
Onny River

[SO 422 854]–[SO 426 852]

Introduction

This is the type locality for the Actonian and Onnian substages of the Streffordian Stage, for the Acton Scott and Onny formations, and for some 17 taxa of trilobites and brachiopods. The section also contains a mid Actonian bentonite for which fission-track ages have been obtained. The top of the section shows the historic unconformity between the upper Caradoc and the upper Llandovery, the recognition of which was an important factor leading to the establishment of the Ordovician System.

Bancroft (1945) designated the Onny River as the type section of his Actonian and Onnian stages of the type Caradoc Series (Bancroft, 1929a, 1933), and these now form substages of the Streffordian Stage (Fortey *et al.*, 1995). The base of the Actonian, and hence the Streffordian, is not exposed here and its basal stratotype is at Marshwood Quarry (see site report), 4 km to the north-east (Hurst, 1979b). In addition to its national and international importance to chronostratigraphy, the Onny River was the first Ordovician stratotype section to yield a chronometric age: this was obtained from a bentonite in the Actonian part of the section (Ross *et al.*, 1976, 1982) and is thus a global reference point on the chronometric time-scale. The type Onnian rocks are overlain with very slight angular unconformity by the upper Llandovery Hughley Shale Formation. Murchison (1839) overlooked this unconformity when describing his 'Caradoc Formation', but it was subsequently described by Salter and Aveline (1854). The recognition of this unconformity between Murchison's lower and upper Silurian played a fundamental part in Lapworth's (1879a) establishment of the Ordovician System for the lower succession.

The lithostratigraphical terminology applied to the Actonian and Onnian strata in Shropshire was summarized by Hurst (1979b) and further refined by Owen and Ingham (1988). Hurst assigned all but the lowest part of the Actonian strata to the Acton Scott Formation, with the basal stratotypes for its Ragdon and Wistanstow members defined in the section near Oakwood, south of Ragleth Hill [SO 451 908]–[SO 451 906]. Hurst placed the overlying Onnian rocks in the Onny Shale Formation, but Owen and Ingham (1988) reverted to the usage of Bancroft (1929a, 1933), who restricted what he termed the 'Trinucleus' or 'Onnia Shales' to the uppermost part of the Onnian Stage. Owen and Ingham advocated the use of the term 'Onny Formation' for this unit and reassigned the underlying Onnian strata to the Wistanstow Member of the Acton Scott Formation.

The type Actonian and Onnian are locally richly fossiliferous, especially with brachiopods (Hurst, 1979a, b) and trilobites (Dean, 1960, 1961b, 1963a, b; Owen and Ingham, 1988), 17 species or subspecies having their type locality here. Other taxa include ostracods (Jones, 1986–1987), conodonts (Savage and Bassett, 1985), acritarchs (Turner, 1982, 1984), chitinozoans (Jenkins, 1967), annelids, bivalves, gastropods, monoplacophorans, cephalopods, bryozoans and fragmentary graptolites. Hurst (1979a) undertook palaeoecological analysis of the faunas, and Lockley (1983) further analysed them in the context of Llanvirn and Caradoc palaeoecology of the whole Welsh Basin. Descriptions of the Actonian and Onnian of the Onny River section are given by Greig *et al.* (1968) and by Toghill (1992). Savage and Bassett (1985, fig. 3) gave a geological map of the Onny Valley that puts the section in its immediate stratigraphical context ((Figure 10.18) herein).

Description

The Actonian and Onnian rocks in the Onny section dip south-east at 22–25° and are exposed discontinuously in the banks and bed of the river (Figure 10.18). It is clear from the literature that erosion, changing vegetation cover and shifting patterns of river sediment have influenced the parts of the section available to workers over the years. The lowest part of the Actonian currently (1997) exposed comprises bioturbated siltstones of the Ragdon Member, though most of this unit is not exposed.

Immediately east of where the river turns almost due east, this member is overlain by blocky grey bioturbated siltstones, some of which are calcareous and contain limestone nodules. These belong to the Wistanstow Member, 70 m thick, and are best seen on the south bank of the river in a cliff 50 m west of Batch Gutter. About 2.5 m of the Wistanstow Member crops out in this cliff, including two orange-weathering bentonites 8 cm and 5 cm thick separated by 12 cm of silty mudstone. The higher and thicker of these bentonites, known as Jack Slither (Bancroft, 1949), has yielded a zircon fission-track age of 468 ± 12 Ma and an apatite fission-track age of 464 ± 21 Ma, giving an average value of 466 ± 15 Ma (Ross *et al.*, 1982).

The Wistanstow Member continues downstream and extends well into the Onnian, where the dark, rubbly calcareous siltstones bear a stronger similarity to the underlying upper Actonian strata than to the shales and blocky mudstones of the upper 15 m of the Onnian (Owen and Ingham, 1988). The base of the Onnian is defined on the first occurrence of the trinucleid trilobite *Onnia superba cobboldi* (Bancroft) in the northern bank, about 30 m to the east of Batch Gutter (Dean, 1963b, p. 8; Owen and Ingham, 1988, fig. 1). The Wistanstow Member continues downstream for some 70 m (about 31 m stratigraphical thickness), and at about 7 m from its summit, a layer of phosphatic nodules may represent an episode of reduced sedimentation rate. The base of the lower part of the overlying Onny Formation is marked by about 5 m of laminated blue-grey mudstone and is overlain by 10 m of blocky blue-grey mudstones that weather orange. The upper 3 m of the Onny Formation exposed in the famous cliff section on the north bank of the river (Figure 10.19) are overlain by purple shales and fine sandstones of the Hughley Shale Formation of Upper Llandovery age. This unconformity shows an eastward overstep, and although the angular discordance is of only a few degrees and is not easily seen, it marks the absence of an unknown amount of the uppermost Onnian, the Ashgill and much of the Llandovery.

Interpretation

The faunas of the Actonian strata in the Onny River section are dominated by brachiopods, especially *Onniella*. Hurst (1979a) replaced earlier biozonations (Bancroft, 1929a, 1933; Dean, 1958) by a twofold faunal division based on the whole fauna and conforming to the Ragdon and Wistanstow members, with a lower *Onniella reuschi*–*Chonetoidea radiatula* Association succeeded by an upper *Onniella depressa* Association. About 6 km to the north-east, around Acton Scott, hard calcareous sandstones of the Henley Member (Hurst, 1979b) are developed in the upper part of the Acton Scott Formation and contain a fauna termed the '*Dalmanella unguis*' Association by Hurst (1979a). This marks a return of a faunal association that typifies the middle part of the Marshbrookian Crosspipes Member of the Cheney Longville Formation.

Hurst (1979b) noted that the upper Actonian marked a significant species turnover and an increase in trilobite diversity. Of particular importance is the occurrence of *Tretaspis ceriodes* (Angelin) (*T. ceriodes favus* Dean), which first appears at the very top of the Actonian in the Onny River section (Dean, 1963b, p. 8), where it persists into the lowest Onnian. This species is an important marker for the upper Caradoc Streffordian Stage in the North of England, Scotland, Scandinavia and China (Owen, 1980, 1987; Fortey *et al.*, 1991, p. 19).

The overall fauna of the Onnian was ascribed to the *Onniella broeggeri*–*Sericoidea homolensis* Association by Hurst (1979a). A thin, shelly lens, rich in the brachiopod *Heterorthis alternata*, was described from near the top of the section by Harper (1978) and was interpreted by Hurst (1979b, p. 205) as representing a distal storm deposit bringing shallow-water species into a deeper environment. *H. alternata* is one of the dominant components of some of the coquinas in the Alternata Limestone (see the site report for Soudley Quarry), but both Harper and Hurst noted that it cannot be considered an index fossil for the Woolstonian.

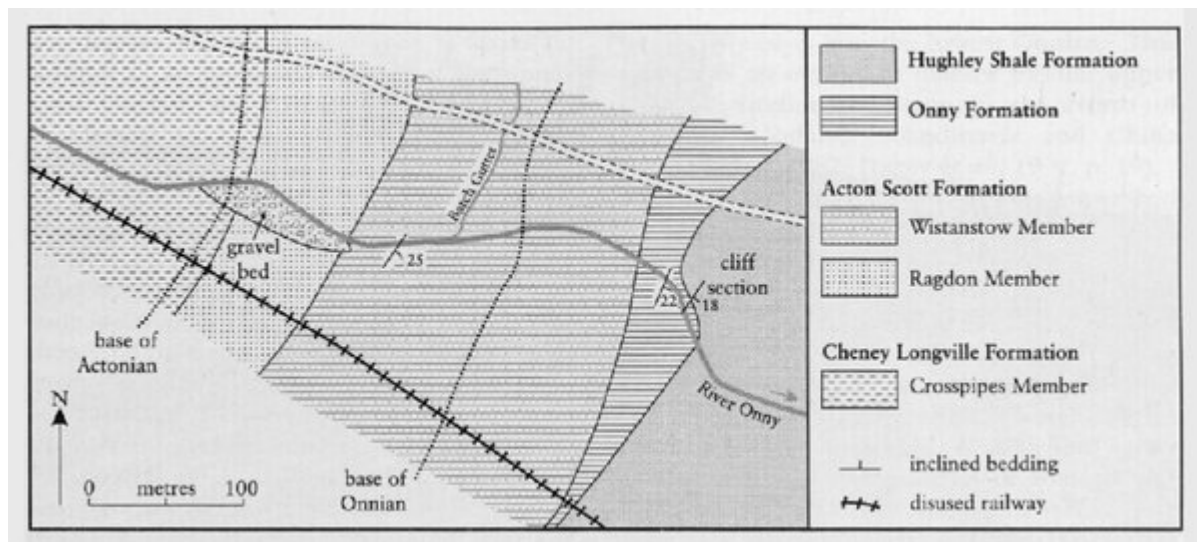
The Onnian was divided into three zones by Bancroft (1929a, 1933, 1949); in ascending order: the zones of the trilobites *Onnia cobboldi*, *O. gracilis* and *O. superba*. Closely spaced sampling by Owen and Ingham (1988) enabled a more detailed analysis of populations and a taxonomic revision of *Onnia* in the type Onnian. This resulted in a four-fold division, in ascending order: *Onnia superba cobboldi* Local Range Zone (LRZ), *O. superba creta* LRZ, *O. gracilis* Acme Zone and *O. superba superba* LRZ. This analysis has become an important case study in patterns of evolutionary or environmentally controlled change through time (Fortey and Owens, 1990a; Skelton, 1992). The base of the Onny Formation lies some 9 m above the base of the *O. superba superba* LRZ and marks a distinct shift in variance in some

features of the zonal subspecies. Although *O. gracilis* (Figure 10.20) occurs as a rare component of the late Actonian fauna near Cardington in south Shropshire, its occurrence at Welshpool (see the Gwern-y-brain site report) and in the Cross Fell and Cautley inliers of the north of England (see the Pus Gill and Sally Beck site reports) may well be at levels equivalent to its Acme Zone in the Onny River section. In the north of England it is succeeded by *O. pusgillensis* Dean, which may have been its descendant or a derivative of *O. superba*; the precise correlation of the sections there with the upper part of the type Onnian is not clear-cut. However, in the north of England the succession continues into the Ashgill, the base of which is marked by (*inter alia*) the disappearance of *Onnia* from Britain and the replacement of *Tretaspis ceriodes* with members of the *T. seticornis* group (see Chapter 11).

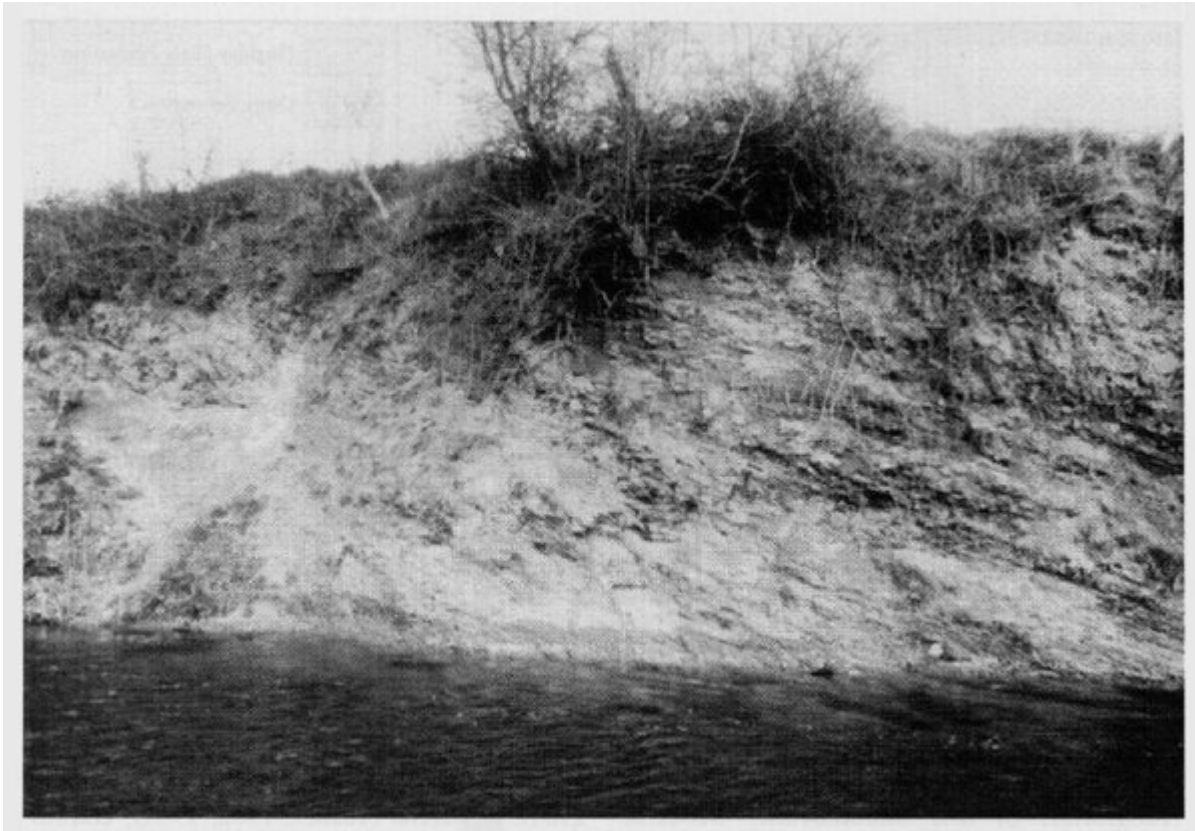
Conclusions

The Onny River GCR site is internationally and historically important. It is the type locality for the Actonian and Onnian substages of the upper Caradoc, as well as for the Acton Scott and Onny formations and some 17 taxa of trilobites and brachiopods. The middle Actonian part of the section contains a bentonite that has been dated radiometrically at about 466 ± 15 Ma before present and is an important marker internationally in the dating of the Ordovician. The cliff at the top of the section shows a classic unconformity between the upper Caradoc and the upper Llandovery, giving evidence for the absence of the uppermost Caradoc, Ashgill and much of the lower part of the Silurian. The recognition of this unconformity between Murchison's Lower and Upper Silurian (overlooked by Murchison) was a factor leading to Lapworth's establishment of the Ordovician System.

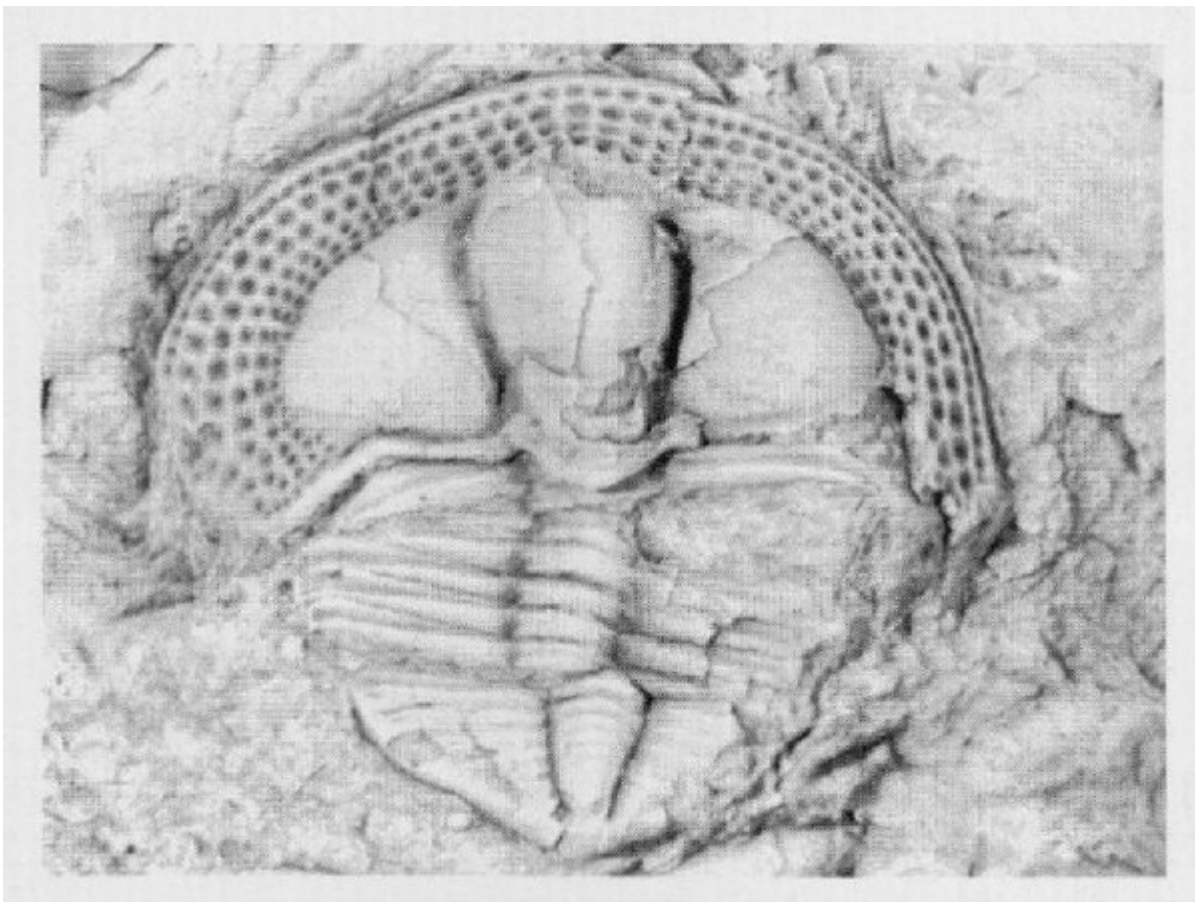
References



(Figure 10.18) Geological map of the eastern part of the Onny River section showing the bases of the Actonian and Onnian substages and their relationship to the upper Caradoc formational boundaries, after Hurst (1979b, fig. 8), and Toghill (1992, fig. 4), with the amendment to the Onnian lithostratigraphy proposed by Owen and Ingham (1988).



(Figure 10.19) The cliff section at the eastern end of the Onny River section, showing how difficult it is to see the slight angular unconformity of the Lower Silurian (upper Llandovery) Hughley Shale Formation above the shales of the uppermost Caradoc Onny Formation (Caradoc, Streffordian, Onnian Substage). (Photo: J. K. Ingham.)



(Figure 10.20) *Onnia gracilis* (Bancroft), x3, from the Wistanstow Member of the Acton Scott Formation (Streffordian, Onnian Substage).