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# Brinkmarsh Quarry

[ST 674 913]

## Introduction

This site is situated in the Lower Palaeozoic inlier of the Tortworth district (Figure 3.14), about 10 km north of Bristol and 8 km east of the Severn estuary. Ordovician (Tremadoc Series) and Silurian rocks are present beneath Devonian, Carboniferous, then Triassic and Jurassic sediments. The Silurian consists largely of Llandovery and Wenlock rocks that occur in the main part of the inlier, but there is a thin strip of Ludlow present in the north of the area, with the Pridoli and the Devonian comprising the Lower and the Upper Old Red Sandstone, respectively. The Llandovery and Wenlock strata form part of the Bristol Coalfield Syncline. On the north-west limb of this structure there is a complementary, southerly plunging anticline. Brinkmarsh Quarry lies on the nose of this anticline, just west of its axis (Figure 4.15).

Silurian rocks in the inlier have been commented on by various authors for over 150 years, Murchison (1839) and Phillips (1848) being amongst the earliest of them, with Weaver (1824) providing very early, comprehensive observations, including a description of the section at Brinkmarsh Quarry. Indeed, Weaver's contribution was 'the first detailed study to be made of any area of Lower Palaeozoic rocks in the British Isles' according to one student of the Tortworth region (Curtis, 1955a). After these assessments the following works, in the main, dealt with the Silurian geology and fossils of the area: Morgan and Reynolds, 1901; Reed and Reynolds, 1908a, b; Reynolds, 1924; Smith, 1934; Whittard and Smith, 1944; Curtis, 1955b, 1956, 1958, 1972; Curtis and Cave, 1964; Cave and White, 1971; Bassett, 1974a and Cave, 1977. The stratigraphical accounts of Reed and Reynolds (1908b), Curtis (1972) and Cave (1977) are those most pertinent to the present site.

Fossiliferous beds at the base of the Wenlock Series are exposed in Brinkmarsh Quarry. These have been utilized for local stratigraphy, but more importantly they have wider palaeontological and palaeogeographical significance.

## Description

The Wenlock succession of the Tortworth area consists of shales, mudstones, siltstones, calcareous sandstones and some limestones. All these various elastic horizons belong to the Brinkmarsh Formation (Curtis, 1972; Bassett, 1977), which is some 244 m thick and considered to range in time from the base of the *centrifugus* Biozone to the *lundgreni* or the *ludensis* Biozone (Bassett, 1974a; Cocks *et al.*, 1992). Certain layers are rich in fossils; also some horizons show sedimentary structures, particularly the fine-grained sandstones that exhibit ripple marks, current bedding and drag marks. Three prominent, discontinuous bands of impure limestone, best exposed just south of Whitfield in the Brinkmarsh area, occur in the lowest, middle and upper parts of the formation. The oldest of them has a maximum thickness of about 30 m and passes laterally into calcareous sandstones. The upper part of this lowest limestone together with overlying mudstones are present in Brinkmarsh Quarry.

The quarry itself, the working of it long discontinued, is no more than a very shallow excavation with exposures now being confined essentially to low banks at the southern to northwest boundary of the field it occupied. The beds dip south-west at 15–20°. Reed and Reynolds (1908b) gave a log of the southern side of the quarry, this area having been opened up during the time they were working, the original section of Weaver (1824) having become overgrown. In modern times Curtis (1972) and Cave (1977) have described the exposures still available, the latter account largely forming the basis for the following description.

At the north-west extremity of the quarry, some 3.7 m of limestone are present. It is fine-to medium-grained, mainly greyish-green in colour but in places red, with calcite veining and slickensiding. Thin lenticular beds of greyish-green, micaceous, cross-bedded sandstone also occur, as do lenticles of fossil remains, mainly crinoid ossicles, brachiopods and bryozoa. Brachiopods from here include *Amphistrophia* (*Amphistrophia*) *euglyphoides*, '*Camarotoechia*' sp. and *Resserella whitfieldensis*.

The centre of the south face of the quarry [ST 6740 9125] shows the following section:

Lithology	Thickness (m)
Soft, greyish-green mudstone	1.22
Calcareous, greyish-green, crinoidal sandstone	0.51
Soft, green, shaly mudstone	0.20
Hard, olive-green, ?chloritic, calcareous sandstone	0.36
Massive reddish limestone	0.91

The veins of celestine from this face noted by Reed and Reynolds (1908b) were not seen by Cave (1977).

At the eastern end of the south face more of the mudstone above the limestone is present at the top of the face, and the top part of the limestone is not so arenaceous as that at the centre of the face. The section here comprises 0.30 m of mudstone with some nodular limestone overlying 1.52 m of mudstone, which in turn lies above 0.46 m of rubbly limestone. Fossils from the limestone here include the brachiopods *Brachyprion waltonii*, *Sphaerirhynchia davidsoni*, *Camarotoecbia' diodonta*, *Howellella* sp., and *Whitfieldella* sp., the alga *Rothpletzella gotlandica*, the coral *Favosites bisingeri* and bryozoans.

The mudstones immediately above the limestone are fossiliferous. This is the horizon of Reed and Reynolds (1908b) with the coral *Hallia mitrata*, the same level referred to as the Pycnactis Band by Curtis (1972), who recorded from it at the southern face *Pycnactis mitratus*, *Coenites juniperus*, *Resserella* cf. *basalis*, *Sphaerirhynchia davidsoni*, *Microsphaeridiorhynchus* cf. *nucula* and *Whitfieldella* cf. *canalis*.

Reed and Reynolds (1908a, 1908b) estimated the total thickness of massive limestone in Brinkmarsh Quarry to be over 8 m. They listed more than 60 species of fossils from the lower limestone band at Whitfield, which, as they noted, essentially means from Brinkmarsh Quarry or to a lesser extent from the smaller, adjacent, Rifle Cottage Quarry (Figure 4.15). Curtis (1972) commented that many such fossils may, in fact, have come from the few metres of Pycnactis Band mudstones immediately above the lower limestone rather than from the limestone itself, but that nevertheless specimens from these two horizons form a large proportion of the fossils from Tortworth Wenlock rocks and represent nearly all those described and figured. His combined faunal list for the lower limestone and Pycnactis Band totals 23 species, including a conulariid, a coral, an 'annelid', a trilobite, a nautiloid, four brachiopod and three gastropod species all additional to those given above.

Brachiopods are perhaps the most diverse macrofossils from Brinkmarsh Quarry, various of them having been used in both taxonomic (e.g. Davidson, 1848; Bassett, 1972, 1977) and ecological (Calef and Hancock, 1974) studies.

The lower limestone of the quarry has produced a diverse microfauna, including ostracods (Siveter, 1978, 1980; Lundin *et al.*, 1991), acritarchs and chitinozoans (Aldridge *et al.*, 1981), and the microvertebrate thelodonts (Siveter and Turner, 1982) and conodonts (Aldridge, 1975, 1976, 1985; Aldridge and Mabillard, 1981).

Taxa of both macro- and microfossils have been based on material from the quarry, for example *R. whitfieldensis* Bassett, 1972, the ostracod *Nudista cariticuspis* Siveter, 1980, the nautiloid *Armenoceras nummularium* (J. de C. Sowerby in Murchison, 1839) and the coral *Phaulactis glevensis* (Ryder, 1926).

## Interpretation

A Wenlock age for the Brinkmarsh Formation as a whole is based on the general aspect of its shelly fauna and microfauna, as it lacks graptolites. Moreover, there has been uncertainty over the precise age of the lower limestone, which contains a number of brachiopod species such as *Leptostrophia compressa* that are more typical of the Llandovery (Bassett, 1974a). These, however, are considered faunal leftovers and the lower limestone has been assigned to the basal Wenlock, making it a correlative of the lower part of the Woolhope Limestone Formation as present at Woolhope, May Hill and the Malverns; this age is corroborated by the presence of the conodont *Ozarkodina sagitta rhenana* (R.J. Aldridge, pers. comm.). The sediments underlying the Brinkmarsh Formation in the Tortworth Inlier, the Tortworth Beds,

are securely dated as late Llandovery by the presence of *Eocoelia sulcata*, *Costistricklandia lirata* and *Palaeocyclus porpita* (Cocks *et al.*, 1992).

Certain faunal elements and species associations of the lower limestone and Pycnactis Band are, within Britain, peculiar to the Tortworth Inlier, this perhaps especially applying to the microfossils. The conodont, beyrichiacean ostracod and thelodont faunas from the basal Brinkmarsh Formation have, in their various ways, all been described as unique (Aldridge *et al.*, 1981); the conodont genus *Icriodella*, for instance, has no other Wenlock record in Britain (Aldridge, 1976).

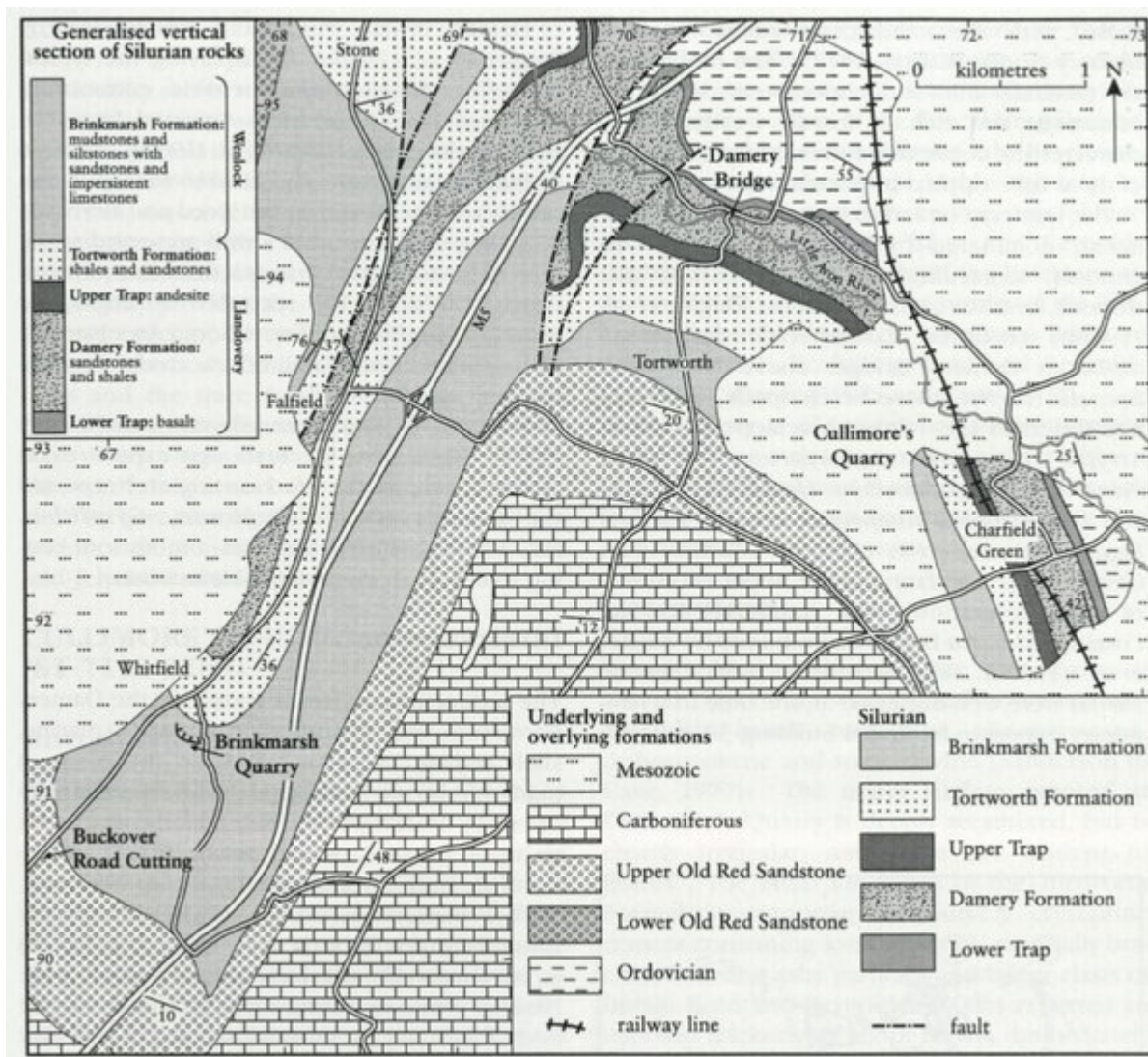
The sandy, bioclastic nature of the lower limestone suggests a high energy, shallow water environment. Thus all palaeogeographical reconstructions for the early Wenlock have the Tortworth area just north of the Pretannia landmass, close to the southern margin of the Welsh Basin (Bassett, 1974a; Hurst *et al.*, 1978; Holland, 1992). In particular, the lateral interdigitation of limestones with calcareous sandstones at Tortworth has been taken to indicate a position at the boundary between an inshore arenaceous facies belt and a slightly more distal, carbonate belt (Bassett, 1974a). The Pycnactis Band mudstones, with their *Resserella* Association (Calef and Hancock, 1974), represent slightly deeper conditions after deposition of the lower limestone.

Other Welsh Borderland sites that contain rocks approximately coeval with those in Brinkmarsh Quarry are those of Scutterdine Quarry in the Woolhope area, which exposes the Woolhope Limestone Formation, and the Hughley Brook and Buildwas sites near Much Wenlock, where the lime-rich Buildwas Formation crops out. The strata at all these other sites lack the markedly arenaceous fingerprint of the lower limestone. However Rumney Quarry in the Cardiff district shows the Rhymney Grit, which is thought to indicate an even more inshore (sub-tidal) position on the basin margin than the lower limestone, but this grit is of late Wenlock age. In the Tortworth Inlier, the Buckover Road section complements the Brinkmarsh Quarry site by exposing upper Wenlock strata, while those sites at Damery Bridge and Cullimore's Quarry have Llandovery significance. Just to the north, on the Severn estuary, is Tites Point, a site important for Ludlow age rocks.

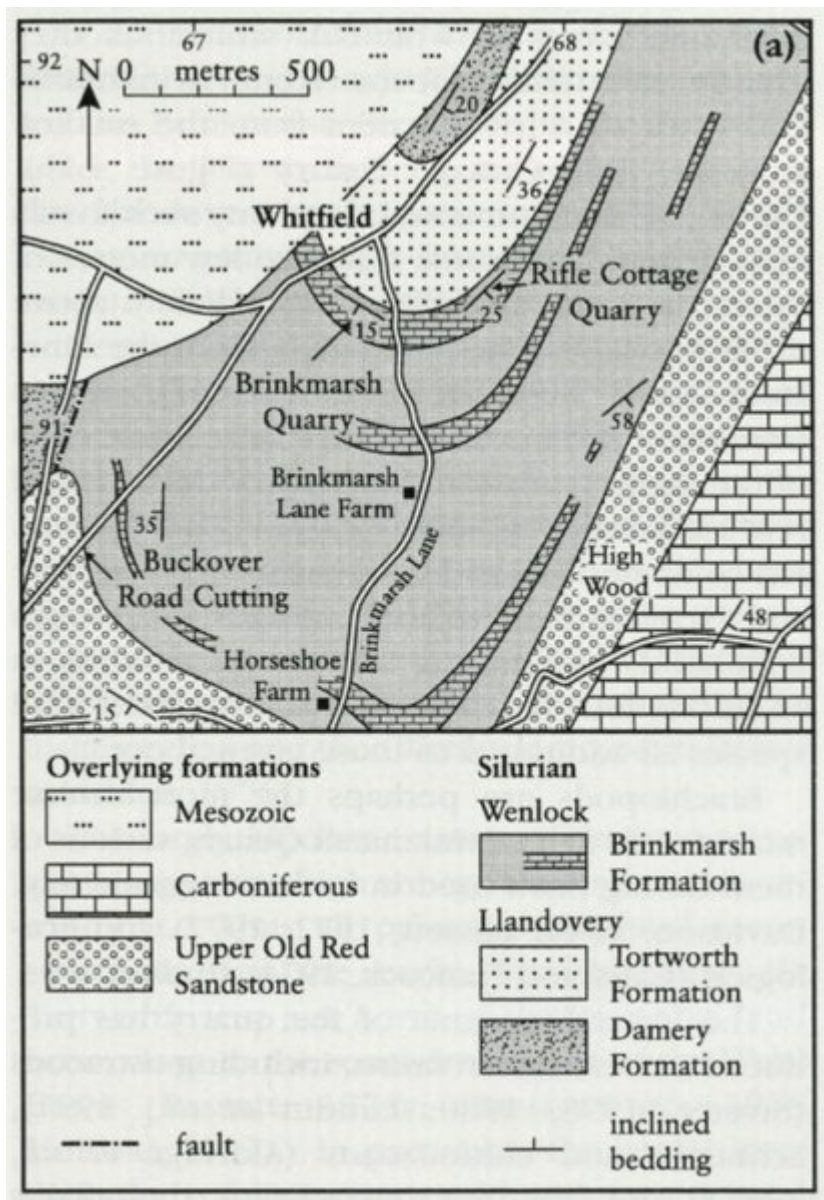
## Conclusions

This important site forms part of the Tortworth Silurian inlier and exposes the lower limestone and the Pycnactis Band mudstones of the Brinkmarsh Formation, which belong to the lowest part of the Wenlock Series. The quarry has been a rich source of fossils since the early part of the 19th century and it represents the type locality for various macro- and microfossils. Some of the fauna is distinctive and known only from here. The nature of the limestone facies here is also distinct and indicates a relatively nearshore situation; consequently it is of great utility for palaeogeographical reconstruction of this part of the Anglo-Welsh area for early Wenlock times.

## [References](#)



(Figure 3.14) Geological map of the Tortworth Inlier (after Curtis, 1972).



(Figure 4.15) Location of Brinkmarsh Quarry and Buckover Road Cutting, and geology of this southern part of the Tortworth Inlier (after Curtis, 1972).