

TITE'S POINT (PURTON PASSAGE)

OS Grid Reference: SO688046

Highlights

This Gloucestershire site has produced a *Thelodus parvidens* fish fauna, evidence that its age matches that of the Ludlow Bone Bed. It is particularly important as an early source of specimens of the heterostracan fish *Cyathaspis*, and it is also notable as the most southerly of the Welsh Borders late Silurian fish sites, possibly lying close to the coast of that time.

Introduction

At low tide, Leintwardine (Ludlow) and Downton Castle Sandstone Formation beds are exposed on the eastern shore of the River Severn to the west of Tite's Point, Gloucestershire. The outcrop consists of the core of an anticline, plunging north-north-west, dipping 30° towards the north-west and 5° towards the north-east (Cave and White, 1971, p. 241). To the west and north-west, the Lower Old Red Sandstone is in depositional contact with the underlying Ludlow beds, but the exposure is extensively faulted, with faults becoming more numerous to the east close to a large north-south trending pre-Triassic fault. The Downton Castle Sandstone Formation in the east has a faulted contact with the Ludlow rocks (Figure 3.17).

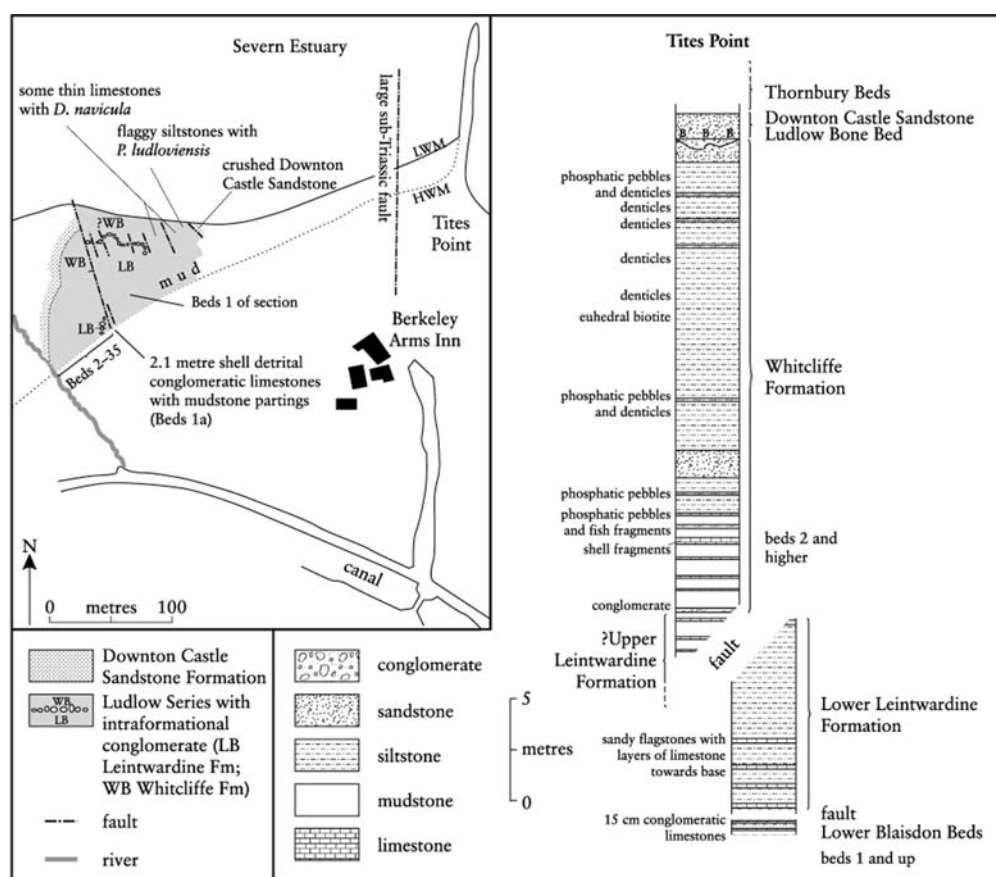


Figure 3.17: Sketch map of the GCR site at Tite's Point, and stratigraphical section (after Cave and White, 1971).

The geology of the site has been described by Murchison (1839), Phillips (1848), and Holland *et al.* (1963), and the fish fauna by Murchison (1839), Phillips (1848), Huxley and Salter (1856), Cave and White (1971) and Turner (1973). The locality figures in the Geologists' Association Guide to the Silurian inliers of the Welsh Borders (Lawson *et al.*, 1982).

Description

The succession at Tite's Point (Curtis, 1972; Cave, 1977; Cocks *et al.*, 1992) is:

	Thickness (m)
Upper Old Red Sandstone (unconformity)	?
Přídolí Series	
Thornbury Beds	?
Ludlow Series	
Ludfordian Stage	
Whitcliffe Formation	21.8
Leintwardine Formation	13.5
Gorstian Stage	
Bringewood Formation	25+

The Whitcliffe Formation is a succession of silty mudstones, siltstones and thin limestone layers. The last mentioned occur particularly in the upper part of the sequence, and commonly contain a concentration of brachiopods, worm tubes, various other organic debris, including small phosphatic pebbles, and fish denticles (Cave and White, 1971). These are the bone beds recorded by Phillips (1848, p. 191): 'at Tites Point are several beds in which white sand drift is mixed with shales and calcareous matter, and each yields scales and teeth', and on p. 226, 'in the the Tortworth country, I discovered several bands of fish remains in the uppermost Ludlow strata on the shore at Pyrton Passage exposed to an unusual degree in 1843; but the full exploration of the bed was prevented by the redeposition of the sediments of the Severn'. In his map and section, Phillips (1848, pl. 3) noted five bone beds in all, while Cave and White (1971) showed seven horizons containing fish fragments or denticles, plus the 'Ludlow Bone Bed', within the overlying sandstones which have channels cut into sandstones at the top of the Whitcliffe Formation below.

The Whitcliffe Formation is overlain by 1.7 m of Thornbury Sandstone (?equivalent to the Downton Castle Sandstone Formation and Clifford's Mesne Sandstone of May Hill). The contact is seen in the west of the section and shows the sandstone channels cutting into the underlying fine-grained sandstone at the the top of the Whitcliffe Formation. This contact cannot always be seen because all but the tops of one or two harder bands are hidden under thick glutinous estuarine mud, and the rock can only be examined after exceptional conditions have swept away this mud. This is not a recent phenomenon: Phillips (1848, p. 191) wrote 'The fish beds ... have been as yet incompletely explored; they are so commonly covered with sediment of the river as to have several times eluded the most anxious search of our indefatigable collectors. In fact the few species which have been extracted were taken by the author of this memoir while engaged in measuring the Palaeozoic Beds and, in several subsequent visits, the fish beds were invisible'.

Murchison (1839), on the other hand, had described exposures of Lias at Purton Passage nearby, which had previously yielded vertebrate fossils, but which were then completely buried under reclaimed land. He described the process by which mud accumulated on lines of piles and osiers, but stressed that the Silurian exposures had not been similarly affected. He figured (p. 446) a sketch of the Silurian rocks showing a fairly complete exposure substantially domed out of the waters of the Severn. He must have viewed the site at a time when the mud had been well scoured away from the section; such a clear exposure cannot be seen today (1994).

Fauna

AGNATHA

Heterostraci: Cyathaspidiformes: Cyathaspididae

Cyathaspis banksi (Huxley and Salter, 1856)

Cyathaspis sp.

Thelodonti: Thelodontida: Coelolepididae

Thelodus parvidens Agassiz, 1839

T. bicostatus (Hoppe, 1939)

T. pugniformis Gross, 1967

T. trilobatus (Hoppe, 1939)

GNATHOSTOMATA

Acanthodii incertae sedis

Onchus sp.

indeterminate jaw fragments and scales

Tite's Point was sampled by Turner (1973) for thelodonts which are abundant in the upper Whitcliffe Formation bone beds; they constitute a typical *Thelodus parvidens* fauna (see Ludford Lane report). Acanthodian scales and a jaw are also recorded.

The bone bed at the base of the Thornbury Beds, associated with the channelling, contains a concentration of fish fragments, including *Cyathaspis banksi* scales and *Onchus* sp. spines (Huxley and Salter, 1856), which Cave and White (1971) suggest are indicative of the Ludlow Bone Bed horizon (Figure 3.17). *Cyathaspis* is relatively common, a scale having been found by Cave and White (1971), and an old record of a 'swarm of shields on a bedding plane, exposed after a storm had swept away all the mud' is given. Tite's Point is one site where *Cyathaspis* can be found when the rocks are exposed above the mud (Figure 3.18).

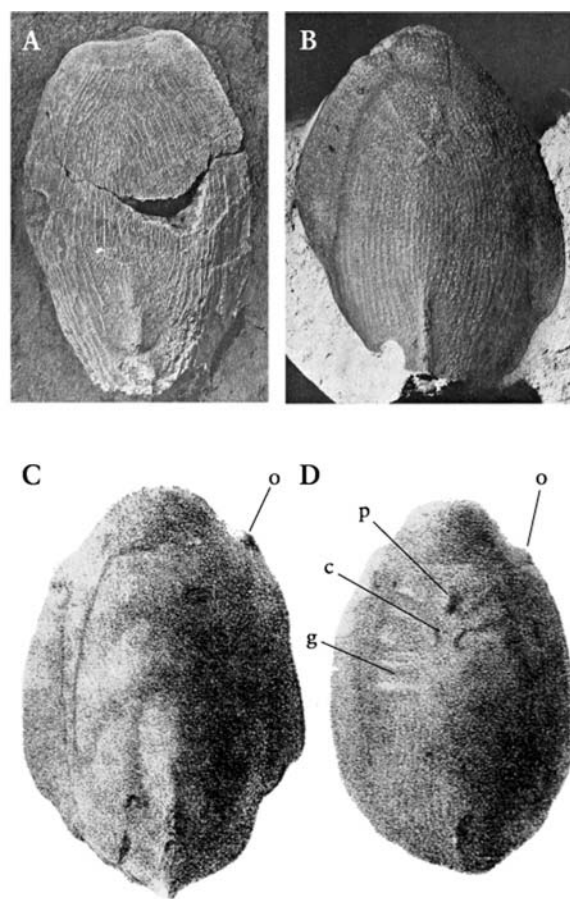


Figure 3.18: *Cyathaspis banksi* Lankester, $\times 1.25$; a primitive heterostracan, relatively common in Ludlow–Píídolí sites in this region. (A) external surface of ventral disc; (B) internal surface of the ventral disc; (C) cast of the internal surface of dorsal disc; (D) impression of the internal surface of the dorsal disc showing position of the gill pouches (g), semi-circular canals (c), orbits (o) and pineal foramen (p). Specimens from Kington, in the Museum of Practical Geology when figured by Lankester (1868).

Cyathaspis is a primitive heterostracan, found in the Welsh Borders, New Brunswick, Siberia and the southern Urals. Its type locality is 'Kington', probably Bradnor Hill Quarry or Ivy Chimney Quarry (q.v.). It is recorded throughout the Late Ludlovian and Early Píídolí of the Welsh Borders. Specimens are rare or fragmentary in most of these sites, most specimens having been found when the quarries were worked in Victorian times. Cave and White (1971, p. 253) also reported undifferentiated bone fragments.

Interpretation

Holland *et al.* (1963) suggest that the Whitcliffe Formation here might represent a brackish-water phase in late Ludlovian times, but Cave and White (1971) found no evidence to support this. Palaeogeographically, Tite's Point lay close to the Late Silurian shoreline, at a location where terrestrial sediment was being fed in from a volcanic centre near the present Mendips, and from the east (Siveter *et al.*, 1989). The vertebrate remains are consistent with a basal Píídolí date.

Conclusions

The conservation value of this site lies in its fish fauna, which contains *Thelodus parvidens* and correlates the succession with the stratotype succession in the Ludlow area, 75 km to the north. In addition, the early heterostracan *Cyathaspis* is reasonably abundant at this site, and there is more potential for collecting. The location of the site is crucial, since it is the farthest south of the Welsh Borders fish sites, apparently close to the late Ludlovian–Píídolí shoreline.

Reference list

- Agassiz, J.L.R. (1839) Fishes of the Upper Ludlow Rock. In *The Silurian System*, R.I. Murchison (ed.), Vol.2, 605–7, John Murray, London.
- Cave, R. (1977) *Geology of the Malmesbury District*. Memoir of the Geological Survey of Great Britain, HMSO, London, 291pp.
- Cave, R. and White, D.E. (1971) The exposures of Ludlow rocks and associated beds at Tites Point and near Newnham, Gloucestershire. *Geological Journal*, **7**, 239–254.
- Cocks, L.R.M., Holland, C.H. and Rickards, R.B. (1992) *A Revised Correlation of Silurian rocks in the British Isles*. *Geological Society of London Special Report* **21**.
- Curtis, M.L.K. (1972) The Silurian rocks of the Tortworth Inlier, Gloucestershire. *Proceedings of the Geologists' Association*, **83**, 1–35.
- Gross, W. (1967) über Thelodontiers Schuppen. *Palaeontographica Abteilung A*, **127**, 1–67.
- Holland, C.H., Lawson, J.D. and Walmsley, V.G. (1963) The Silurian rocks of the Ludlow District, Shropshire. *Bulletin of the British Museum Natural History (Geology)*, **8**, 93–171.
- Huxley, T.H. and Salter, J.W. (1856) Appendix to article: Banks, R.W. On the tilestones, or Downton sandstones, in the neighbourhood of Kington, and their contents. *Quarterly Journal of the Geological Society of London*, **12**, 100.
- Lawson, J.D., Curtis, M.K., Squirrel, H., Tucker, M.E. and Walmsley, V. (1982) *The Silurian Inliers of the Southeastern Welsh Borderland*. Geologists' Association Field Guide No. 5.
- Murchison, R.I. (1839) *The Silurian System*, 2 vols, John Murray, London, 768 pp.
- Phillips, J. (1848) *The Malvern Hills, compared with the Palaeozoic districts of Abberly, Woolhope, May Hill, Tortworth, and Usk*. Memoirs of the Geological Survey of Great Britain, HMSO, London, **11**, 330 pp.
- Siveter, D.J., Owens, R.M. and Thomas, A.J. (1989) *Silurian Field Excursions. A Geotraverse across Wales and the Welsh Borderland*. *National Museum Wales Geological Series* **10**, Cardiff, 133 pp.
- Turner, S. (1973) Siluro-Devonian thelodonts from the Welsh Borderland. *Quarterly Journal of the Geological Society, London*, **129**, 557–84.