

## OXENDEAN BURN

OS Grid Reference: NT771561

### Highlights

Oxendean Burn in Border has produced many plates and carapaces of the placoderm *Bothriolepis*, and it is the only site for the species *Bothriolepis hayi*. Fossil fishes have been found at three levels in the Oxendean Burn, and one of these may represent a catastrophic fish mortality in a drying pool.

### Introduction

The Oxendean Burn drains into the Whiteadder Water on the northern side of the Lammermuir Hills (Figure 8.5). It exposes Upper Old Red Sandstone along its length. The Late Devonian Oxendean Beds there dip east-south-east and yield fishes from three horizons. The fish-bearing beds were discovered in 1961 and they were described by Waterston (1962a) and Miles (1968), who named the site 'Wellrig Burn'.

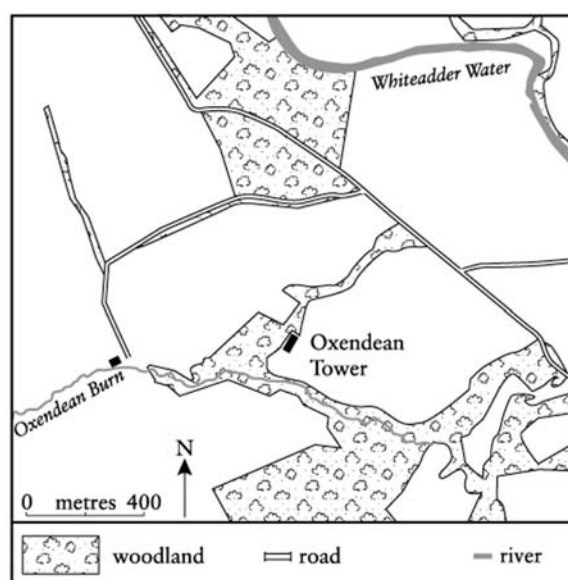


Figure 8.5: Sketch map of Oxendean Burn area.

### Description

The outcrop in the stream is much obscured, and it is difficult to see how all the previously noted fish-bearing exposures fit in to the measured section, which is as follows (recorded by M.A. Rowlands in 1979):

	<b>Thickness (m)</b>
Red mudstones	0.4
Massive sandstone, cross-bedded, pink mud clasts and plates of <i>Bothriolepis hayi</i> in the base. Locality A of Miles (1968)	1
Red mottled mudstones with sandstone lenses. ? Locality B of Miles (1968)	1
Lens of sandstone with thin green mudstones, irregular base with mudclasts (section obscured); red mudstones	0.4
Sandstone	0.01
Green mudstones with clay clasts in base; becoming mottled red–green upwards	1.4
Green mudstone with clay clasts; uneven base	0.05–0.1
Pale pink micaceous sandstone, cross-bedded	1
Red mottled mudstones	1
Red mudstones, mottled micaceous, contains ribs of hard, calcareous siltstone and fine-grained sandstone c. 0.2 m thick	4
– gap (? Waterston's lower fish bed): 0.8 m –	
Red siltstone and flaggy purple siltstone	0.4
----- gap: 0.4 m -----	
Bright red siltstones, with micaceous bedding planes and green reduction spots	1
----- gap: 0.3 m -----	
Green and yellow sandstones	0.2
Yellow sandstone	0.3 +

Waterston (1962) noted two fish beds: the lower is 'three inches thick, at the top of a red marl' and packed with *Bothriolepis* plates and areas of *Holoptychius* ornamentation; the upper '20 ft above the lower, is a sandstone rib' and contains disarticulated and disorientated plates of *Bothriolepis*, as well as *Holoptychius* plates and scales, and clay intraclasts. Miles (1968) identified three fish-bearing horizons. Waterston's upper fish bed is Miles' Locality A, described by the latter as a red mudstone and in the base of the overlying lens of fine-grained pink sandstone, and about 4 m wide. Localities B and C of Miles (1968) both yield fossils from gritty bands within pale pink and buff fine-grained sandstones. Waterston's (1962) lower fish bed was not observed in 1979, and may lie in a gap, as noted above.

### Fauna

Placodermi: Antiarchi: Bothriolepidae

#### **Bothriolepis hayi** Miles, 1968

Osteichthyes: Sarcopterygii: Porolepiformes: Holoptychiida

#### **Holoptychius** sp.

The horizons yield numerous plates of *Bothriolepis hayi*. The specimens are mainly detached plates, plus a few articulated individuals, these latter being slightly crushed and distorted. *Bothriolepis hayi* is one of several species recorded from the Berwickshire area by Miles (1968). It was a moderate-sized *Bothriolepis* with trunk armour 150 mm long and a broad, moderately high shield (Figure 8.6). All the material described by Miles (1968) was from individuals of a similar size, interpreted as full-grown adults. *Bothriolepis hayi* is distinguished from other species of *Bothriolepis* by its ornament; the reticular network is broken up by prominent round-topped nodes that may be isolated tubercles or irregular interconnecting

ridges. These nodes are prominent on the median dorsal plates and anterior ventrals (Miles, 1968). The distal part of the pectoral appendage has an ornament of fine longitudinal ridges (Miles, 1968), a feature also seen in species of *Bothriolepis* from the Frasnian of Victoria, Australia and Antarctica (Long, 1983).

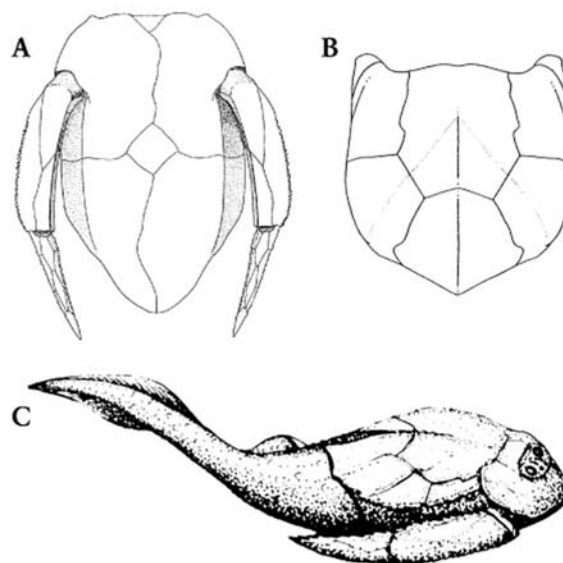


Figure 8.6: The antiarch *Bothriolepis hayi* Miles (1968) from the Oxendean Beds of Oxendean Burn. (A) restoration of the trunk-armour in ventral aspect based on RSM 11967.34.43 and FR 1867,  $\times 0.2$ ; (B) restoration of the dorsal trunk armour, somewhat flattened, based on RSM 1967.34.16,  $\times 0.2$  (after Miles, 1968); (C) reconstruction of *Bothriolepis* (after Long, 1995),  $\times 0.42$ .

## Interpretation

The depositional environment of these beds at Oxendean is the subject of debate. Leeder (1973, 1976) suggested that the Upper Devonian of the Scottish Borders accumulated in an interior drainage basin centred on Teviotdale, where argillaceous deposits, possibly of lacustrine origin, occur in the sequence. On the other hand, Paterson *et al.* (1976) considered that the deposits were those of a wide alluvial plain of an easterly flowing river system.

Waterston (1962) interpreted the 'lower fish bed' as having been deposited *in situ* by the killing of fish in a drying pool whereas the contents of the 'upper fish bed' are thanatocoenose (derived) material that has been sorted and stream transported some distance.

*Bothriolepis* has a broad stratigraphical value. In northern Europe, the Middle Devonian *Asterolepis* is replaced by the Late Devonian *Bothriolepis*. However, in the Baltic area, they occur together in an overlapping zone, and in south China *Bothriolepis* is found in much earlier sediments, whereas *Asterolepis* persists well into the Late Devonian (Dineley and Loeffler, 1993, fig. 6.10).

It is difficult to determine the relative stratigraphical relationships of the Berwickshire Upper Old Red Sandstone faunas. Oxendean appears to lie at the same level as the Prestonhaugh Beds on the Whiteadder that yield *Bothriolepis stevensoni* (Miles, 1968). These units have been dated as Famennian, but the evidence is limited (Westoll, *in* House *et al.*, 1977).

## Conclusions

The conservation value of Oxendean Burn results from its production of abundant fossil fish specimens from two or three horizons. The sedimentary environments of these are debated, but they were clearly shallow water and probably lacustrine or associated with fluvial

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backwaters. Specimens of *Bothriolepis* and *Holoptychius* are fairly common, and fresh excavations may yield much new material.

## Reference list

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