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# Joppa Shore

## Highlights

Joppa Shore (Figure 12.5) is the type and best available exposure of the Roslin Sandstone Formation, the most important sandstone unit in the Namurian of Scotland. It also has the best exposed sequence through the lower Productive Coal Formation of the East Fife–Midlothian Trough.

## Introduction

Foreshore exposures at Joppa [NT 321 734], on the east side of Edinburgh, Scotland, show the Roslin Sandstone Formation and the lower part of the Productive Coal Formation of the Midland Valley of Scotland (Figure 12.6). The best account of the field geology is provided by Peach *et al.* (1910).

## Description

### Lithostratigraphy

Exposed here are 225 m of the Roslin Sandstone Formation, overlain by 120 m of Productive Coal Formation (Figure 12.7). The base of the Roslin Sandstone Formation is placed at the top of a calcareous band known as the Castlecary Limestone, and which is upper Arnsbergian. The exact level of the junction between the Lower and Upper Carboniferous is difficult to ascertain, but is probably about 90 m above the Castlecary Limestone (evidence discussed in the next section).

The lower part of the Upper Carboniferous segment of the Roslin Sandstone Formation consists mainly of mudstones and sandy shales, with only thin sandstone bands. The mudstones include some bands of nodular ironstone, representing brackish marine conditions. At higher levels, sandstone bands become increasingly important, and the top 31 m consists of an interval of cross-bedded sandstones. The entire sequence appears to be the result of the progressive infill of a shallow basin by a prograding delta complex.

The base of the Productive Coal Formation is taken at the Seven Foot Coal, which lies just above the thick, cross-bedded sandstone mentioned in the previous paragraph. It is difficult to see this seam at Joppa Shore, although Peach *et al.* (1910) claimed to have been able to identify its position by comparing the exposed sequence with nearby underground successions. Using similar evidence, they were also able to place the levels of the Four Feet, Fifteen Feet and Nine Feet coals here. The position of the Fifteen Feet Coal in particular they were able to identify by the presence of an ironstone band containing non-marine bivalves which they regarded as characteristic of this stratigraphical level.

The lower 58 m of the Productive Coal Formation here consists predominantly of shales with only thin sandstones. In the upper part of the mainly argillaceous unit, two 60 cm thick coals separated by 1.2 m of seat earth can be seen (in contrast to the lower seams mentioned in the previous paragraph). This seam complex is known locally as the Salters Coal.

The Salters Coal is overlain by 64 m of cross-bedded, fluvial sandstone, with a distinctive brown to purple colour, and marks the highest beds visible here. Towards the top of this sandstone is a 4 m shale band, thought to mark the level of the Greymechan Coal, that has been commercially worked in the vicinity.

### Biostratigraphy

#### Plant macrofossils

Peach *et al.* (1910) mention two plant horizons in the lower Roslin Sandstone. The lower one, lying about 60 m above the Castlecary Limestone, yielded a characteristically Lower Carboniferous assemblage, including *Sphenopteris elegans* Brongniart, *Sphenophyllum trichomatosum* Stur and *Archaeocalamites radiatus* (Brongniart) Stur. Some 80 m above this, Peach *et al.* record another plant bed. No species list was given, but the assemblage is claimed to be Upper Carboniferous in character.

### **Marine bands**

Between these two plant beds, Peach *et al.* (1910) identify three bands of nodular ironstone, which they refer to as Nos 2, 3 and 4 marine bands. However, they are not the same as the marine bands identified using the same names in the Kincardine Basin (Ramsbottom *et al.*, 1978). So far, no details of the fossils found in these bands have been published.

### **Non-marine bivalves**

The Coal Measures of the Midlothian Coalfield are generally poor in non-marine bivalves. The lowest known horizon occurs about 9 m above the Fifteen Feet Coal. It was formerly exposed at Joppa Shore, although it is no longer visible. The shells were initially identified by Peach *et al.* as *Carbonicola robusta* (Sowerby). However, they were subject to a detailed morphometric study by Leitch (1936), who showed that they belonged to the general complex referred to as *Carbonicola communis* Davies and Trueman *sensu lato*. They thus indicate a position in the middle Langsettian.

## **Interpretation**

This is the type and best exposure of the Roslin Sandstone Formation. It clearly shows the characteristic facies of the formation, including both the basinal argillaceous deposits and the fluvial sandstones. There is also potential here for establishing details of the biostratigraphy, although it is in much need of revision.

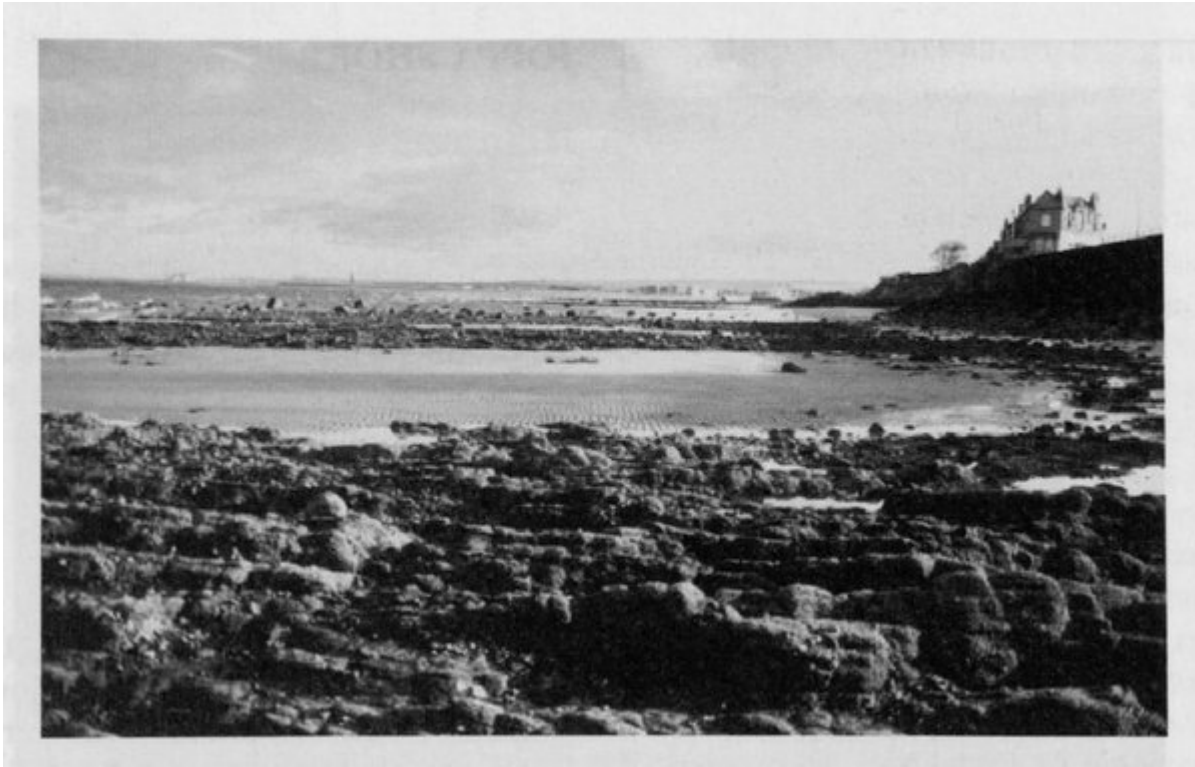
The Roslin Sandstone Formation is the dominant unit of the Passage Group of Scotland. It is thought to reflect increased erosion of the Caledonian Highlands to the north, due to uplift following the collision of the Massif Central micro-plate with the main Laurasia Plate (Dewey, 1982). It would seem to coincide approximately with the flood of deltaic sandstones into the basins of the Central Province in Northern England, such as the Kinderscout Delta (see Chapter 9). However, the relatively weak biostratigraphical control on these Scottish beds needs to be improved before any definitive statement can be given as to their relationship with the English successions.

This is also the best available exposure of the Productive Coal Formation in the eastern part of the Scottish Basin. It represents the deposits formed in a north–south trending trough known as the East Fife–Midlothian 'Basin'. The exposures in Fife have been the subject of some sedimentological investigation (Kirk, 1983), but the Lothian part of the trough has been neglected. Joppa Shore would provide the key locality for looking at this in more detail.

## **Conclusions**

Joppa Shore is the best exposure in Scotland of sandstones of Namurian age (315–320 million years old), known as the Roslin Sandstone. It is also the best site for seeing the lower part of the Productive Coal Formation of the East Fife–Midlothian Trough.

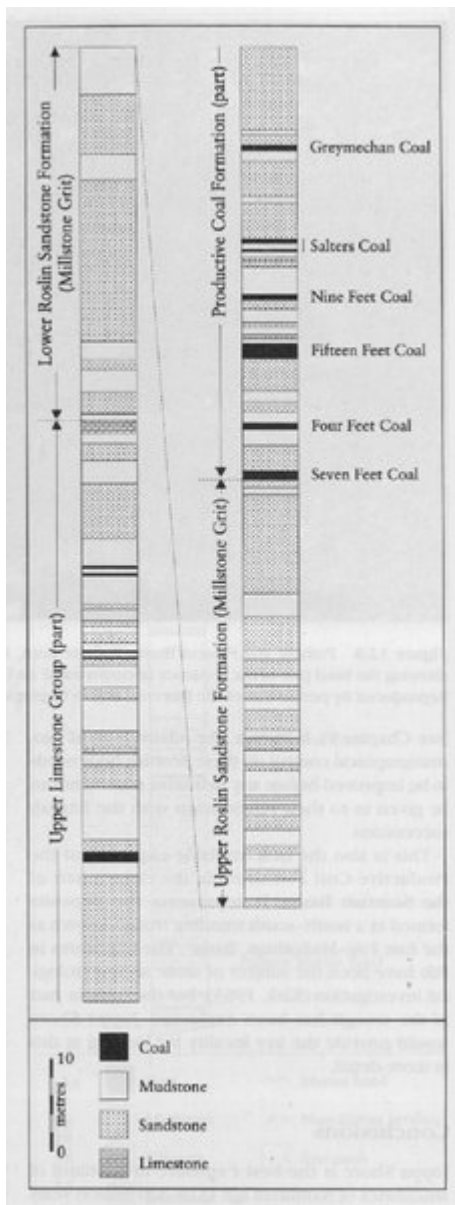
## **References**



*(Figure 12.5) Joppa Shore GCR site, foreshore exposures. (Photo: C.C.J. McFadyen.)*



*(Figure 12.6) Upper Carboniferous sequence exposed at Joppa Shore. (Photo: C.C.J. McFadyen.)*



(Figure 12.7) Exposed Upper Carboniferous beds at Joppa Shore. Based on Peach et al. (1910).