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# Joppa Shore, City of Edinburgh

[NT 321 734]

## Introduction

The Joppa Shore GCR site lies on the south shore of the Firth of Forth, 7 km east of the centre of Edinburgh [NT 321 734]. The easterly dipping succession of the upper part of the Upper Limestone Formation (Arnsbergian) is the best remaining exposure of rocks of this age within the Midlothian Syncline. The sequence passes conformably upwards into younger strata of the Joppa Shore GCR site described by Cleal and Thomas (1996) in the *British Upper Carboniferous Stratigraphy* GCR volume and together these sites provide a composite exposure that is unique within the Midland Valley. The succession has been described by Peach *et al.* (1910) and Tulloch and Walton (1958), and in a guide by Tulloch (in Mitchell *et al.*, 1960).

## Description

The succession of the upper part of the Upper Limestone Formation at Joppa Shore is approximately 175 m thick although some strata have probably been faulted out (Figure 2.20). The basal bed is a massive sandstone which underlies the Wood Coal. Like most of the coals in this section the Wood Coal has been exploited and is no longer exposed. Above, there are sandstones and silty sandstones (12 m) capped by a pale seatearth (Tulloch and Walton, 1958). Overlying this are dark shales and bituminous shales (2 m) with ironstone nodules and fish remains, and these pass up into 3.5 m of shale with a low-diversity marine fauna including *Lingula* and the bivalves *Actinopteria* cf. *persculpta*, *Sanguinolites* cf. *clavatus*, and *Edmondia punctatella*. The last of these species is particularly common in a band 1 m above the base of the shale. The shale coarsens up through 8 m of siltstone and sandy siltstone into a sandstone with silty sandstone layers (7 m). Above this is a shale (1.5 m) with a restricted marine fauna of *Lingula* and several species of thin-shelled epifaunal and infaunal bivalves such as *Cardiomorpha*, *Prothyris* and *Sanguinolites*. The overlying Calmy Limestone (1.3 m), which is separated from this marine band by 1.5 m of siltstone and sandstone, is a crinoidal limestone with gigantoproductid and spiriferoid brachiopods.

There is a gap above the Calmy Limestone that may result from faulting (Tulloch in Mitchell *et al.*, 1960). Above this there are 25 m of sandstones, siltstones, fireclays and a few thin coals. The succeeding part of the succession (c. 40 m) is a variable succession of dark shales, siltstones, sandstones with fireclays and thin coals. A notable feature of this part of the succession is the presence of fossil bands containing *Lingula*, a band containing *Anthraconauta*, and a marine shale and limestone development with the most diverse marine fauna in the sequence; a fauna that includes *Fenestella*, *Antiquatonia* cf. *muricata* and *Pugilis* cf. *pugilis* (Tulloch and Walton, 1958; Wilson, 1967). A band containing *Lingula* also occurs about 3 m above the marine shale. The final 23 m of the succession is dominated by sandstones and seatearths. This is capped by the Castlecary Limestone (3.8 m), which is a shelly crinoidal limestone that marks the top of the Upper Limestone Formation and the boundary of the site.

## Interpretation

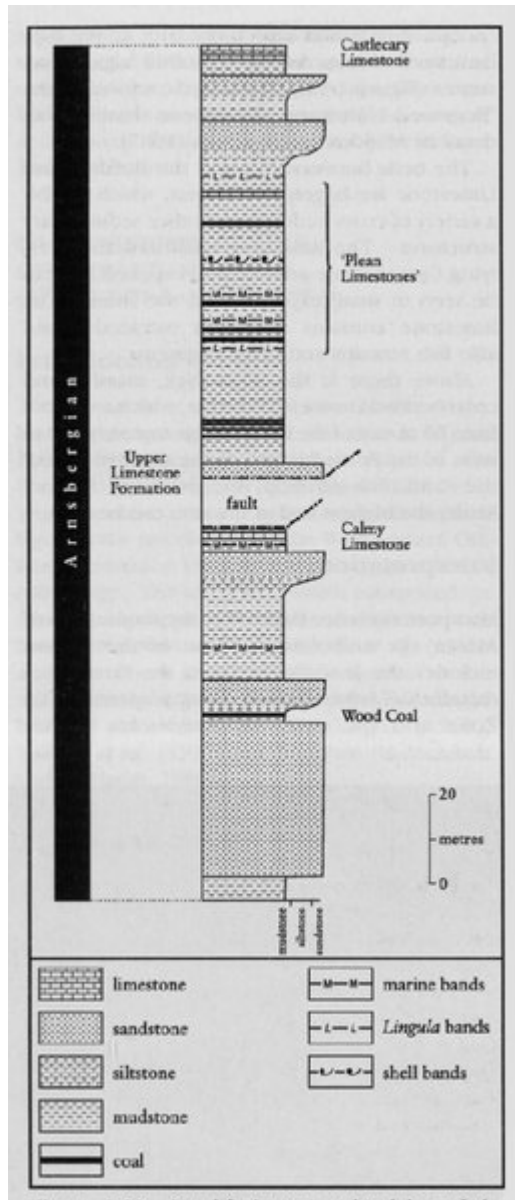
The section is a typical section of the Upper Limestone Formation (E<sub>2</sub>, Arnsbergian) and displays extremely well its component lithologies, including sandstones, siltstones, shales, seatearths and coals. Marine bands are less well developed than in the Lower Limestone Formation but the named horizons can be correlated over long distances. The occurrence of *Edmondia punctatella* in the lower part of the sequence below the Calmy Limestone is a distinctive feature, as is the higher horizon with thin-shelled bivalves (Wilson, 1967). The bands containing *Lingula* and other horizons in the centre of the succession are the equivalent of the Plean Limestones of the Central Coalfield (Tulloch in Mitchell *et al.*, 1960). The marine fauna that occurs towards the top of this part of the sequence is the most diverse marine fauna known from the Plean Limestones or their equivalents in the Midland Valley. The presence of the Castlecary Limestone is particularly interesting as this limestone is absent due to an unconformity throughout most of the Midlothian Syncline

(Tulloch and Walton, 1958). Similar erosional loss of the limestone also occurs in other areas (Wilson, 1967). Thus the site is of vital importance in the detailed correlation of successions of this Namurian (E<sub>2</sub>) age.

## Conclusions

The Joppa Shore GCR site reveals the best section of the upper part of the Upper Limestone Formation (Arnsbergian) in the Midlothian Syncline. In addition to displaying the typical range of strata found in the Upper Limestone Formation it contains distinctive faunas that characterize particularly useful lithostratigraphical marker bands. It is an indispensable site in the network of Lower Carboniferous sequence correlations across the Midland Valley.

## References



(Figure 2.20) Simplified stratigraphical log of the Upper Limestone Formation (Clackmannan Group) succession at the Joppa Shore GCR site. Based on various sources and including information from Mitchell et al. (1960).