

# Passage Formation

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## Passage Formation ([PGP](#)), Carboniferous, Midland Valley of Scotland

Passage Formation is part of the [Clackmannan Group](#).

### Name

Forsyth et al. (1996)<sup>[1]</sup> changed the name Passage Group to Passage Formation. The boundary definitions were unaffected.

### Lithology

The Passage Formation (see Browne et al., 1999, fig. 6<sup>[2]</sup>) is characterised by an alternation of fine- to coarse-grained sandstones (with some conglomerates) and structureless clayrocks (including some high-alumina seatclay, fireclay and bauxitic clay). The clayrocks are commonly mottled reddish brown and greenish grey. Upward-fining cycles predominate over upward-coarsening cycles. Bedded grey and black siltstones and mudstones are also present, and beds of limestone, ironstone, cannel and coal. Marine faunas, diverse and closely spaced at the base, become progressively impoverished upwards. Volcanic rocks also occur.

### Genetic interpretation

Fuviodeltaic ('Millstone Grit') facies.

### Stratotype

The type section of the Passage Formation occurs between 48.95 and 368.15 m depth in the Saltgreen No. 1 Borehole (BGS Registration Number NS98NW/197) (NS 9196 8608), south of

Clackmannan (see Browne et al., 1999, fig.6, col. 6<sup>[2]</sup>).

## Lower and upper boundaries

The base is taken at the top of the Castlecary Limestone (CAS) or at a plane of disconformity where the base is erosive, both underlain by cyclic sedimentary rocks of the [Upper Limestone Formation](#) (Figure 6, Column 4). The top is drawn at the base of the Lowstone Marine Band (LOMB) or a correlative, marking the base of the Scottish Coal Measures Group. It has been suggested (see Read, 1981<sup>[3]</sup>, Read et al., 2002, pp. 281–282<sup>[4]</sup>) that, in the area of greatest thickness, the formation includes up to three major disconformities. These apparently cut out strata of mid Arnsbergian, late Arnsbergian to late Alportian, and Kinderscoutian to Marsdenian age and may include the mid Carboniferous break. In some areas, such as Douglas, two unconformities have been proved.

The Passage Formation also occurs in the Thornhill Basin, where the sandstone facies (including grey, white and pink pebbly sandstone with beds of conglomerate) lie conformably or disconformably on the carbonate and siliciclastic rocks of the late Asbian to Brigantian Closeburn Limestone Formation (Yoredale Group) (Figure 6, Column 6), or unconformably on the mainly sandstone turbidites of the Ordovician Glenlee Formation or Silurian Gala Group. They are overlain by the *fluviodeltaic* ('Coal Measures') facies of the Scottish Lower Coal Measures Formation.

## Thickness

The maximum thickness of the formation is about 380 m in the Clackmannan area of the Central Coalfield (Browne et al., 1985, p. 10<sup>[5]</sup>). Generalised thicknesses were given of 0–50 m on Arran (BGS, 1987a) and 152.5 m in the main coalfield area at Machrihanish (BGS, 1996<sup>[6]</sup>).

## Distribution and regional correlation

Throughout the Midland Valley of Scotland, on the Isle of Arran, at Machrihanish, and in the Thornhill Basin and the western part of the Sanquhar Basin.

## Age and biostratigraphical characterisation

Namurian to Westphalian (Arnsbergian to Langsettian), lower SO to lower SS Miospore zones. Ammonoids are rare. *Anthracoseras glabrum* and *A. paucilobum* of Arnsbergian (E2) age have been recovered from shortly above the Castlecary Limestone (see Currie, 1954<sup>[7]</sup>), and *Homoceratoides* sp. of apparently Kinderscoutian (R1) age has been found probably within the No.3 Marine Band group (Neves et al., 1965<sup>[8]</sup>). Neves et al. (1965)<sup>[8]</sup> located spore assemblages of lower Kinderscoutian (R1), uppermost Marsdenian (R2), by implication Yeadonian (G1), and lower Langsettian (G2) age in the Scottish Namurian and Westphalian, but found no evidence of the Chokierian (H1) or Alportian (H2) stages. The No.2 Marine Band, which is developed in places as a thin, impure limestone (the Roman Cement Limestone) is largely composed of crushed brachiopod valves. The mudstone and ironstone marine bands in the formation have dominantly brachiopods including orthotetoids, *Productus* cf. *carbonarius* and *Schizophoria* cf. *resupinata* and the bivalve *Schizodus taiti* (Wilson, 1967<sup>[9]</sup>). The nonmarine bivalve genus *Curvirimula* is abundant in the immediate roof mudstone of the Castlecary Limestone, which forms the uppermost bed of the Upper Limestone Formation (see above).

## Formal subdivisions

See also Appendix 1. Members of the Passage Formation in ascending stratigraphical order include:

[Troon Volcanic Member \(TVL\)](#)

# References

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