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# Polhote and Polneul Burns

## Highlights

Polhote and Polneul Burns (Figure 12.8) provide the best exposed sequences through the lower part of the Sanquhar Coalfield, including outcrops of Tait's Marine Band, the Fauldhead Mussel Band and the Kirkconnel Splint Coal.

## Introduction

These stream sections [NS 688 123]–[NS 691 117], [NS 697 123]–[NS 695 101] extend south from McCrierick's Cairn and Nether Cairn, 4 km west of Kirkconnel, Dumfries and Galloway, Scotland. They expose the Passage Group and the Langsettian and lower Duckmantian parts of the Productive Coal Formation in the Sanquhar Coalfield. A general description of the geology of this area is provided by Simpson and Richey (1936), and details of the field geology of the site can be found in Davies (1970).

## Description

### Lithostratigraphy

The exposed sequence here is about 60 m thick, of which 46 m is Upper Carboniferous (Figure 12.9). The lowest unequivocally Upper Carboniferous stratum is a 2 m thick marine mudstone, known locally as Tait's Marine Band. It overlies a sequence of non-marine mudstones and kaolinitic sandstones of the Passage Group. There is no clear evidence as to the age of these lower beds, but they themselves overlie the Polhote Marine Band which is thought to be Pendleian. It is likely therefore that there is a major non-sequence between the Polhote and Tait's bands, and Davies (1970) implies that it is immediately below the Tait's band.

Above the Tait's Marine Band are about 18 m of mainly mudstones, including two unnamed *Lingula* bands, both of which are underlain by thin coals. At the top of this unit the beds become more sandy.

There follows a non-sequence, and then a 5 m thick sandstone. This sandstone has been identified throughout the coalfield, and on the eastern margins of the coalfield it onlaps directly onto Ordovician strata. The top of the sandstone is marked by a seat earth and thin coal, which is overlain by a lacustrine mudstone, known as the Fauldhead Mussel Band. This mudstone is a laterally persistent stratum throughout the coalfield, and acts as a valuable marker band.

Exposure of the beds above the Fauldhead Mussel Band is poor and discontinuous, but there are probably about 12 m of mainly sandy beds present. There then follows about 12 m of repeated thin coals and seat earths known as the Swallowcraig Coals. These are the stratigraphically lowest coals of any significance in the coalfield. According to Davies (1970), one of the Swallowcraig seams (he does not say which) was worked commercially at Gateside Colliery in the northern part of the coalfield, but that this was discontinued.

Above the Swallowcraig Coals are about 4 m of sandstone, overlain by about 2 m of lacustrine mudstones, and then a 1 m thick coal known as the Kirkconnel Splint Coal. This was the most widely worked seam in the coalfield since, although it is nowhere particularly thick (a maximum of 1.6 m was present at Fauldhead Colliery), it is a good quality, bright coal. Polneul Burn provides the best natural exposure of the seam, where the bands of dull, splinty coal characterizing the upper part of the seam, can be clearly seen.

The roof of the Kirkconnel Splint Coal is normally a 4 m thick sandstone, but here 2 m of lacustrine shale is present between them. Above the sandstone is a thin coal (0.1 m) and then 1.5 m of dark, lacustrine shales. In some other parts of the coalfield, this shale is underlain by a *Lingula* Band, thought to be equivalent to the Queenslie Marine Band. More commonly, however, such as at Polneul Burn, it does not occur and its position has to be inferred from the presence of the immediately overlying lacustrine shales.

Above the level of the Queenslie Marine Band there occur three fining-upwards sequences, comprising a total of about 40 m thick. Each cycle consists of a sandstone at the base, overlain by a seat earth and coal, with a lacustrine mudstone as the roof. The lower two cycles, associated with the Cistern and Parrot coals, are poorly seen here. However, the third, which is associated with the Daugh Coal, is well seen. This marks the top of the sequence as exposed here.

## Biostratigraphy

### Marine bands

Only two marine bands have been positively identified in this section. The lowest is known as the Tait's Marine Band and marks the base of the Productive Coal Formation in this coalfield. There are problems with establishing the age of this band. The palynology (summarized below) suggests that it is lower Langsetian, but the macrofauna suggests that it is no higher than the Kinderscoutian. The latter is based on the presence of calcareous brachiopods identified by Wilson *in* Davies (1970), such as *Schizophoria cf. resupinata* (Martin), which in Central Scotland is unknown above the Kinderscoutian No. 3 Marine Band Group, and are unknown from exposures of the Westphalian marine bands of England (Calver, 1968). Davies (1970) suggested that this may reflect the marginal setting of the Sanquhar Coalfield, allowing a fauna of early to middle Namurian aspect to persist here through to the early Westphalian.

The second band lies 11.6 m above Tait's Marine Band. It in fact consists of two discrete leaves, the lower one only containing *Leaia*, and the upper one *Lingula*.

In other nearby sections in the Sanquhar Coalfield, a third marine band has been identified. It does not contain much more than inarticulate brachiopods, but it is generally taken to be a lateral equivalent of the Queenslie Marine Band of the Central Scottish Coalfield (Brand, 1977). Since this in turn is taken to be equivalent to the Vanderbeckei Marine Band in England, it marks the boundary between the Langsetian and Duckmantian stages. In Polneul Burn, not even the *Lingula* band has been identified, although its position has been inferred from the occurrence of a characteristic non-marine bivalve assemblage in shales overlying the Kirkconnel Splint Coal.

### Non-marine bivalves

This site has proved particularly rich in non-marine bivalves. The lowest assemblage is from the Fauldhead Mussel Band, between Tait's Marine Band and the Swallowcraig Coals. It has yielded *Carbonicola communis* Davies and Trueman, *C. polymontensis?* (Brown), *C. cf. robusta* (Sowerby), *C. cf. pseudorobusta* Trueman and *?Anthracosphaerium dawsoni* (Brown). Such an assemblage belongs to the *C. pseudorobusta* Sub-zone in the upper part of the *C. communis* Zone, thus indicating upper Langsetian.

The next highest assemblage is from mudstones between the Swallowcraig and Kirkconnel Splint coals. This mussel band has been identified over much of the coalfield, but Polneul Burn is reputed by Davies (1970) to be the best exposure. From here have been reported *Anthracosia regularis* (Trueman) and *Carbonicola oslancis* Wright, which would seem to belong to the *A. regularis* Subzone. This indicates the upper Langsetian.

A second *A. regularis* Subzone assemblage has been found from between the Kirkconnel Splint Coal and the level of the Queenslie Marine Band. It includes *A. regularis*, but this time in association with *Anthracosphaerium cycloquadratum* (Wright) and *Anthracosia aff. modiolaris* (Sowerby).

In other parts of the coalfield, a mussel band occurs immediately above the Queenslie Marine Band. In Polneul Burn, the marine band has not been found, but the mussel band is well exposed and yields *A. modiolaris?*, *Anthracosia aff. aquilina* (Sowerby), *A. cf. ovum?* Trueman and Weir and *Anthracosphaerium turgidum* (Brown). This evidently belongs to the *A. ovum* Subzone, and is typical of the bivalves found immediately overlying the Vanderbeckei Marine Band (cf. Cwm Gwrelych–Nant Llyn Fach in South Wales — see Chapter 4).

The highest assemblage is found in mudstones overlying the Daugh Coal. Davies' (1970) list from here includes *Anthraconaia robertsoni* (Brown), *Anthracosia ovum*, *A. cf. phrygiana* (Wright), *Anthracosphaerium affine* (Davies and Trueman), *A. exiguum* (Davies and Trueman) and *Naiadites quadratus* (Sowerby). This is very similar in composition to

the assemblage from immediately overlying the Queenslie Marine Band, and also belongs to the *A. ovum* Subzone.

### **Plant macrofossils**

The only plant macrofossils reported from here are from immediately below Tait's Marine Band. Chaloner *in* Davies (1970) lists from here *Karinopteris acuta* (Brongniart) Boersma, *Sphenophyllum cuneifolium* (Sternberg) Zeiller and *Alethopteris lonchitica* Sternberg. Such an assemblage is not particularly diagnostic, and could be found anywhere between the *Lyginopteris larischii* and *L. hoeninghausii* zones (Arnsbergian to Langsettian).

### **Palynology**

Neves *in* Davies (1970) investigated the pollen and spores from coals a short distance above and below the Tait's Marine Band at Polneul Burn. He found a very similar assemblage in both seams. Biostratigraphically significant species include *Apiculatisporites variocorneus* Sullivan, *Raistrickia fulva* Artuz, *Densosporites marginatus* Artuz, *D. belliatius* Artuz, *Triquitrites variabilis* Sabry and Neves, *Cristatisporites connexus* Potonié and Kremp and *Florinites mediapudens* (Loose) Potonié and Kremp. A similar assemblage was reported by Neves *et al.* (1965) from near the upper Langsettian Bowhouse Bog Coal near Stirling. Neves *in* Davies (1970) also reported a similar assemblage from above the lower Langsettian Listeri Marine Band in Yorkshire. It is thus strong evidence that Tait's Marine Band is Langsettian.

### **Interpretation**

These are the best sections through the lower Westphalian part of the Sanquhar Coalfield, combining generally good exposure and close biostratigraphical control, particularly with the non-marine bivalves. They show most of the key stratigraphical levels within the lower part of the Sanquhar Coalfield succession, including Tait's Marine Band, the Fauldhead Mussel Band and the Kirkconnel Splint Coal.

The site has been particularly important in helping understand the stratigraphical position of Tait's Marine Band, which is taken as the base of the Productive Coal Formation in this coalfield. It was from here that the palynological evidence was obtained, showing that the band is almost certainly Langsettian, rather than mid-Namurian as suggested by the shelly fauna. The apparent discrepancy is thought to be due to the Sanquhar Coalfield being in a marginal position in the Scottish Basin, which allowed a Namurian-like fauna to persist here into the Westphalian.

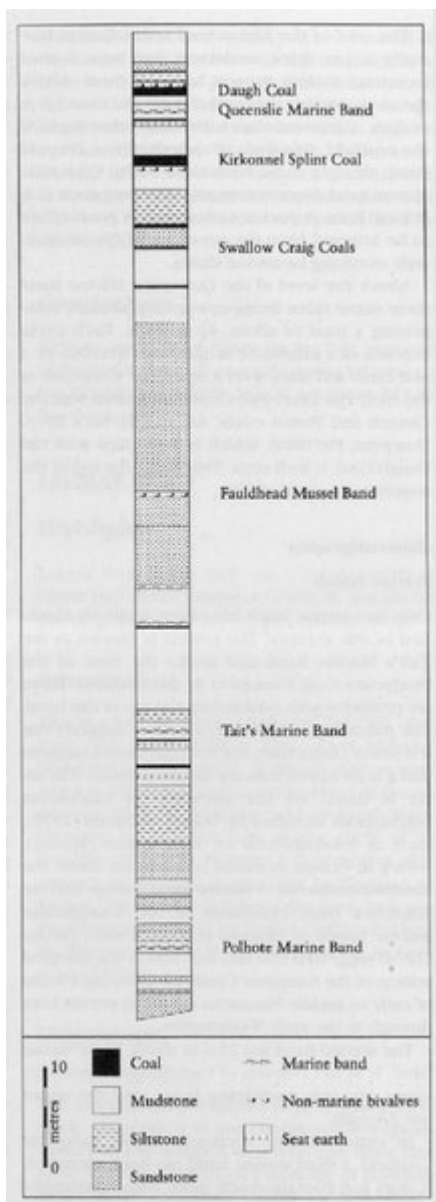
### **Conclusions**

Polhote and Polneul Burns are the best exposures of the lower part of the coal-bearing sequence in the Sanquhar Coalfield, which are about 313 million years old.

### **[References](#)**



*(Figure 12.8) Polhote and Polneul Burns. Polhote Burn, 1.3 km upstream from the junction with the River Nith, showing the basal part of the sequence unconformable on Ordovician strata, and including the Polhote Marine Band. Reproduced by permission of the Director, British Geological Survey: NERC copyright reserved (D1159).*



(Figure 12.9) Upper Carboniferous exposed along the Polhote and Polneul Burns. Based on data given in Davies (1970).