Glenkiln Burn

[NY 007 894]

Introduction

Glenkiln Burn gives its name to the Glenkiln Shale, the lowest division of the Moffat Shale Group. Besides the Glenkiln Shale, which here contains a diverse fauna of graptolites of the *Nemagraptus gracilis* Zone, Glenkiln Burn exposes one of the best outcrops of the Lower Hartfell Shale of the *Climacograptus wilsoni* Zone and also fossiliferous Silurian strata that date the greywackes of Gala Tectonostratigraphic Unit 7.

About 13 km north of Dumfries, near Townhead, Glenkiln Burn cuts a ravine known as Black Linn, which exposes Moffat Shale and greywackes of the Gala Group. The section is tectonically disturbed and stratigraphical relationships are unclear; however, Lapworth (1878, p. 285) took Glenkiln Burn as the typical exposures of the Glenkiln Shales because they are large and the graptolites from them relatively well preserved, in preference to the section at Berrybush Burn (Finney and Bergström, 1986, pp. 51, 57), where he considered the stratigraphical relationships clearer but where the fossils are poorly preserved.

The Glenkiln Section was redescribed by Peach and Horne (1899), p. 146), the *wilsoni* Zone was studied in detail by Williams (1994), and a brief guide was given by Rushton and Tunnicliff (1996).

Description

The downstream end of the section exposes black Lower Hartfell Shale striking WNW and dipping steeply upstream (Figure 15.6); this contains graptolites of the *clingani* Zone. The beds, which are inverted, are succeeded by grey mudstones with thin black layers that yield well-preserved graptolites of the *wilsoni* Zone (Williams, 1994). These appear to pass down into grey cherty beds referable to the Glenkiln Shale. Upstream from this locality for some 40 m the stream exposes a folded and faulted mass of unfossiliferous grey siltstones, but at the foot of Lambfoot Linn, a small tributary on the north bank of Black Linn, there is a good exposure of black Glenkiln Shales, from which large assemblages of graptolites of the *gracilis* and *peltifer* zones have been recorded (e.g. Lapworth, 1878, p. 305), including *Nemagraptus gracilis* itself (Figure 15.7)a. Farther up Lambfoot Linn are unfossiliferous grey strata that Peach and Horne (1899) compared to the Upper Hartfell 'Barren Mudstones'. Going up the main stream, the bed of Glenkiln Burn exposes a confused section of grey shales and flaggy mudstone for some 50 m, beyond which a large folded mass of black Glenkiln Shales is present on the south bank (Figure 15.6), whence Lapworth (1878, pp. 287, 305) recorded an extensive fauna. Northwards, upstream from this exposure, the course of the burn crosses a faulted mass of Gala greywacke, followed by another exposure of Glenkiln Shale, here faulted against an exposure of Birkhill Shale and a further mass of greywacke. The greywackes are assigned to Gala Tectonostratigraphic Unit 7, and at an exposure some 600 m upstream from the principal locality of the Glenkiln Shale [NY 007 898] a thin fossiliferous bed enables them to be dated as the late Llandovery *guerichi* Zone (probably *gemmatus* Subzone). This is a relatively satisfactory identification of the age of Gala Unit 7 compared with others in south-west Scotland (White *et al.,* 1992).

Interpretation

Southward-directed imbricate thrusting pervades the Southern Uplands of Scotland, and the long strike-faults that extend north-east to south-west are the surface expression of the major thrusts (e.g. Rushton *et al.,* 1996a). The Moffat Shale Group, being tectonically incompetent, commonly forms the plane of decollement above which the more massive greywackes were thrust. This notion explains why the Moffat Shale outcrops lie in linear tracts, why they are so deformed and why, where stratigraphical contacts between Moffat shales and greywackes are found, they are generally only on the north-west side of the outcrop — the south-east side being the major thrust.

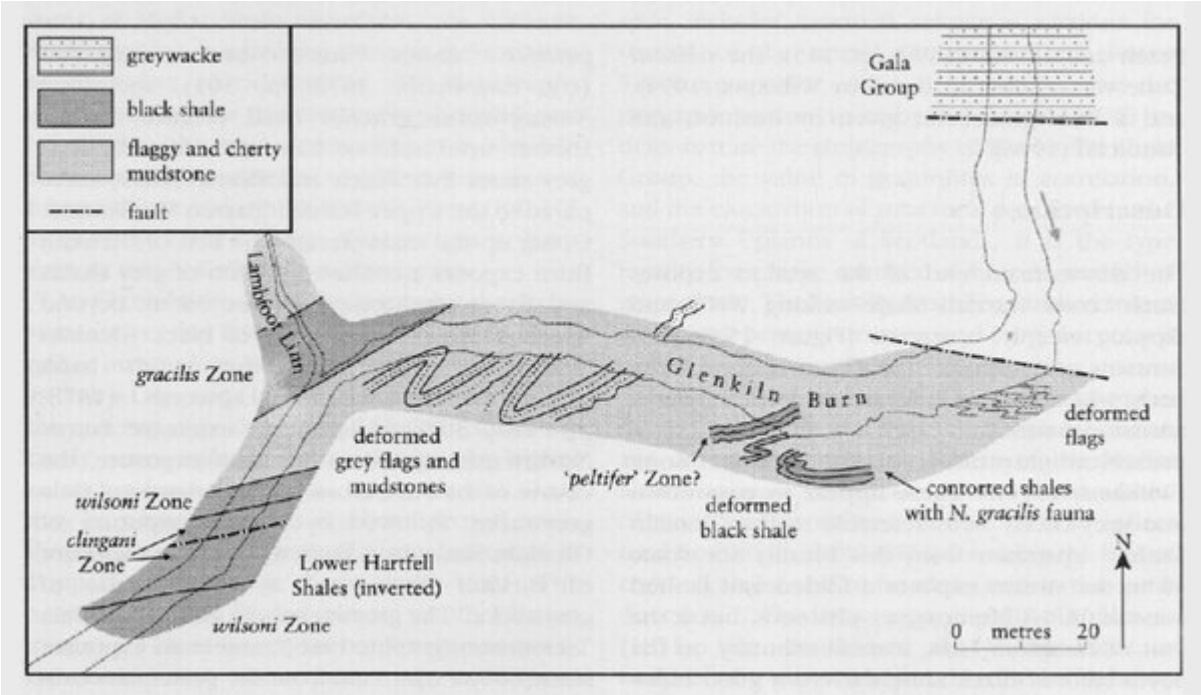
One of these thrusts, the Lauriston Fault, which forms the southern boundary of Gala Tectonostratigraphic Unit 7 (Stone, 1995, pp. 6, 35), crosses Glenkiln Burn at Black Linn. No contact with the Carghidown Formation to the south is seen, and the Moffat Shales are indeed very deformed. Compared with exposures of Moffat Shale elsewhere, the Glenkiln Shale division is extensive, though deformation makes exact elucidation of the stratigraphy impracticable. For this reason Floyd (1996) proposed that the type section for the Glenkiln Shale should be taken, not at Black Linn, but at Lapworth's section in Berrybush Burn [NT 272 193] in the Ettrick Valley. This section is, however, in need of modern redescription.

At Glenkiln Burn the stratigraphical succession above the level of the Glenkiln Shale is rather incomplete, compared with sections such as Dob's Linn and Craigmichan Scaur. However, the outcrop of Lower Hartfell Shale includes the rarely seen *wilsoni* Zone, though its higher zones are faulted out. The Upper Hartfell Shale may be present but has not been proved, even though it is proved by fossiliferous outcrops in Tuppark Linn, 600 m to the south-west. The overlying Birkhill Shales (almost wholly Silurian in age) are likewise very incompletely preserved. However, the occurrence of an upper Llandovery (Telychian) graptolite fauna of the *guerichi* Zone at the north end of the section is valuable for dating the greywackes at the base of Gala Unit 7.

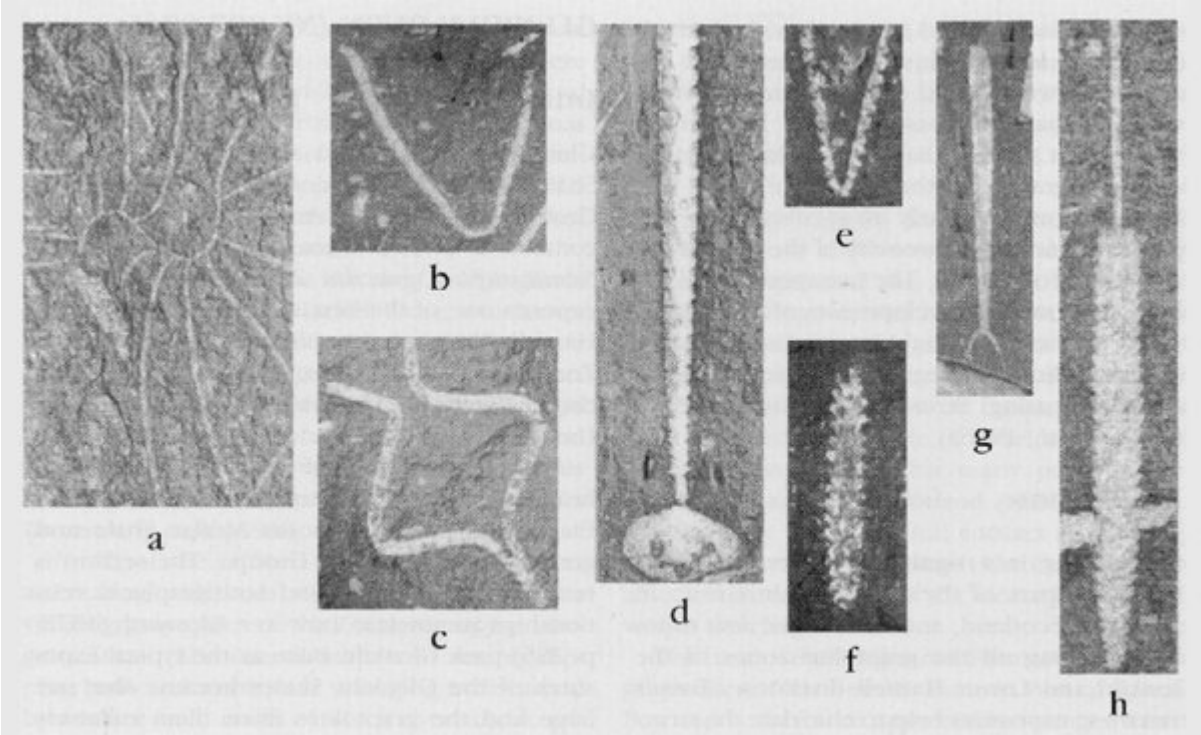
Conclusions

Glenkiln Burn is a historically important site, giving its name to the Glenkiln Shales and containing a diverse graptolite fauna of the *gracilis* Zone. The overlying Hartfell Shales contain well-preserved material of the rarely seen *wilsoni* Zone fauna. Another important graptolite fauna from near the base of the overlying greywacke sandstones dates the Gala Group as Telychian (Silurian, upper Llandovery).

References



(Figure 15.6) Sketch-map of Black Linn, Glenkiln Burn, showing the principal graptolite localities, based on Lapworth (1879a), Williams (1994), and unpublished work by the British Geological Survey.



(Figure 15.7) Graptolites from Glenkiln Burn (a) and Dob's Linn (b-h). All figures x2. (a) Nemagraptus gracilis (Hall), gracilis Zone. (b) Dicellograptus morrisi Hopkinson, clingani–linearis zones. (c) Dicranograptus ziczac Lapworth, peltifer Zone. (d) Climacograptus wilsoni Lapworth, wilsoni Zone. (e) Dicellograptus anceps (Nicholson), anceps Zone. (f) Lasiograptus harknessi (Nicholson), wilsoni Zone. (g) Climacograptus supernus Elles and Wood, anceps Zone. (h) Orthograptus calcaratus (Lapworth) sensu lato clingani–linearis zones.