Dunside, South Lanarkshire

[NS 746 362], [NS 752 371]

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Introduction

This composite site is located on Logan Water about five kilometres south-west of Lesmahagow in the Midland Valley of Scotland. It lies within the inlier named after this town, which is the largest of four Silurian inliers in the central part of the Midland Valley, the others being the Hagshaw Hills, Carmichael and Eastfield (see (Figure 2.5)). Devonian and Carboniferous strata surround the inlier. The Silurian at Lesmahagow is disposed into an asymmetrical anticline and comprises sediments of at least Llandovery and Wenlock age, the Dunside site exposing rocks of the Llandovery Series, some 430 Ma.

Murchison (1856), in connection with the arthropod discoveries at Lesmahagow of Robert Slimon, gave some observations on the geology of the area, as did Woodward (1970). Peach and Horne (1899) produced a more detailed account later in the 19th century, in which they specifically referred to the Logan Water exposures that form the Dunside site, and gave lists of fossils that occur there. However it was Jennings (1961), through his mapping of the inlier, who established a modern stratigraphy for it. All subsequent authors who have published on the geology or palaeontology of Lesmahagow, for example Rolfe (1973b, 1992b), Ritchie (1968, 1985), Walton and Oliver (1991), and Dineley (1999a), have used his stratigraphical scheme. Armstrong *et al.* (1995) and Paterson *et at* (1998) also essentially did so in their re-mapping and assessment of the area, but with some refinement of the lithostratigraphy. The environmental and biofacies analysis of the Lesmahagow Silurian by Lovelock (1998) is unpublished.

Dunside is one of relatively many localities in the Silurian of the Lesmahagow, Hagshaw and Carmichael inliers that are notable for yielding a variety of non-trilobite arthropods (see, for example, Currie, 1927; Rolfe 1960, 1962a, 1962b, 1973b, 1992b; Ritchie, 1968; Selden and White, 1983; Siveter, 2000a; Palmer, 2000; Tetlie and Braddy, 2004). Through the collecting of Slimon the site has some historical significance the importance of the arthropods from here being proclaimed at a British Association meeting in Glasgow in 1855 by Murchison — and it has also yielded, at that time in particular, an abundance of specimens which have been subsequently deposited in major Scottish and other museums throughout the world (Rolfe, 1992b). Most of these specimens are eurypterids, which have been studied since the late nineteenth century (see, for example, Salter, 1856, 1859a, 1859b; Woodward, 1864a, 1864b, 1868b;

Waterston, 1960, 1962, 1964, 1979; Kjellesvig-Waering, 1964; Plotnick, 1999). Additionally, a 'synziphosurine' chelicerate, and phyllocarid crustaceans have been described from here (Woodward, 1868a; Jones and Woodward, 1888–1899; Størmer, 1952; Bergstrom, 1975; Eldredge, 1974; Eldredge and Plotnick, 1974; Rolfe and Burnaby, 1961; Rolfe, 1962b).

Dunside also has significance for early vertebrates, and has been selected for inclusion in the GCR volume on fossil fishes (Dineley and Metcalf, 1999).

Description

The Silurian succession of the Lesmahagow Inlier was divided by Jennings (1961) into, in ascending order, Priesthill, Waterhead and Dungavel groups, each comprising various formations and above which are Old Red Sandstone conglomerates and sandstones of Devonian age (Figure 2.11). Paterson *et al.* (1998) introduced the Ponesk Burn Formation for those strata originally comprising the lower part of the Patrick Burn Formation of the Priesthill Group. These authors also slightly changed the boundaries of the Castle, Kip Burn and Blaeberry formations of this group. Additionally, they did not recognize the Passage Formation of Jennings at the base of the Waterhead Group, with the argillaceous strata in the lower part of this formation being re-assigned to the underlying Dunside Formation at the top of the Priesthill

Group, and they arbitrarily took the base of the overlying Waterhead Group at the incoming of red beds into the sequence.

A late Llandovery age is generally accepted for the Priesthill Group, though palynological evidence suggests that beds as old as those of the Patrick Burn Formation, and by Implication all younger formations of the Priesthill Group, may be of Wenlock age (Wellman, 1995; Anderson and Moore, 2004). The Waterhead Group has been assigned to the Wenlock Series, and at least part of the Dungavel Group may belong to the Ludlow Series (Cocks *et al.,* 1992; Wellman and Richardson, 1993; Paterson *et al.,* 1998; Palmer, 2000).

The Dunside site consists of two localities along the stretch of Logan Water that runs between the Logan and the Dunside reservoirs. The first of these is represented by exposures close to the outflow from Logan Reservoir, at Shank's Castle [NS 746 362]; the second is about 600 m downstream, closer to Dunside Reservoir [NS 752 371].

At Shank's Castle both the Castle and the overlying Kip Burn formations crop out. The Castle Formation here comprises massive siltstone turbiditic flow deposits, sometimes over a metre thick, with load and flute casts, interbedded with bedded grey siltstones. It overlies, regionally, the Patrick Burn Formation, the upper part of the latter containing beds that probably lie within the lower part of Ceratiocaris Beds of Peach and Horne (1899; Rolfe, 1973b, 1992b; Armstrong *et al.,* 1995; Paterson *et al.,* 1998). The Kip Burn Formation comprises grey and olive-grey silty mudstones with dark grey carbonaceous siltstone laminae. At Shank's Castle the carbonaceous siltstones at the base of the unit pass upwards from the massive siltstones and mudstones of the Castle Formation. This locality was specifically noted by Peach and Horne (1899) with respect to the *Ceratiocaris*-bearing strata found there, but it is only one of several localities exposing their Ceratiocaris Beds. The lower part of the Kip Burn Formation, then, indudes the uppermost part of their Ceratiocaris Beds.

The Lesmahagow Inlier has some ten species of the phyllocarid *Ceratiocaris* recorded from it. For four of these, *C. angusta* Etheridge, Jones and Woodward, 1886; *C. laxa* Etheridge, Woodward and Jones, 1886; *C. stygia* Salter, 1860; and *C. papilio,* Salter, 1859, the Shank's Castle area probably represents their type locality (Rolfe and Burnaby, 1961; Etheridge *et al.,* 1886). However out of the total of ten species, only *C. stygia* has been regarded as well founded. Other non-trilobite arthropods from Shank's Castle include the eurypterids *Erretopterus* and *Slimonia* and material of the putative phyllocarid *Dictyocaris* (Rolfe, 1973b, 1992b). Also recorded from here, albeit rarely, is the fish *Birkenia elegans.*

At the locality near Dunside that forms part of this site, slightly younger beds than those at Shank's Castle are exposed, belonging to the upper part of the Kip Burn Formation. These are carbonaceous laminated siltstones and they represent the Pterygotus Beds of Peach and Horne (1899; Rolfe, 1973b, 1992b; Paterson *et al.,* 1998). It was from such beds that Slimon amassed his large collection of eurypterids, which are represented (Rolfe, 1973b, 1992b; Plotnick, 1999) by at least the following species: *Pterygotus lanarkensis* Kjellesvig-Waering, 1964, *Slimonia acuminata* (Salter, 1856); *Erretopterus bilobus* (Salter, 1856); *Nanahughmilleria lanceolata* (Salter, 1856), *Carcinosoma scorpioides* (Woodward, 1868), *Paracarsinosoma obesa* (Woodward, 1868) and *Stylonurella spinipes* (Page, 1859) see (Figure 2.12) and (Figure 2.13). The very rare synziphosurine species *Neolimulus falcatus* Woodward, 1868, known from just the holotype and possibly one other specimen (see (Figure 2.14)), and which should probably be referred to *Pseuiloniscus,* is also from Dunside (Bergström 1975; Morris, 1980). This locality appears to stand as the type locality for all these species.

About 1.5 km upstream on Logan Water from the Shank's Castle is the separate GCR site of Birk Knowes, where the sediments belong to the slightly older Patrick Burn Formation of the Priesthill Group. Birk Knowes is internationally recognized for yielding the agnathan *Jamoytius kerwoodi,* together with the thelodont *Logania scotica.* However it has also produced the eurypterids *S. acuminata, E. bilobus, N. lanceolata,* and *Hardieopterus? lanarkensis* Waterston, 1979, the chasmataspid *Loganamaraspis dunlopi* Tetlie and Braddy, 2004, the synziphosurids *Cyamocephalus loganensis* Currie, 1927 and a *Pseudoniscus* species, the phyllocarid *Ceratiocaris papilio* Salter, 1859 and the possible thylacocephalan *Ainiktozoon loganense* Scourfield, 1937 (see Currie, 1927; Eldredge, 1974; Waterston, 1979; Ritchie, 1985; Palmer, 2000; and Tetlie and Braddy, 2004). *Archidesmas loganensis* Peach, 1899, also from here and originally described as a myriapod, was later interpreted as a plant fragment (Almond, 1985; Rolfe, 1980, 1992b, Wilson and Anderson, 2004).

Interpretation

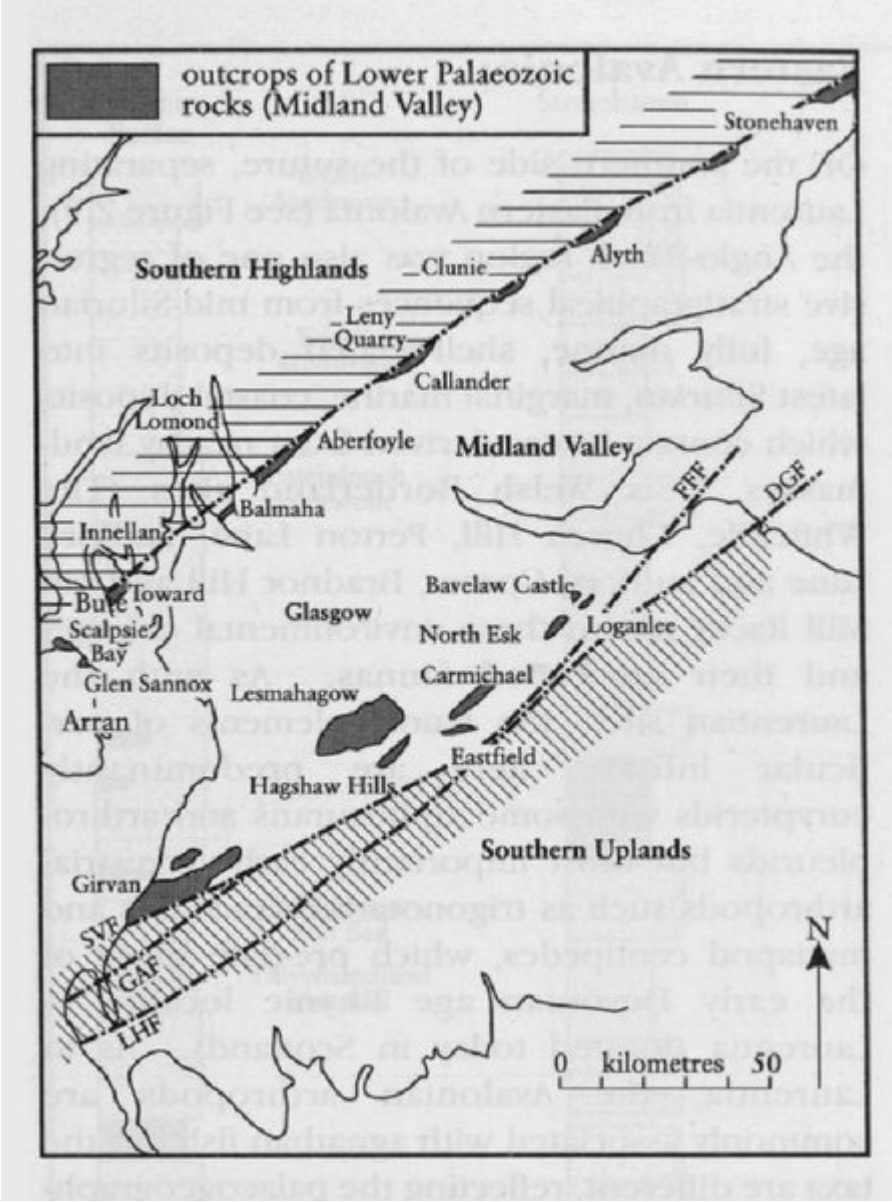
The Priesthill group is fully marine in nature in its lower part (Ponesk Burn Formation) and in its upper part (Patrick Burn Formation) it is restricted marine interrupted by turbidite flows (Paterson *et al.,* 1998). The Waterhead Group, comprising red and purple siltstones and sandstones, is of continental origin. The clastic rocks of this latter group are interpreted as being fluvially derived, except for some within the Dippal Burn and Slot Burn formations that were probably deposited when temporary lakes formed. The Dungavel Group sediments are indicative of stable terrestrial conditions and, at least for the conglomerates and pebbly sandstones at its base, high-energy braided river systems. Thus this succession records, as with almost all other Silurian sequences in the Midland Valley, a major regressive episode from the marine Llandovery through into the non-marine environments of post-Llandovery times. The Girvan area witnessed a slight change to this pattern, as marine conditions persisted there into the early Wenlock.

Dunside has particularly close network links with the other Scottish Siluro-Devonian arthropod sites of Slot Burn, Gutterford Burn and Turin Hill. All of these are rich in eurypterids, though the genera and species in each are mostly different. Dunside also has links with the younger, Ludlow through to P■ídolí Series Anglo-Welsh arthropod sites of Church Hill, Whitcliffe, Ludford Lane and Ludford Corner, Tin Mill Race, Perton Lane, and Bradnor Hill. All of these sites again have important eurypterid faunas that, however, contrast markedly in their composition to that at Dunside.

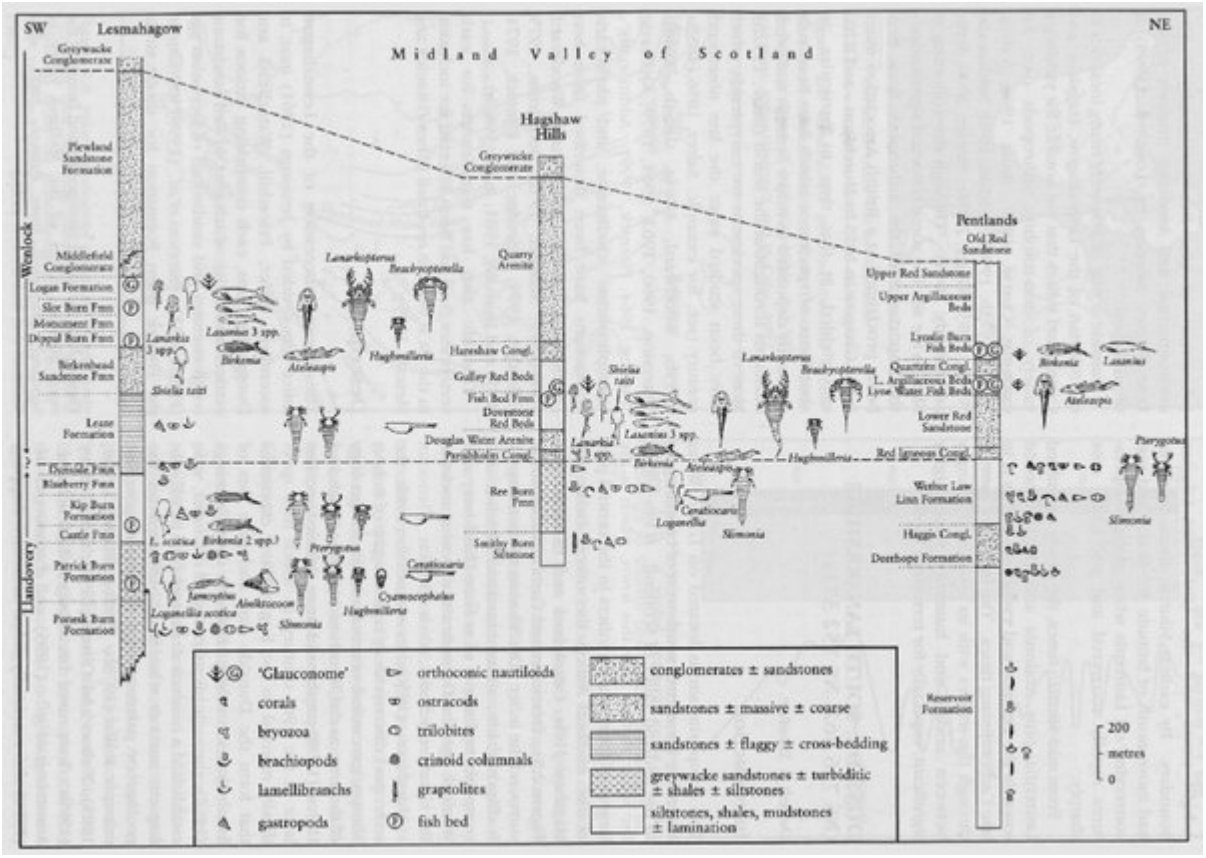
Conclusion

This Lesmahagow, upper Llandovery Series (Silurian) site is particularly rich in eurypterids, for which it probably stands as the type locality for about seven species as well as for a very rare synziphosurine chelicerate and, probably, several species of phyllocarid crustacean. Most of this material was collected in the 19th century, when the site became celebrated through the collecting of Robert Slimon and descriptions from the likes of Salter and Woodward. Specimens from here subsequently found their way to major museums in the UK and abroad. It is a site of very high conservation value.

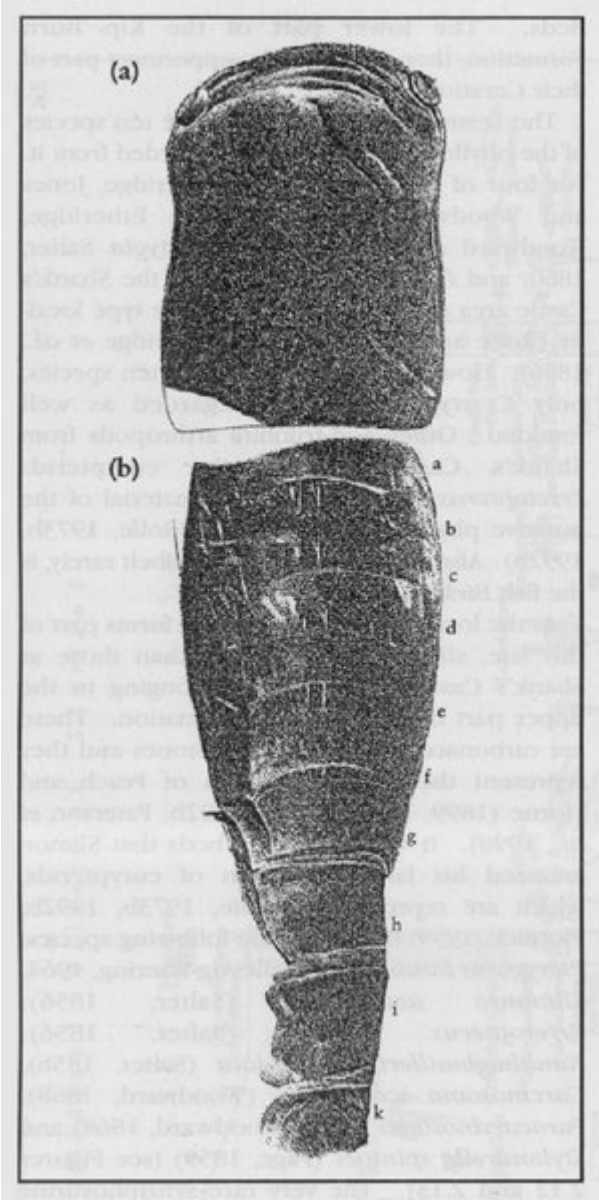
References



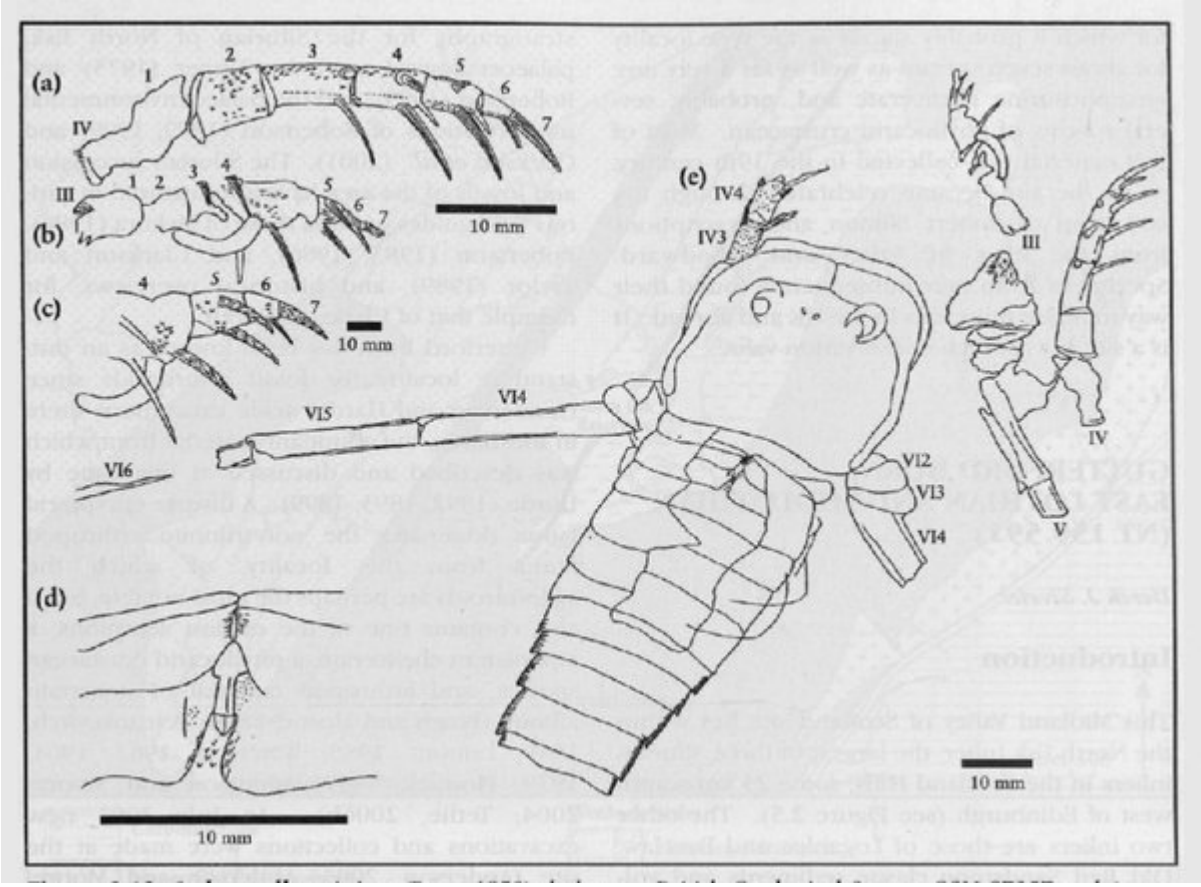
(Figure 2.5) Location of the main Silurian inliers of the Midland Valley of Scotland, and faults. SVF Stinchar Valley Fault; GAF Glen App Fault; LHF Leadhills Fault; FFF Firth of Forth Fault; DGF Dunbar–Gifford Fault; HBF Highland Boundary Fault. (After Palmer, 2000 and Bluck, 2002.)



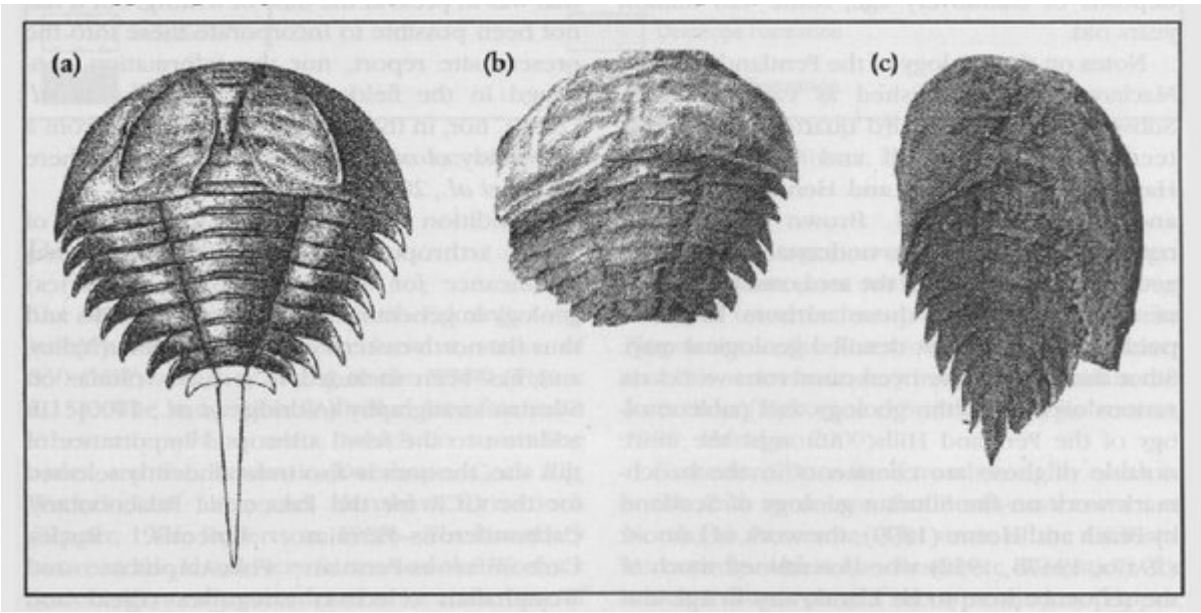
(Figure 2.11) (overleaf) Stratigraphy and faunas of the main Silurian inliers of the Midland Valley of Scotland. (Modified from Palmer, 2000, after Wellman and Richardson, 1993.)



(Figure 2.12) Slimonia acuminata (Salter, 1856); Llandovery Series, Silurian, Lesmahagow inlier. (a) 'Carapace'. (b) 'the body of a smaller specimen; the segments a to f have a small double keel, and are probably thoracic; g, h, and k are probably abdominal rings, and are destitute of these ornaments.' (Lithograph from Salter (1859b, plate 2, figs la and 10.)



(Figure 2.13) Stylonurella spinipes (Page, 1859); holotype, British Geological Survey, GSM 87357 and (counterpart) National Museums of Scotland, NMS 6.1891.32.33; Kip Burn Formation, Priesthill Group, Llandovery Series, Silurian, Dunside, Lesmahagow Inlier. (a) prosomal appendage IV; (b) prosomal appendage III; (c) distal podomeres of prosomal appendage III; (D) median abdominal appendage; (e) holotype, showing disposition of appendages as preserved. (From Waterston, 1979, text-fig. 12.)



(Figure 2.14) Neolimulus falcatus Woodward, 1868; holotype, Natural history Museum, London, In.44122; Kip Burn Formation, Priesthill Group, Llandovery Series, Silurian, Dunside, Lesmahagow Inlier. (a) Reconstruction, x 4 (from Woodward, 1868, plate I, fig. la.) (b) Photograph, dorsal view, x 3.75 (from Bergström, 1975, plate 1, fig. 2). (c) ? N. falcatus, photograph, dorsal view, x 2.8, Natural History Museum, London, In.14724, same horizon and locality as (a) and (b).