Hughley Brook

[SO 566 984]–[SJ 599 011]

Introduction

Hughley Brook is situated in Ape Dale at the foot of Wenlock Edge in the type Wenlock area; it runs into Harley Brook, which also forms part of this site, their combined length being about 10 km (Figure 4.27). Both streams have an overall NE–SW alignment that is parallel with the Caledonoid strike of the Silurian strata locally, their joint course meandering frequently across the boundary between the Llandovery and the Wenlock series. Since the benchmark works of Murchison (1833, 1835, 1839, 1854), Salter and Aveline (1854) and Davidson and Maw (1881) in which the stratigraphical units of the Wenlock Series were established and largely refined, the Silurian geology of the Wenlock Edge–Apedale area has been described by numerous authors, in particular Lapworth and Watts (1894, 1910), Watts (1925), Whittard (1928, 1932, 1952), Pocock *et al.* (1938), Bassett *et al.* (1975) and Bassett (1989a).

Pocock *et al.* (1938) drew attention to the Hughley Brook–Harley Brook section with respect to the contact there between the Purple Shales (Formation) of the Llandovery Series and the overlying Buildwas Beds (= Formation) of the Wenlock Series. The importance of this combined stream course in exposing this contact was given formal stratigraphical recognition by Bassett *et al.* (1975) when they selected the Hughley Brook section at Leasows to stand as the international stratotype for the base of the Wenlock Series, coincident with the bases of the Sheinwoodian Stage and the Buildwas Formation. The site also contains the type area for the Buildwas Formation, and the standard section for the base of the Coalbrookdale Formation (Apedale Member).

The Llandovery succession of this site is described in Chapter 3.

Description

The stratotype section is situated 0.5 km northeast of Hughley church and 200 m south-east of Leasows Farm, on the north-west bank of a sharp northerly meander of Hughley Brook (Figure 4.28). The beds here (Bassett *et al.,* 1975) strike at 140°, have an average dip to the east of 15° and show the following boundary sequence.

Unit	Thickness (m)
Buildwas Formation	
(Wenlock Series, Sheinwoodian Stage)	
I. Mudstone, grey, with nodule band (14 cm), the base of which lies 107 cm from base of the unit.	2.2+
H. Mudstone, blue-grey, with bentonite band (1 cm) at 70 cm from base and nodule band (14 cm) at top.	1.5
G. Mudstone, grey-green at base, bluegrey above, with variable shelly debris/crinoids, brachiopods, etc.. Nodule band (14.5 cm thick) at top.	■ 2.14
Purple Shales Formation	
(Llandovery Series, Telychian Stage)	
D. Mudstone, green; with one impersistent hard siltstone band, 8 cm thick (unit E), the top of which lies 15 cm below the top of the formation. These uppermost 15 cm (unit F) are of a mixed facies within unit G.	0.6
C. Siltstone, hard.	0.08
B. Mudstone, purple and green variegated.	0.32

A. Mudstone, purple, with sporadic brachiopods; thin (2 cm) green mudstone bands and a few thin (6 cm) calcareous siltstone bands with crinoid fragments.	Up to 1 m thick; seen seen over a length of 4 m of the stream.

There is a colour transition in the sediments over about 1 m between the Purple Shales and the Buildwas formations, from mottled green, grey and purple into olive-buff and grey (Bassett, 1989a). Similarly there is a decrease in the occurrence of hard siltstones up-section, the Buildwas Formation containing only calcilutites and lacking almost entirely terrigenous sand and silt. This gradational nature notwithstanding, the base of the Buildwas Formation is readily mapped at the base of the first grey-green rubbly mudstones with comminuted shell debris.

The following brachiopods have been recorded (Bassett *et al.,* 1975) from the top 10 m of the Purple Shales Formation in Hughley Brook: *Eoplectodonta penkillensis, Glassia obovata, Visbeyella pygmaea, Atrypa reticularis, Aegiria grayi, Mesopholidostrophia salopiensis, Leptaena purpurea, Skenidioides lewisii, Craniops implicatus, Dicoelosia alticavata, Amphistrophia whittardi, Eocoelia sulcata, Coolinia applanata, Cyphomenoidea wisgoriensis, Clorinda undata, Pentlandina parabola, Cyrtia exporrecta, Eospirifer* aff. *radiatus, Dictyonella* sp. and *Resserella* sp. together with other less common species. Trilobites (more than 12 types), rugose and tabulate corals, crinoids, bryozoans, orthoconic nautiloids, gastropods and bivalves also occur, as well as an abundant microfauna and microflora as indicated below. Graptolites have not been recovered from the top 10 m of the Purple Shales, but regionally the presence nearby in Devil's Dingle, Buildwas, of *Monograptus parapriodon, Monograptus priodon* and *Monograptus discus* indicates that the top of this unit belongs to the *crenulata* Biozone (Bassett *et al.,* 1975).

Brachiopods also dominate the macrofauna of the lowest part of the Buildwas Formation, including: *Dicoelosia biloba, Leangella segmentum, A. reticularis, Eoplectodonta duvalii, C. exporrecta, Atrypina barrandii, E. radiatus, Streptis grayii, Isorthis elegantulina, Resserella sabrinae, G. obovata, Dictyonella capewelli, Dalejina* sp. and indeterminate rhynchonellids. Trilobites, rugose and tabulate corals, crinoids, orthoconic nautiloids, gastropods and bivalves are also present.

Graptolites have not been found in the Buildwas Formation at Leasows, but *Monoclimacis* aff. *vomerina,* which is indicative of a late Llandovery–early Wenlock age, is recorded from 3–4.5 m above the base of the Buildwas Formation in Harley Brook [SJ 5961 0075], and *Pristiograptus watneyae* from 18.3 m above the base in the type Wenlock area at Ticklerton [SO 4858 9042] 12 km to the south-west, the latter species indicating the *centrifugus* Biozone (Bassett *et al.,* 1975). The *riccartonensis* Biozone was recognized in the lowest part of the Coalbrookdale Formation by the eponymous species occurring 3 m above its base, in Hughley Brook [SO 5711 9840].

Rich microfossil assemblages have been recovered from across the Llandovery–Wenlock boundary stratotype at Leasows (Figure 4.28) and from nearby localities in Hughley and Harley brooks, in particular from Domas 0.75 km south of Harley (e.g. Downie, 1959, 1960, 1963; Dorning, 1981b, 1981c; Mabillard and Aldridge, 1982, 1985; Lundin *et al.,* 1991). Sixty-two species of acritarch are known from Leasows, the series boundary occurring 15 cm above the base of acritarch Biozone 5 (of Hill, 1974). The latter is characterized by the appearance of *Duenffia brevispinosa, D. ramusculosa* and *D. amphora,* all of which enter the type section in unit F of the Purple Shales. Chitinozoans are represented at the stratotype by species of *Angochitina, Margachitina, Eisenackitina* and *Ancyrochitina.* Some 18 000 conodonts were examined from Leasows and over 22 000 from Domas (Aldridge and Mabillard, 1981; Mabillard and Aldridge, 1985), these comprising more than 20 species. The base of the *Pterospathodus amorphognathoides* interval occurs 65 cm below the Llandovery–Wenlock boundary at Leasows, near the top of unit B, this interval straddling the boundary, with the local disappearance of *P. amorphognathoides* occurring in unit G 30 cm into the Buildwas Formation.

Foraminiferan assemblages from the Purple Shales of Leasows and Domas are dominated by *Ammodiscus exsertus, with Hyperammina* species, *Webbinelloidea tholus, Psammosphaera cava, Hemisphaerammina* sp. and *Turritellella* and *Thurammina* speties occurring (Mabillard and Aldridge, 1982, 1985). The basal Buildwas Formation has decreased numbers of specimens, which are dominated by assemblages of *Hyperammina* spp., *Lagenammina* sp., and *Lituotuba* sp.. Both palaeocope and non-palaeocope ostracods occur, Leasows and Domas having yielded for one study (Mabillard and Aldridge, 1985) a combined total of about 20 000 specimens belonging to more than 25 species (see also Siveter, 1978, 1980; Lundin *et al.,* 1991). At the basal Wenlock stratotype and elsewhere, characteristic species of the Purple

Shales include *Craspedobolbina* (*Mitrobeyrichia*) *hipposiderus, C.* (*Artiocraspedon*) *glabra* and *Menoeidina lavoiei,* with the Buildwas Formation seeing the introduction of *Tubulibairdia alabamensis, Parulrichia diversa, Beyrichia admixta, Thlipsura martinssoni* and *Bollia bicollina;* other species such as *Craspedobolbina* (*M.*) *interrupta* and *Macrocypris? vinei* enter the section just below the boundary and range into the Buildwas Formation. Also, sporomorphs have been documented from the Buildwas Formation of Hughley Brook (Burgess and Richardson, 1991).

The whole of the Buildwas Formation (27 m thick in outcrop) is transected by Hughley and Harley brooks, where it comprises grey to olive-green mudstones, shales and siltstones with intercalations of more limey, nodular horizons. Shelly fossils are scattered throughout, but are generally small and fragmentary *Dicoelosia, Atrypa, Atrypina, Isorthis, Resserella, Leangella, Eoplectodonta* and *Eospirifer* are the most common genera. Rugose and tabulate corals, trilobites, orthoconic nautiloids, bivalves, gastropods, bryozoa and various microfossil groups occur. The formation in the type area ranges through the *centrifugus, murchisoni* and lowermost part of the *riccartonensis* biozones, though the presence of the *murchisoni* Biozone there is unproven.

There are numerous bentonite layers up to 15 cm thick in the Buildwas Formation. Ross *et al.* (1978, 1982) produced fission-track dates from zircons obtained from bentonites from the top 5 m of this formation in Hughley Brook [SO 5703 9833] and from the lower 10 m from the north bank of the River Severn at Buildwas [SJ 6435 0445], giving ages of 423 ± 11 Ma and 422 11 Ma respectively, and a subsequent age (see Bassett, 1989a) for the basal Buildwas Formation (*centrifugus* Biozone) of 422 ± 14 Ma.

The lower part of the Coalbrookdale Formation together with its transitional contact with the Buildwas Formation is exposed in a small tributary that runs from near the farmstead at Rowley into Harley Brook (Bassett *et al.,* 1975; (Figure 4.27)). The highest nodular horizons of the Buildwas Formation pass over 3–9 m into the Apedale Member of the Coalbrookdale Formation, which overall is less calcareous and consists of olive-grey to blue-grey mudstones, again with numerous bentonite horizons.

G. obovata, L. segmentum and *R. sabrinae* are the commonest brachiopods of the Coalbrookdale Formation, with trilobites, graptolites, nautiloids and bivalves also occurring.

In addition to the Hughley Brook–Harley Brook sections, a very important ancillary sequence for detailing the faunal and sedimentary changes through the Buildwas and Coalbookdale formations is provided by the core from the Lower Hill Farm Borehole, sunk in Ape Dale 1 km to the ESE of Leasows (Bassett *et al.,* 1975).

Interpretation

Ecologically, the benthic macrofauna of the Purple Shales in the Wenlock Edge area has been referred to the *Clorinda* or mixed *Clorinda–Costistricklandia* Community (Ziegler *et al.,* 1968b), and that of the Buildwas Formation to the *Dicoelosia biloba* Community (Calef and Hancock, 1974; Hurst, 1975b; Hurst *et al.,* 1978). These are comparable to Benthic Assemblages 4–5 of Boucot (1975), from the deeper part of the outer platform (Bassett, 1989a). The sparser nature and slight change in composition of the benthos (increase in graptolites and nautiloids), and smaller size of brachiopod specimens, in the Apedale Member, Coalbrookdale Formation, suggests that these belong to Boucot's BA6 in an outermost platform setting (Bassett, 1989a).

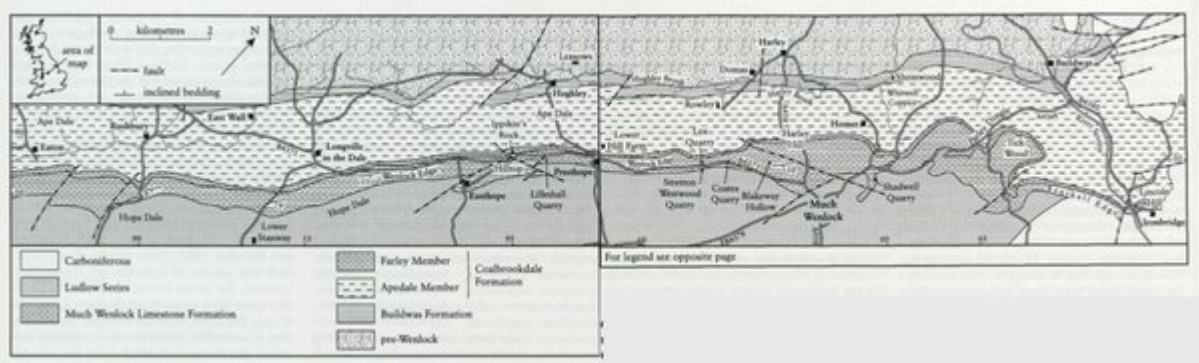
Conclusions

Hughley Brook is situated in the Wenlock Edge–Apedale area, which in late Llandovery and early Wenlock times formed part of the outer to outermost shelf region.

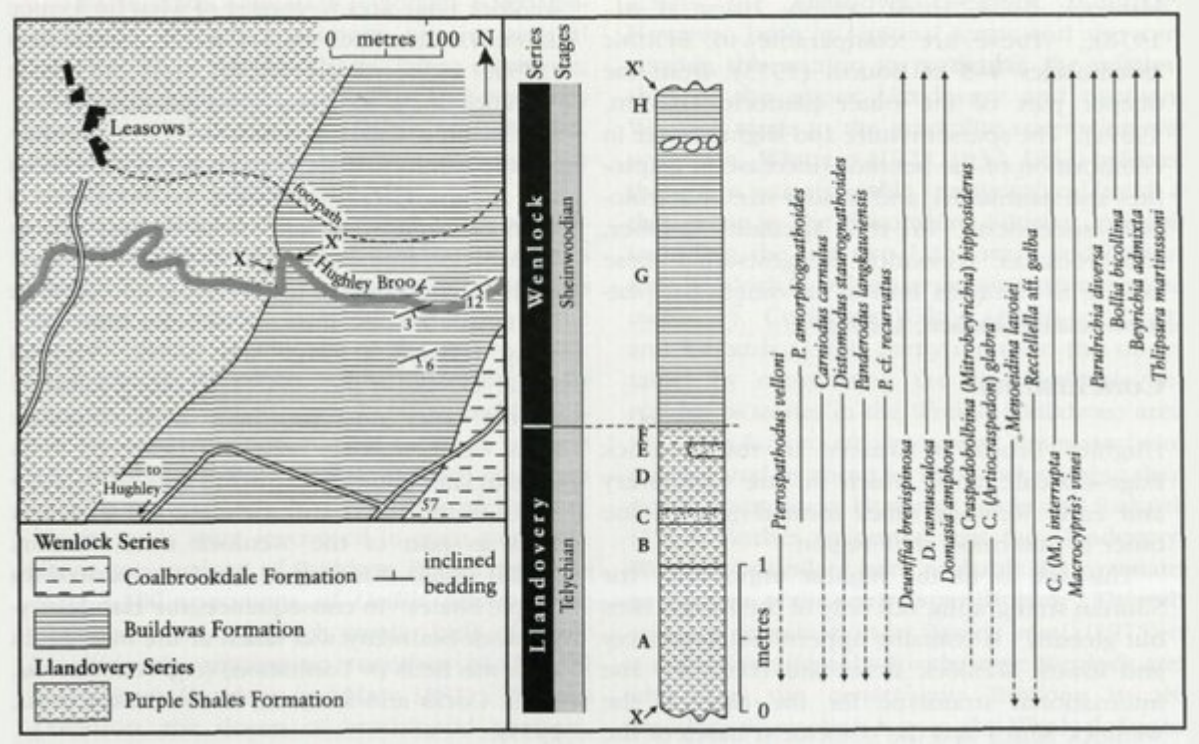
This site is of the highest importance for Silurian stratigraphy, not only of the British Isles but globally. It contains uppermost Llandovery and lowest Wenlock strata and (Leasows) the international stratotype for the base of the Wenlock Series and the coincident bases of the Sheinwoodian Stage and Buildwas Formation in the type Wenlock area. The site also stands as the type area for the Buildwas Formation (Hughley Brook–Harley Brook) and for the base of the Coalbrookdale Formation (stream section, Rowley). It thus has the standard sequence of rocks and fossils representing

this period of geological time against which correlation is made on a local to worldwide basis. It is of potential interest to and use by researchers of all countries where Silurian rocks occur. It demands the highest priority for conservation.

References



(Figure 4.27) Geology of the Wenlock Edge–Benthall Edge area between Eaton and Ironbridge, Shropshire (after Bassett et al., 1975).



(Figure 4.28) Hughley Brook, Shropshire. Location and summary section for the stratotype base of the Wenlock Series, Sheinwooclian Stage and the Buildwas Formation, with the ranges of some important microfossil species used in correlation (after Bassett, 1989a).