
Pus Gill

[NY 696 256]–[NY 704 262]

Introduction

The section in Pus Gill shows the only Onnian strata in the Cross Fell Inlier and is the historical type section for the Pusgillian Stage (Bancroft, 1945). The site is the type locality for several fossil species and is of key importance in the correlation of the Dufton Shale Formation and for the international correlation of the standard British chronostratigraphical units at the Caradoc–Ashgill boundary. Together with Swindale Beck, it was considered 'the best exposure of Pusgillian strata in England' by Burgess and Wadge (1974, p. 23), making it a key reference section. However, as the base of the Pusgillian Stage is faulted here, the stratotype base, and thus the base of the Ashgill Series, is now defined in Foggy Gill in the Cautley district (Fortey *et al.*, 1991).

Nicholson and Marr (1891), used Swindale Beck as the type locality for their 'Corona Series', but Harkness and Nicholson (1877, p. 463) had earlier applied the term '*Discina corona* bed' to a level within this oldest part of the Dufton Shales in Pus Gill, which indeed includes the type locality for the brachiopod *Trematis corona* Davidson (Figure 11.10)a, b.

Dean's (1959a) geological map of the site was refined by Burgess and Holliday (1979), who also assigned to the Onnian some of the strata at the eastern end and middle part of the section that were marked on Dean's map as Pusgillian. Extensive faunal lists were provided in both papers.

Description

The Dufton Shale Formation in Pus Gill dips south-west at 15–25° (Figure 11.11). At the eastern end of the site, the sandy volcanoclastic *corona* facies rests stratigraphically on tuffs of the Borrowdale Volcanic Group, but this boundary is cut by a fault that brings the Borrowdale Group into contact with higher Longvillian and Onnian strata. The *corona* facies extends westwards for some 200 m, with Onnian strata faulted against its north-west edge. About 200 m downstream, beyond a gap in exposure, are Onnian strata that are siltier and more calcareous than the Actonian beds of Swindale Beck (Burgess and Holiday, 1979), though the precise relationship between these two substages is not seen in the Cross Fell Inlier.

The boundary between the Onnian and Pusgillian parts of the Dufton Shales is faulted. The Pusgillian outcrops are cut by numerous strike faults and extend for about 270 m downstream to below Pusgill House, where they are faulted against Silurian shales. The Pusgillian rocks are largely dark bluish-grey shales with impure limestone nodules, but in the lower reaches of Pus Gill, the sandy Billy's Beck Member (see the Harthwaite Sike site report) is developed.

Interpretation

The abundant shelly faunas in Pus Gill enable the recognition and correlation of the important Onnian and Pusgillian parts of the Dufton Shale Formation. Lower horizons of the Onnian yield the trinucleid trilobite *Onnia gracilis* (Bancroft): in Shropshire this has its acme in the middle part of the type Onnian Substage (see the Onny River site report) and is succeeded by the *O. superba superba* Local Range Zone. In Pus Gill, *O. gracilis* is succeeded by *Onnia superba pusgillensis* Dean (1961a), to which Owen and Ingham (1988) accorded full specific status. *O. gracilis* and *O. pusgillensis* occur in the same stratigraphical order in the Cautley and Dent area, facilitating correlation within the north of England. Rushton (in Burgess and Holliday, 1979, fig. 11) assigned a specimen of *Onnia* from the southernmost end of the Onnian outcrop in Pus Gill to *Onnia superba superba* (Bancroft). Re-examination of the specimen indicates that it may rather be *O. superba cobboldi* (Bancroft), the nominate species of the lowest Local Range Zone in the type Onnian. If this identification and correlation are correct, it would be the first direct evidence for the lower part of the Onnian Substage in

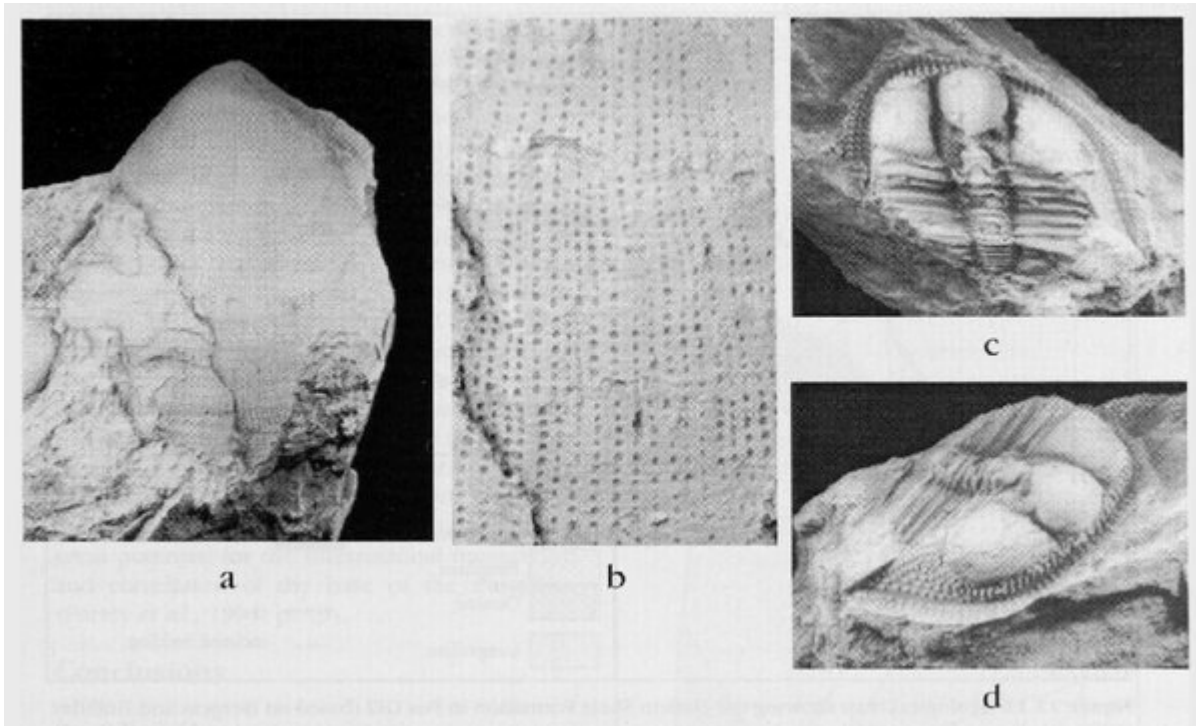
the Cross Fell Inlier.

The Pusgillian strata have several abundant elements in common with the Onnian beds (Burgess and Holliday, 1979, p. 13), but the trinucleid trilobites *Tretaspis duftonensis* Dean (for which this is the type locality), *T. moeldenensis* Cave (Figure 11.10)c, d and *T. convergens* Dean, together with *Atractopyge scabra* Dean and *Gravicalymene jugifera* Dean, give an unequivocal Pusgillian age and allow correlation with strata in the Cautley and Dent districts. As in those districts, the widespread abundance of species of the brachiopods *Onniella* and *Sericoidea* (or *Chonetoidea*) at Pus Gill holds great potential for the international recognition and correlation of the base of the Pusgillian (Fortey *et al.*, 1991, p. 19).

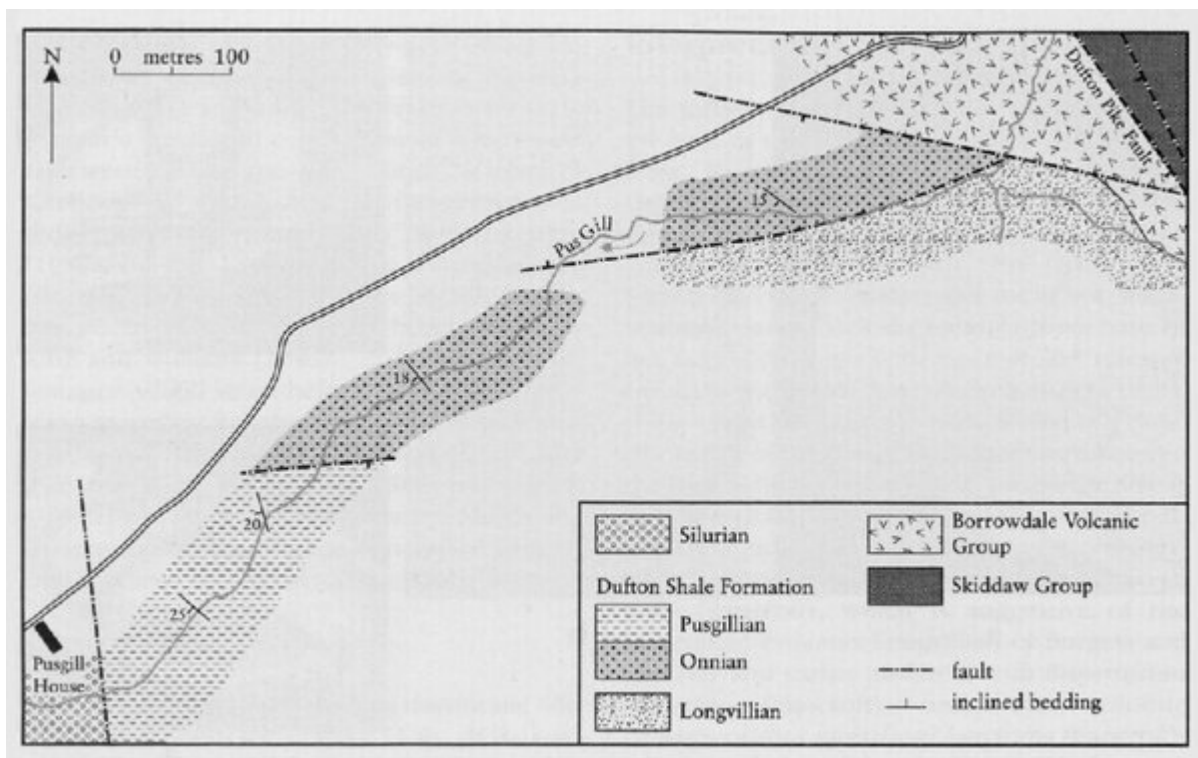
Conclusions

Pus Gill is of key importance in the correlation of parts of the Dufton Shale Formation and for the international correlation of the British Ordovician standard at the Caradoc–Ashgill boundary. The section contains the only strata of Onnian age in the Cross Fell Inlier and is the historical type section for the Pusgillian Stage. It is the type locality for several species of trilobite, some of which are crucial for correlation with sequences elsewhere.

References



(Figure 11.10) Fossils from the Dufton Shale Formation in Pus Gill. (a, b) A brachiopod of the corona facies (Longvillian), *Trematis corona* Davidson, x3, with enlargement of sculpture, x8. (c, d) Two views of the Pusgillian trilobite *Petaspis moeldenensis* Cave (*sensu lato*), x 2.



(Figure 11.11) Geological map showing the Dufton Shale Formation in Pus Gill (based on Burgess and Holliday (1979, fig. 8) and Dean (1959a, fig. 1).