
Waulkmill Glen and Rouken Glen, City of Glasgow

[NS 523 584] and [NS 549 580]

Introduction

The Waulkmill Glen and Rouken Glen GCR sites are complementary sites that provide the best representative sections of the Upper Limestone Formation (Arnsbergian) in the Central Coalfield Basin. They lie in the Arden area on the southwest outskirts of Glasgow, 9 km from the city centre and 2.5–5 km east of Barrhead. Rouken Glen [NS 549 580], the valley of the Auldhouse Burn, lies in a public park that was described by Macnair (1906) as the best place in the vicinity of Glasgow to 'acquire a knowledge of the leading principles of geology'. Waulkmill Glen [NS 523 584], in which the exposures are more accessible, runs parallel to Rouken Glen and 1.5 km to the west. The two valleys are entrenched in the southern limb of the Arden Syncline, an important E–W-trending fold structure on the southern margin of the Central Coalfield. Descriptions of the sites, as well as summaries of earlier work, are given by Macnair (1906) and Carruthers and Anderson (1908). McCallien (1938) and Bassett (1958), in excursion guides, and Hinxman *et al.* (1920), Macgregor *et al.* (1925) and Hall *et al.* (1998) also give details of the area.

Description

The two localities provide overlapping, but complementary, sections (Figure 2.31) of part of the Upper Limestone Formation (Arnsbergian). The fullest succession is at Waulkmill Glen, which reveals strata from the Barrhead Grit to the Arden (Calmy) Limestone, including the Lyoncross Limestone and the Orchard Limestones. However, there is a gap in the section where strata between the Orchard Limestones and the Arden (Calmy) Limestone are cut out by a fault. The Rouken Glen exposures provide valuable supplementary outcrops of the missing strata as well as showing clearly their relationship to the underlying Orchard Limestones and Giffnock Sandstones.

The lowest beds exposed at the head of Waulkmill Glen are beds of the Barrhead Grit. These are massive gritty sandstones with bands of white quartzite pebbles that pass up into bedded grits and sandstones. These are overlain by the Lyoncross Coal (0.4 m), which is separated from the Lyoncross Limestone by 4.3 m of sandstone and fireclay with a thin coal. The Lyoncross Limestone is an ochreous-weathering argillaceous limestone, which is in two beds separated by a thin shale parting. The lower bed (0.7 m) is purer than the upper bed (0.3 m) (Macgregor *et al.*, 1925) and has in the past been worked for cement. The chemical characters of the bed have been summarized by Hinxman *et al.* (1920) and the cement produced is recorded to have been fast setting but of low strength (Hinxman *et al.*, 1920; Macgregor *et al.*, 1925; Robertson *et al.*, 1949). The old workings of the limestone and of the Lyoncross Coal, which was used in the calcining of the limestone, are still evident. An unusual feature of the Lyoncross Limestone in Waulkmill Glen as compared to other occurrences to the south and south-west of Glasgow is that it is overlain by a bed of highly fossiliferous mudrock with a very diverse fauna.

Above the Lyoncross Limestone and associated fossiliferous strata there is a thick sequence of bedded sandstones (30 m) with subordinate siltstones and two thin coals. These sandstones are also well exposed in the ravine at Rouken Glen where one of the harder bands forms a prominent waterfall. In both glens they are capped by a thin coal on which rests the Lower Orchard Limestone. This latter bed is an argillaceous limestone (0.3 m) and it is separated from the slightly thinner Upper Orchard Limestone by calcareous shales, which contain abundant fossils only in the upper part close to the upper limestone. Abundant fossils are also found in the shales that overlie the upper limestone.

In Waulkmill Glen there is a gap in the sequence above the Orchard Limestones and then some exposures of dark siltstones and mudrocks outcrop, which are faulted against strata immediately below the Arden (Calmy) Limestone. Although the section in Rouken Glen is also incomplete and, largely because of the presence of a small reservoir, does not extend up to the Arden (Calmy) Limestone, it does show a fine partial section of 20 m of bedded sandstones and sandy siltstones.

The Arden (Calmy) Limestone in Waulkmill Glen is a fine-grained, grey-weathering, argillaceous limestone. The limestone itself is not very fossiliferous, but the overlying shales contain an abundant fauna including productoid and other brachiopods such as '*Dielasma*', *Composita*, *Spirifer* and *Pleuropugnoides*. In addition, gastropods, a range of orthoconic and coiled cephalopods and fish teeth have been recorded (Bassett, 1958). The beds immediately beneath the limestone are no longer well exposed but included two coals about 0.25 m apart, the Upper Arden Coal (0.3 m) and Lower Arden Coal (0.6 m), and fireclays. The shales between these coals and the Arden (Calmy) Limestone were excavated by Macnair (1906) who recognized the presence in them of *Edmondia punctatella*.

Interpretation

Despite prolonged debate about the position of the sequence within the Arden area (Macnair, 1906; Carruthers and Anderson, 1908), the sections of the Upper Limestone Formation at these two sites provide important evidence of the age relationships between the different strata and of their stratigraphical level at the southern margin of the Central Coalfield Basin (Carruthers and Anderson, 1908). The sections also show a number of features that are regarded as typical of the Upper Limestone Formation.

The Barrhead Grit is an unusually coarse sandstone for this region and its base is known locally to erode down to and through the Index Limestone at the base of the Upper Limestone Formation (Carruthers and Anderson, 1908; Macgregor *et al.*, 1925). Elsewhere, this part of the Upper Limestone Formation contains a number of coal, fireclay and sandstone cycles and the Barrhead Grit appears to have been deposited in a major distributory channel complex, which has cut down through these delta-top deposits (Hall *et al.*, 1998). The depth of the channel and the coarseness of the channel fill may indicate some uplift and rejuvenation of the hinterland. The upward passage from the Barrhead Grit into finer bedded sandstones, fireclays and coals shows a return to delta-top cyclic deposition.

The Lyoncross Limestone is the marine phase of the next cycle. Its development is unusual for the local area but not inconsistent with its regional variation in that it is poorly developed in the east and becomes increasingly well developed towards the west (Wilson, 1967). The overlying sandstones show cyclical sequences with sandstones and thin coals. At this horizon in other parts of the Glasgow district these beds are replaced by more massive channel sandstones with erosive bases, which are known as the Giffnock Sandstones and which have made a good and important building stone (Hall *et al.*, 1998).

The marine phase of the next cycle is represented by the Orchard Limestones, which is the best developed marine horizon in the Upper Limestone Formation throughout the Midland Valley (Wilson, 1967). The cycle continues with an upward passage into shales, siltstones and sandstones capped by fireclays and coals indicative of a delta-front to delta-top transition. These are overlain by the marine strata of the next cycle, the Arden (Calmy) Limestone and associated shales, which here, as is typical of the development in the western part of the Midland Valley (Wilson, 1967), contains a diverse fauna. The occurrence of *Edmondia punctatella* at the base of the limestone is a typical character of the limestone throughout the North Ayrshire Basin and the Central Coalfield Basin (Figure 2.1).

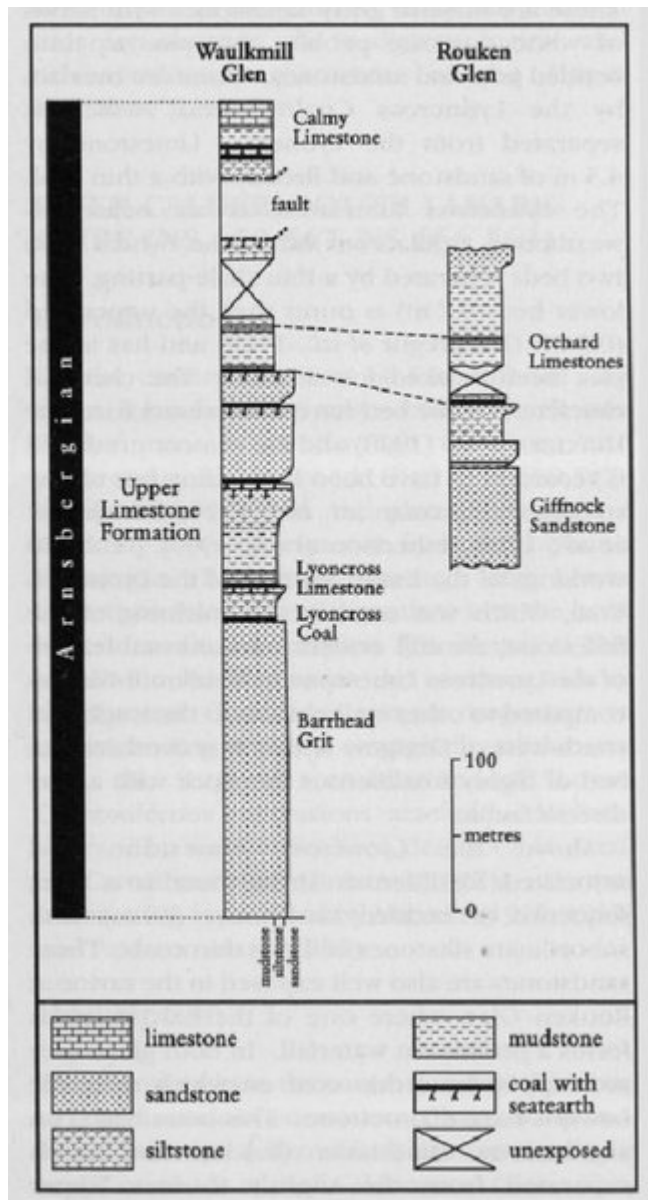
The Arden area has in the past had many quarries and temporary exposures (Macnair, 1906; Carruthers and Anderson, 1908) and both the Lyoncross Limestone and the Orchard Limestones take their names from localities within the basin that are no longer exposed. The Arden Limestone also takes its name from this area, though it is more generally known as the 'Calmy Limestone' throughout the Midland Valley. These long-vanished exposures have in the past provided important sections and a vast amount of faunal evidence. However, because of past controversies as to the exact succession within the basin, it is still difficult to relate all the faunal evidence (e.g. combined faunal lists in Murdoch, 1904; Macnair, 1906) to specific horizons. The Waulkmill Glen and Rouken Glen successions retain the potential to provide more exact faunal information.

Conclusions

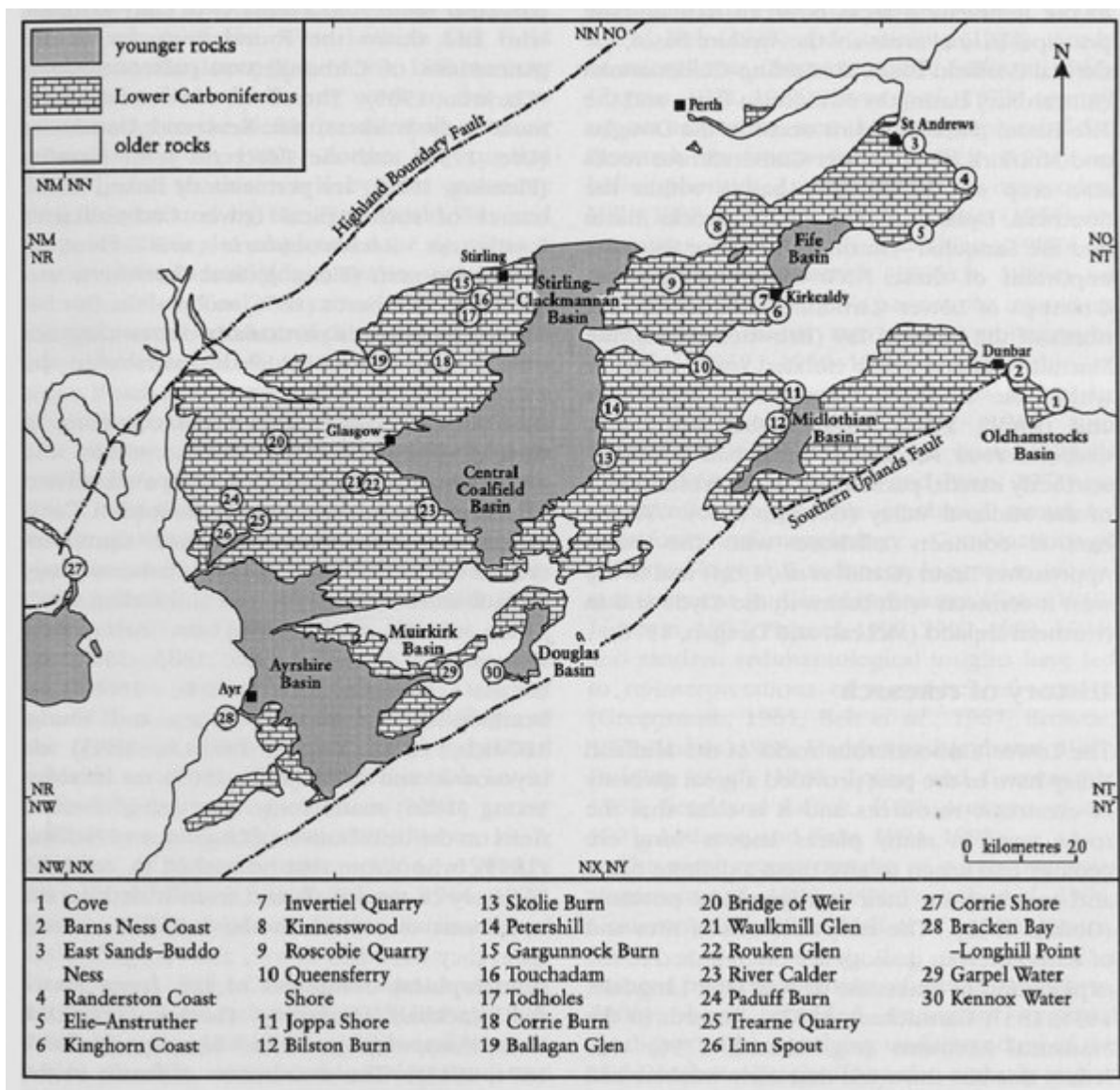
The combined sections of strata at Waulkmill Glen and Rouken Glen provide important details of significant parts of the Upper Limestone Formation (Arnsbergian) in the stratigraphically and historically important Arden area of the Central

Coalfield Basin. They are the best available sites for this interval in the western part of the Midland Valley and essential sites for showing the sedimentological and palaeontological characters of the Upper Limestone Formation.

References



(Figure 2.31) Representative sections of the Upper Limestone Formation (Arnsbergian, Clackmannan Group) from the Waulkmill Glen and Rouken Glen GCR sites. After Carruthers and Anderson (1908).



(Figure 2.1) Geological map of the Midland Valley Basin showing the distribution of Lower Carboniferous outcrops, sedimentary basins and the location of GCR sites described in the text. Based on information from [British] Geological Survey maps of the area (principally Institute of Geological Sciences, 1979a).