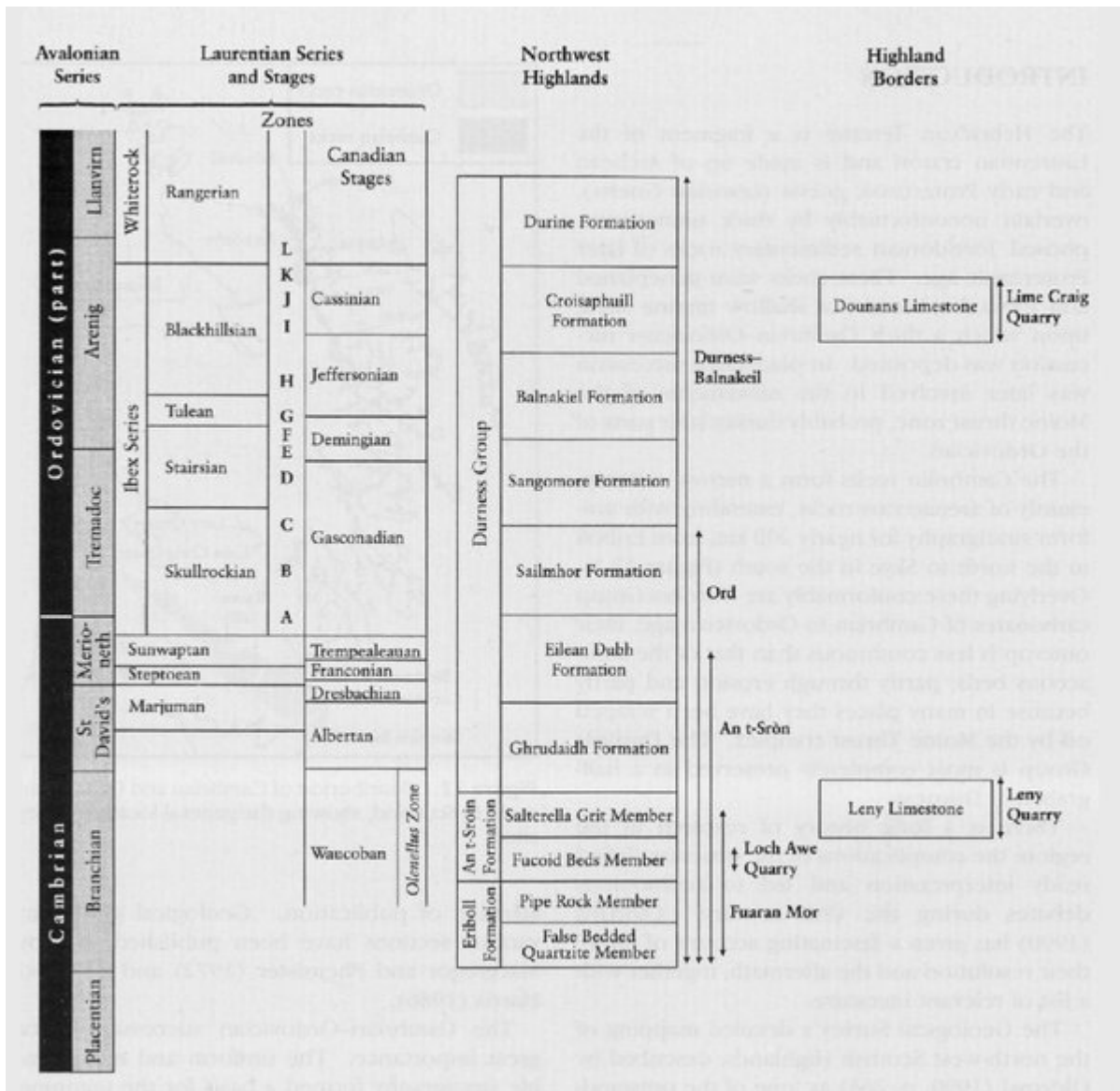


Figure 12.2 Stratigraphical succession in the north-west Highlands of Scotland, correlated with Laurentian (North American) chronostratigraphy; the scheme for the Ibex and Whiterock follows Ross et al (1997), the older stages of the Canadian Series being retained for reference to the succession of cephalopod faunas. The Avalonian standard is also shown for comparison. The Leny and Dounans limestones occur along the Highland Boundary fault complex, and their stratigraphical settings are discussed in the text.