
Glenaruck

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Highlights

Glenaruck has yielded an important assemblage of Visean plant petrifications that is richest in arborescent lycopsids and ferns, including several endemic species. The plants probably grew in a clastic swamp environment.

Introduction

This Lower Carboniferous locality (Figure 5.31) lies east of a waterfall in Glenaruck Burn, in the Kilpatrick Hills, near Glasgow [NS 452 748]. It was probably discovered by the Geological Survey in about 1870 (Smith, 1960). A petrified *Stigmaria* was collected at the locality in 1872, and the presence of this genus was reported by Young (1873) in a general description of the area. Calcareous nodules (possibly pedogenetic) containing a more diverse petrified flora were collected from the upper part of the sequence between 1930 and 1935 by Robert Brown (Smith, 1960), who also redescribed the locality (Brown, 1935). Plants collected by Brown and presented to John Walton were described by Calder (1935), Lacey (1953) and Smith (1960, 1962c, 1964b). A summary of the assemblage is given by Scott *et al.* (1984), who were unable to relocate the now degraded main petrification-bearing horizon.

Description

Stratigraphy

The 12 m-thick Glenaruck sequence (Figure 5.33) is part of the 'Green tuffs and agglomerates' (the lowest member of the Clyde Plateau Lava Formation), underlain by the 'Spout of Ballagan Sandstone' of the Cementstone Group and overlain by the basaltic Clyde Plateau Lavas (Hall, 1978). Miospores recovered during a recent attempt to date the plant-bearing rocks (Scott *et al.*, 1984) were poor, but appear to belong to the Pu Biozone of the lower Visean (Chadian to Arundian stages). More recently, one of us (RMB) has correlated the entire Glenaruck section lithostratigraphically with the mid-Visean (Arundian/ Holkerian) Unit 5 of the nearby Loch Humphrey Burn sequence.

The sediments consist of siltstones (including reworked volcanigenic material) and shales with thin, often discontinuous coals and abundant, apparently *in situ* rootlets delimiting several palaeosols. They are probably river channel and flood plain deposits, suggesting that the plants represent a local swamp community.

Palaeobotany

This locality is significant mainly for the petrified plant fossils, which include the following species:

Lycopsida:

Paralycopodites brevifolius (Williamson) Morey and Morey

'*Lepidodendron solenofolium* Smith

Lepidophloios kilpatrickense Smith

Lepidocarpon wildianum Scott

Stigmaria ficoides (Sternberg) Brongniart

Equisetopsida:

Protocalamites goeppertii (Solms-Laubach) Bateman

Filicopsida:

Metadineuron ellipticum (Kidston) Galtier

Metaclepsydroopsis duplex Williamson

Botryopteris antiqua Kidston

Lagenostomopsida:

Heterangium grievii Williamson

Lyginorachis brownii Calder

Endoxylon zonatum (Kidston) Scott

Uncertain affinities:

cf. *Mittagia seminiformis* Lignier

In addition, there are adpressions of lepidodendrid twigs' (Smith, 1960); possibly *Lepidophloios kilpatrickensis* Smith, *Stigmara ficoides* (Sternberg) Brongniart, and *Aneimites acadica* Dawson.

Interpretation

The main interest of the site lies in its apparently endemic lycopsid species (Smith, 1962c). '*Lepidodendron solenofolium*' is known from only two specimens, a small twig and a larger branch, both with attached leaves. It is characterized by protostelic axes and leaf cushions with prominent lateral 'wings'. The several known axes of *Lepidophloios kilpatrickensis* are protostelic and range in diameter from 5 to 20 mm. Their leaf cushions are almost equidimensional and approach those of *Lepidodendron sensu lato* in outline. The anatomy of *L. kilpatrickensis* was used by Smith (1962c) to speculate that the primary cortex of these lycopsids remained meristematic for much of the plant's life. This is one of the earliest known diverse assemblages of arborescent lycopsids that show details of the axial anatomy; the ferns too are important. It contrasts with the majority of Lower Carboniferous petrification assemblages, which are dominated by seed-ferns and ferns.

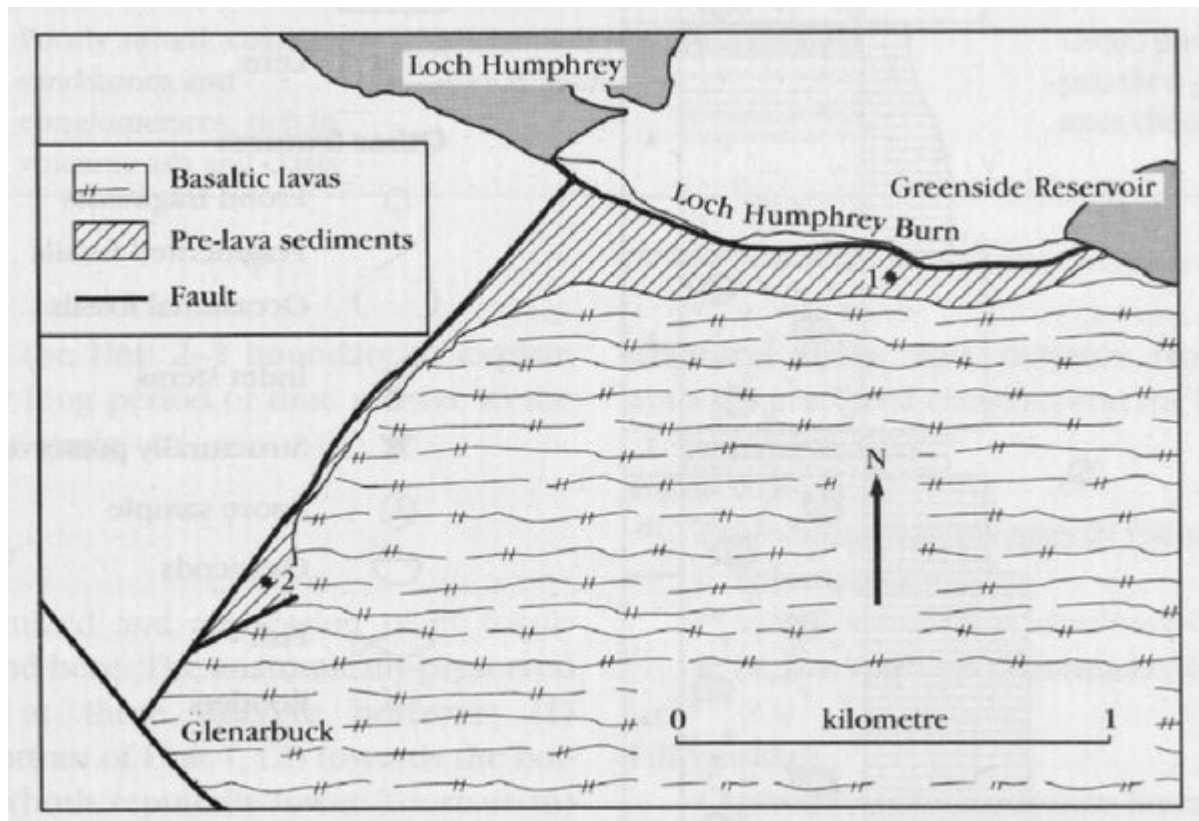
This is the only known locality for the lagenostomalean rachis *Lyginorachis brownii*, which is characterized by a corrugated, 'U'-shaped vascular bundle. Another probable pteridosperm is the petrified axis *Endoxylon zonatum*. It has eight endarch protoxylem strands, and widely-separated, undivided leaf-traces; the secondary wood has narrow tracheids and very small, uniseriate rays (Lacey, 1953). It is associated with the adpression foliage *Aneimites acadica*, although they have not been found in organic connection.

Glenaruck has yielded a small but important amount of palaeobotanical material that is important for showing anatomical details of several early arborescent lycopsids and ferns. It is the type locality for the pteridosperm frond *Lyginorachis brownii* and one of only two known localities for *Endoxylon zonatum*. It is also the only British locality for the enigmatic cf. *Mittagia seminiformis*, a reproductive organ of questionable affinities that was suggested as a possible precursor of the seed plants by Emberger (1968). Palaeoecologically, the site is of interest because it probably represents a swamp community of the same age and depositional environment as the uppermost community found nearby at Loch Humphrey Burn (see previous section).

Conclusion

Glenaruck has yielded an important anatomically-preserved assemblage of plant fossils about 340 million years old. They indicate the presence of about ten whole-plant species, which formed a clastic swamp community that was dominated by lycopsid trees with subordinate seed plants. The lycopsid species, which have only ever been found at this locality, are distantly related to small, herbaceous living plants known as club-mosses. The flora provides an interesting contrast with the main plant-bearing units found at the nearby Loch Humphrey Burn (see previous section), which contain fluviially-transported plant fossils. These communities, which were dominated by seed plants and their immediate progymnospermous ancestors, are thought to immediately pre-date those at Glenaruck.

References



(Figure 5.31) Geological map of area south of Loch Humphrey in the Kilpatrick Hills, showing positions of Loch Humphrey Burn (1) and Glenaruck (2) sites. Based on Scott et al. (1984, figure 5).

