
The Triassic red beds of the Western Highlands and Islands, and Arran

Introduction

There are several Triassic successions on the Western Isles of Scotland that differ from both the Morayshire succession and those of England. Triassic deposits have been identified in small patches along the west coast of the mainland, on the Ardnamurchan and Morvern peninsulas, and at Applecross, Gairloch, Gruinard Bay and Aultbea, and on the islands of Skye, Raasay, Rum, Mull, and Arran (Figure 3.8). Most of these occurrences have been dated as Triassic in age, even if circumstantially, but others (e.g. on Lewis, Islay, and the Kintyre peninsula) are of disputed age, and there are red and buff sandstone formations in the north of Scotland (e.g. at Tongue) that might be Devonian or Permo-Triassic in age.

In the West Highlands and the Hebrides, up to 300 m of mudstones, sandstones, conglomerates, and breccias are termed informally the 'Stornoway Formation' (Figure 3.9), but their age range is almost impossible to determine. Warrington *et al.* (1980) simply assigned a time range through the whole Triassic Period. The succession on Mull is capped by Rhaetian rocks — 10 m or more of Westbury Formation, and about 1.5 m of Lilstock Formation (Lee and Bailey, 1925) representing of the Penarth Group. Elsewhere, the Triassic strata are capped by the Jurassic Blue Lias or Broadford Beds on Skye. The *planorbis* Zone was thought to be absent in the Hebrides, but it has been reported from Mull (Oates, 1978) and probably from Skye (Morton, 1999), where the Triassic–Jurassic boundary may occur in unfossiliferous red-bed sediments — the red-bed succession seems to extend to higher stratigraphical levels in the Skye area. Extensive searches have been made for fossils in all the western Scottish successions, but with minimal success, and those shelly fossils and palynomorphs that have been found have not offered much biostratigraphical information (Warrington *et al.*, 1980, pp. 23–4).

The nomenclature and dating of these red-bed deposits have long been disputed, but more recent studies (e.g. Bruck *et al.*, 1967; Steel, 1971, 1974a,b; Steel and Wilson, 1975; Steel *et al.*, 1975; Nicholson, 1978) have elucidated the sedimentology of the Raasay, Scalpay, Skye, Rum, and Lewis successions in some detail. In all cases, the facies appear similar and indicate deposition in continental alluvial fans and floodplains. This suggests possible contemporaneity of such sequences, and their link to contemporaneous movement of the Minch Fault (Steel, 1971). The succession on Lewis was termed the Stornoway Formation by Steel (1971) and the Camas Malag Formation was established for the unit on Skye by Nicholson (1978), but the latter has since been shown to be Jurassic in age (Farris *et al.*, 1999). Warrington *et al.* (1980, pp. 24–5) rightly urged caution in establishing a formal stratigraphical nomenclature for the area until the relationships of the rocks have been worked out in more detail and evidence of age obtained.

On Arran, a more complex stratigraphy has been erected for the Triassic succession (Figure 3.9). 'New Red Sandstone' was first identified here by Sedgwick and Murchison (1829b). Numerous studies have been published since; the more recent ones include Lovell (1971, 1981), Warrington (1973), Pollard and Lovell (1976), Pollard and Steel (1978), and Astin and MacDonald (1983). Stratigraphical terms derive from the detailed work of Tyrrell (1928), were revised by later workers, and formalized by Warrington *et al.* (1980, pp. 25–6).

The Brodick Breccia, probably late Permian, is overlain by the Lamlash Sandstone Formation and the Glen Dubh Sandstone Formation, which may interdigitate. Both are dated tentatively as Early Triassic since the overlying Lag a'Bheith Formation has yielded miospores (Warrington, 1973) that indicate a Mid Triassic age. This unit, and the succeeding Auchenhew Mudstone, Levenorroch Mudstone, and Derenenach Mudstone formations, are assigned to the Mercia Mudstone Group.

Datable fossils have not been obtained from the group above the Lag a'Bheith Formation, although plant remains and trace fossils have been recorded (Gregory, 1915; Tyrrell, 1928). The trace fossils indicate lacustrine-fluvial conditions (Pollard and Lovell, 1976). In places, indicators of marine influence, such as acritarchs (Warrington, 1973) and pseudomorphs after halite and have also been found in the Mercia Mudstone Group, indicating some similarity with the lower parts of that group in England. Otherwise, the Arran succession is comparable with that of Northern Ireland.

The Derenenach Mudstone Formation is presumably equivalent to the old 'Tea Green Marls', now part of the Blue Anchor Formation in England. Overlying this unit on Arran are black shales and thin limestones with *Rhaetavicula contorta* and other Westbury Formation fossils (i.e. Rhaetian age). The Lilstock Formation is apparently not represented on Arran, nor can the Triassic–Jurassic boundary be detected. The lowest Jurassic succession appears to be absent, the oldest ammonites indicating the *angulata* Zone (Warrington *et al.*, 1980).

It is clearly impractical to include all of the twenty or so isolated patches of Triassic, or possible Triassic, rocks in western Scotland and the Heridean region within the GCR sites. In fact, many of these small outcrops are poorly exposed and were excluded from consideration. However, four with good exposure, and each documenting key aspects of the geology of the British Triassic red beds on the western side of Scotland were selected: Gruinard Bay, Ross and Cromarty; Eyre Burn, Raasay; and Gribun, Mull all illustrate key aspects of the rather extensive, and ill-defined, Stornoway Formation, including its unconformable contact on Torridonian and Moine rocks, its alluvial fan sedimentation, and its palaeosols (cornstones). The King's Cave to Drumadoon section on Arran was selected as the best site for part of the unique Triassic red-bed succession on that island.

[Gruinard Bay, Ross and Cromarty](#)

[The Eyre Burn, Island of Raasay, Skye and Lochalsh](#)

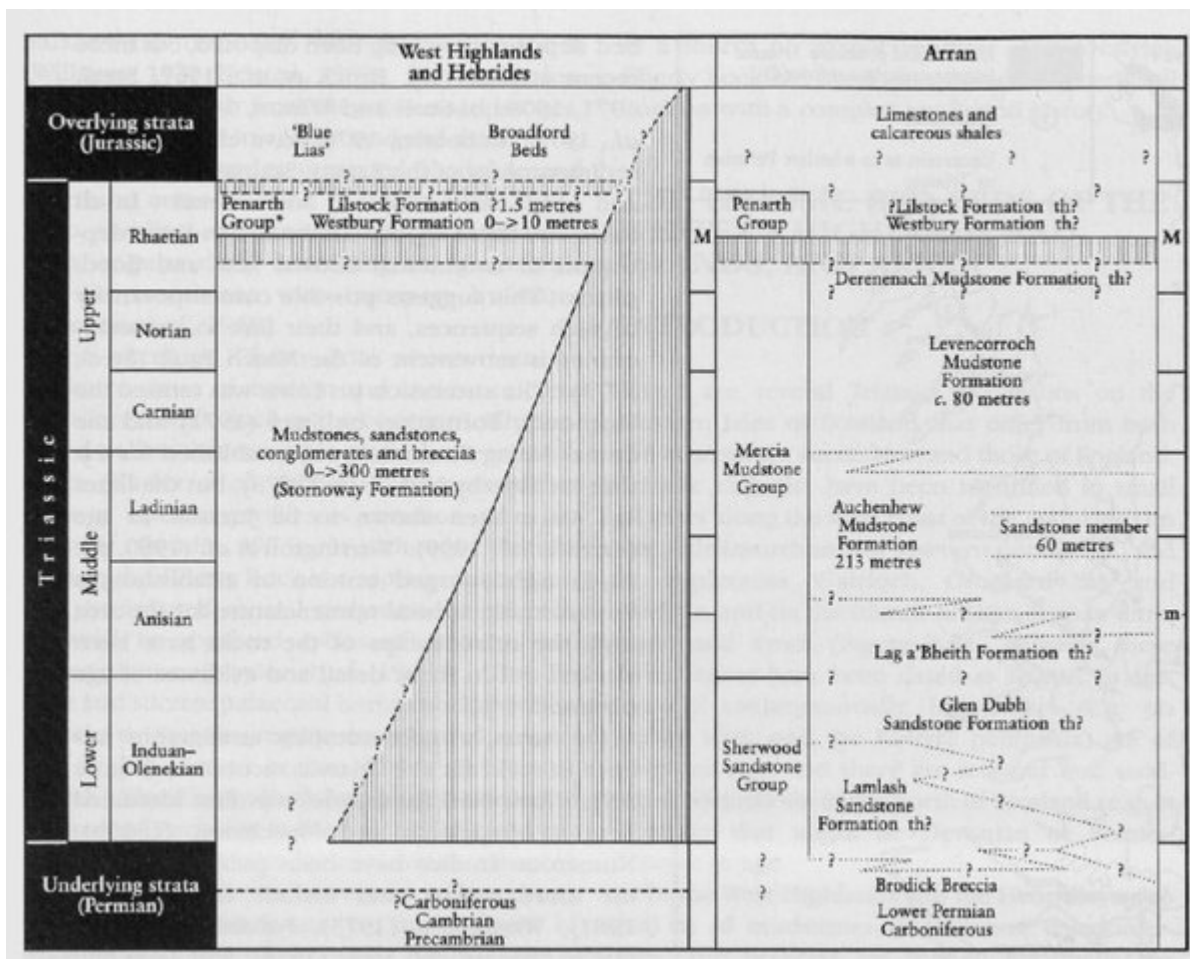
[Gribun Shore and Craggs, Mull, Strathclyde](#)

[King's Cave to Drumadoon, Arran, Strathclyde](#)

[References](#)



(Figure 3.8) 'New Red Sandstone' (including Triassic) outcrops on the west coast of Scotland, the Hebridean islands and Arran. GCR sites are numbered: (1) Grunard Bay; (2) Eyre Burn; (3) Gribun.; (4) Kings Cave to Drumadoon. There are possible occurrences on Islay and the Kintyre Peninsula. (After Warrington et al., 1980.)



(Figure 3.9) Stratigraphical columns for the 'New Red Sandstone' (including Triassic) of the western Highlands, the Hebrides, and Arran. (*The Penarth Group is known only on Mull and Morvern). M, macrofossils; m, microfossils. (After Warrington et al., 1980.)