Silsden Formation

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Silsden Formation (SILS), Carboniferous, Northern England Province

Silsden Formation is part of the Millstone Grit Group

Name

The new name Silsden Formation is proposed to identify all Millstone Grit Group strata of Arnsbergian age. Silsden was chosen as the name had been used in the Bradford district for the Silsden Moor Grit Group (Stephens et al., 1953[1]). The base of the Silsden Moor Grit Group was defined at the base of the *Cravenoceras cowlingense* (E2a) Marine Band, but the top of the group was taken as the base of the *Nuculoceras nuculum* (E2c) Marine Band, resulting in part of the Arnsbergian succession falling within the overlying Middleton Grit. The newly defined formation is named after Silsden village (SE 040 470), to distinguish it from the Silsden Moor Grit Group, named after the upland area to the west of Silsden. Silsden Formation supersedes previous terms such as Roeburndale, Ward's Stone Sandstone, Caton Shale, Claughton, Silver Hills Sandstone and Crossdale Mudstone formations, used in the Lancaster district for components of the Silsden Formation (Brandon et al., 1998[2]).

Lithology

Fine- to very coarse-grained pebbly feldspathic sandstone, interbedded with grey siltstone and mudstone and subordinate marine black shales, thin coals and seatearths. The lower part of the formation is dominated by thinly bedded sandstone, siltstone and mudstone forming sharp-based, normal graded beds interpreted to be of turbiditic origin.

Genetic interpretation

The succession is dominated by a great thickness of turbiditic siltstones and thin sandstones with periodic progradation of shallow-water lobate deltas about 10–15.km south into the Central Pennine Basin (Waters, 1999[3]).

Stratotype

Basal exposures at Lister Gill (SE 0091 4946), overlain by interbedded turbiditic sandstone, micaceous mudstone, Marchup Grit, and by dark grey fossiliferous mudstones of the *Eumorphoceras yatesae* and *Cravenoceras edalensis* marine bands occur along Bracken Hill Gill (SE 0304 4686 to 0324 4697) (Addison, 1997[4]).

Lower and upper boundaries

The base is taken at a sharp base of dark grey fissile claystones of the *Cravenoceras cowlingense* Marine Band (E2A1) with a diagnostic eponymous fauna, commonly underlain by a thin, fine-grained, calcareous and phosphatic sandstone of the Pendleton Formation (Figure 9, Column.17; Figure 15, Column 5). Elsewhere the boundary is taken at the base of the first thick quartz-feldspathic sandstone of Arnsbergian age, present above the dark grey, carbonaceous mudstone of the Bowland Shale Formation. It is taken at the base of the Mirk Fell Ironstones in the Stainmore Trough (Figure 15, Column 2) or the top of the Lower Howgate Edge Grit in the northern part of the Askrigg Block.

The top of the formation is taken at the base of the dark grey fissile claystones of the *Isohomoceras subglobosum* Marine Band (ISMB), with a diagnostic eponymous fauna (Figure 9, Column 17; Figure 15, Column 5). Where the marine band is not proven, the boundary is taken at the base of a thick, mid or dark grey mudstone succession, with numerous marine bands of the Samlesbury Formation. It is taken at the top of the Lower Follifoot Grit in the southern part of the Askrigg Block, or the base of a mudstone succession with *Lingula* in the Stainmore Trough.

Thickness

Lancaster 1000.m; Bradford 400.m; Askrigg Block and Stainmore Trough up to 190.m.

Distribution and regional correlation

Craven Basin of north Lancashire and north Yorkshire, between Lancaster (SD 47 61), Pendle Hill (SD 80 41), Skipton Moor (SE 00 50) and Harrogate (SE 30 55). Also present across the southern part of the Askrigg Block, Masham district (SE 29) (Dunham and Wilson, 1985[5]). The formation passes southward into basinal mudstones of the Bowland Shale Formation (Craven Group).

Age and biostratigraphical characterisation

Arnsbergian (E2). The base is taken at the base of the *Cravenoceras cowlingense* Marine Band, and the top at the base of the lowermost *Isohomoceras subglobosum* Marine Band.

Local notes

Laterally impersistent cross-bedded sandstones are present along the northern margin of the Central Pennine sub-basin. Within the southern part of the Askrigg Block, the lower part of the formation is dominated by the Nidderdale Shales, comprising mudstones with common *Sanguinolites*

bands (Wilson, 1977[6]; Dunham and Wilson, 1985[5]; Brandon et al., 1995[7]). In the western part of the Askrigg Block a lenticular sandstone, the Upper Howgate Edge Grit, occurs towards the base of the formation. In the northern part of the Askrigg Block and Stainmore Trough, sandstones (for example, the Fossil Sandstone and High Wood Grit), ganisters (for example, the Kettlepot Ganister), and thin limestones (for example, the Lad Gill Limestone) occur interbedded with mudstones at this stratigraphical level (Figure 15, Columns 2, 3). The middle part of the formation is dominated by the Red Scar Grit (southern Askrigg Block), Pickersett Edge Grit (northern Askrigg Block) and High Wood Grit (Stainmore Trough). These sandstones are typically overlain by a marine succession (the Colsterdale, Shunner Fell (Figure 15, Column 3), Water Crag (Figure.15, Column 2) and High Wood marine bands), which in the southern part of the Askrigg Block are known as the 'Colsterdale Marine Beds'. These are overlain by a mudstone, siltstone and sandstone succession (the Scar House Beds of Wilson, 1977[6]), which, in turn, are overlain by the Lower Follifoot Grit.

Brandon et al. (1995)[7] postulated the presence of an intra-E2a3 unconformity at the base of the Red Scar Grit. The Colsterdale Marine Beds comprise the *Eumorphoceras yatesae* (E2a3), *Cravenoceratoides edalensis* (E2b1) and *Cravenoceratoides nitidus* (E2b2) marine bands (Cooper and Burgess, 1993[8]). The Lower Follifoot Grit is known to be Arnsbergian in age as it is immediately overlain by the *Nuculoceras nuculum* (E2c) Marine Band (Wilson, 1977[6]).

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