

HOLBORN HEAD QUARRY

OS Grid Reference: ND080710

Highlights

Holborn Head Quarry in Caithness (Highland) has produced specimens of 10 or 11 species of fossil fishes, and it is especially well known for the fine, abundant specimens of the small osteolepid *Osteolepis panderi*.

Introduction

In the large disused cliff-top quarry at Ness of Litter, 3 km W of Holburn Head (Figure 6.25), the flags have been quarried down to tough non-fissile siltstones, and the extensive sloping floor of the quarry lies along a single flat bedding plane. This is a common feature of several flagstone quarries, which were worked down bed by bed for paving flags, without the use of explosives. Crampton and Carruthers (1914, pl. 7) showed the quarry in operation early in the 20th century. Trewin and Hurst (1993) have provided an excursion guide. The beds dip at a shallow angle of about 5° to the north-north-east. The taphonomy of these fish beds was recently investigated by Hamilton and Trewin (1994).

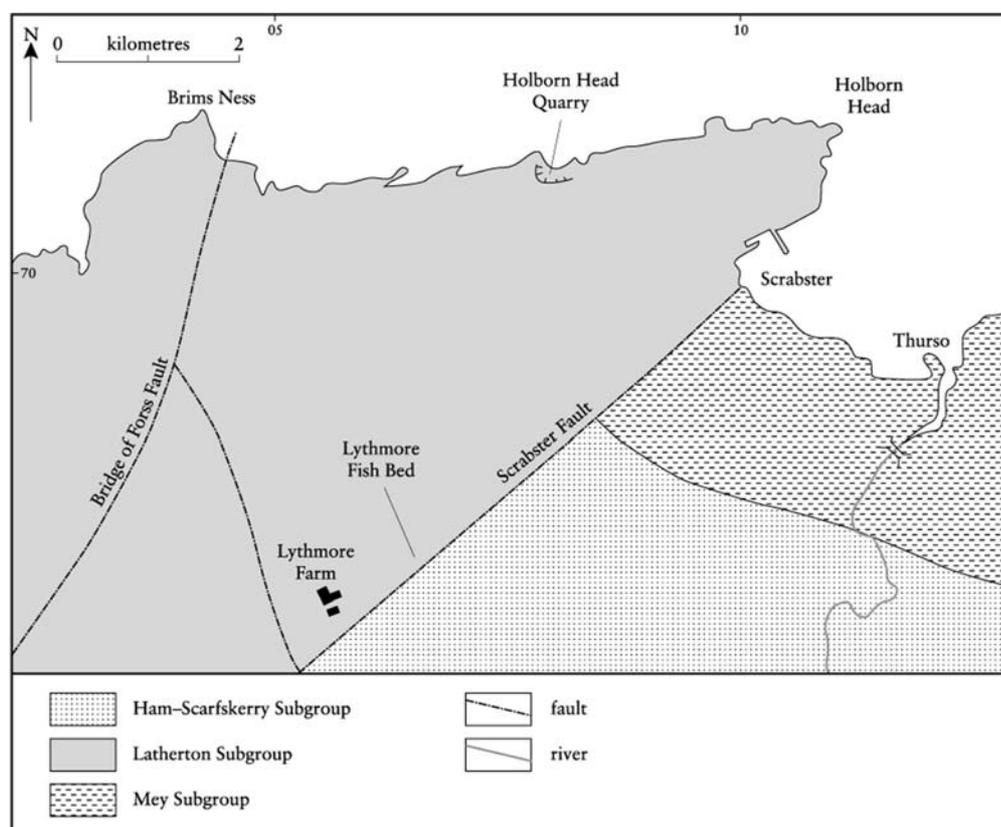


Figure 6.25: Sketch map of the geology of Holborn Head, near Thurso (after Hamilton and Trewin, 1994).

Description

The quarry exposes a 6 m high face of carbonate or organic laminated siltstones with subaqueous shrinkage cracks. These are lacustrine sediments from the Ham-Scarfskerry Subgroup of the Upper Caithness Flagstone Group (Donovan *et al.*, 1974; Westoll, *in* House *et al.*, 1977; Hamilton and Trewin, 1994). The flagstones are thinner-bedded and with lighter weathering colours than those of the underlying Latheron Subgroup, as seen at Banniskirk Quarry (q.v.). Grey and buff sandstones occur in the upper part of the Subgroup. The rocks

are of probable mid-Givetian age (Westoll, *in* House *et al.*, 1977), as indicated by the fauna that probably belongs to Fish Zone 5 of Donovan *et al.* (1974), as found also at Weydale Quarry (q.v.).

The fish-bearing stratum is 130 mm below the bedding plane which forms the floor of the quarry, and is exposed by a small excavation in the south-east corner of the quarry, near the entrance. The fishes are in a tough, dark brownish grey, calcareous siltstone laminite, and they are difficult to remove. A thickness of 260 mm of fish-bearing siltstones are exposed in the excavation, and the base of the unit is not seen. Fishes are very common throughout the 260 mm thick unit, and they are usually complete, but flattened and poorly preserved. Small attractive complete osteolepids, *Osteolepis panderi*, are very common. Disarticulated skull roofs can also be found and, although less common than complete specimens, their preservation is better. An important addition to knowledge of these strata and their fossil fish is Hamilton and Trewin's (1994) detailed consideration of the taphonomy and palaeoecology.

There are problems in assigning provenances of older museum specimens from this area since the locality label 'Holburn Head' includes several sites of different age, from Brims Hill in the west to the headland of Holburn Head. 'Thurso' is also often used very loosely as a specimen label (Miles and Westoll, 1963), and can include material from Holburn Head Quarry. Therefore, in the list below, some of the rarer species are queried, and may not be from this site at all.

Fauna

The fish fauna from Holburn Head Quarry includes the remains of active forms most of which were common and widespread throughout the Orcadian Basin.

Acanthodii: Acanthodiformes: Acanthodidae

Mesacanthus peach Egerton, 1861

M. pusillus (Agassiz, 1844)

?*Cheiracanthus* sp.

acanthodian indet.

Placodermi: Arthrodira: Coccosteidae

Dickosteus threiplandi Miles and Westoll,

1963

Placodermi: Arthrodira: Homosteidae

?*Homosteus milleri* Traquair, 1888

Osteichthyes: Sarcopterygii: Osteolepiformes: Osteolepididae

Osteolepis pander Pander, 1860

Gyroptychius agassiz Traill, 1841

Thursius pholidotus Traquair, 1888

Osteichthyes: Sarcopterygii: Porolepiformes: Holoptychiidae

Glyptolepis sp.

Osteichthyes: Sarcopterygii: Dipnoi: Dipteridae

Dipterus cf. *valenciennesi* Sedgwick and

Murchison, 1828

Dickosteus threiplandi is a large coccosteid fish with a total length (head plus body) of over 0.5 m. The holotype is from Spittal (q.v.), but a large complete specimen from 'Holburn Head' was described by Miles and Westoll (1963), and specimens of plates from 'Brimms' were also figured.

Osteolepis panderi (syn. *O. microlepidotus* Valenciennes and Pentland, 1860) is by far the most common fish at Holburn Head. Hamilton and Trewin (1994) recorded the distribution and abundance of this and four other species throughout the most productive 50 cm of the fish bed at Holborn Head Quarry, and also the size distribution of *O. panderi* within the bed (Figure 6.26). Prior to its complete description by Jarvik (1948a), it had always been known as *O. microlepidotus*, but Jarvik determined that Pander had, in fact, been the first to describe it. Jarvik did not erect a lectotype in his redescription, because Pander's original material in the Imperial Academy of Science, St Petersburg, was unavailable immediately following World War II. Instead, Jarvik (1948a) used a mass of material from 'Thurso' and other Caithness sites. *Osteolepis panderi* is a small species, usually not exceeding 135 mm in length, and therefore considerably smaller than most *O. macrolepidotus*, a close relative from Caithness and Orkney. There are also differences in the pattern of head bones, with numerous small bones at the front of the headshield in *O. macrolepidotus*, and very slight subdivision in this area in *O. panderi*. *Osteolepis macrolepidotus* is restricted to the Achanarras horizon (Saxon, 1978), whereas *O. panderi* is found in the Ham–Skarfskerry Subgroup, and rarely in the Mey Subgroup, in the Thurso area and in Weydale Quarry (q.v.), and in the upper Stromness and Rousay Groups of Orkney.

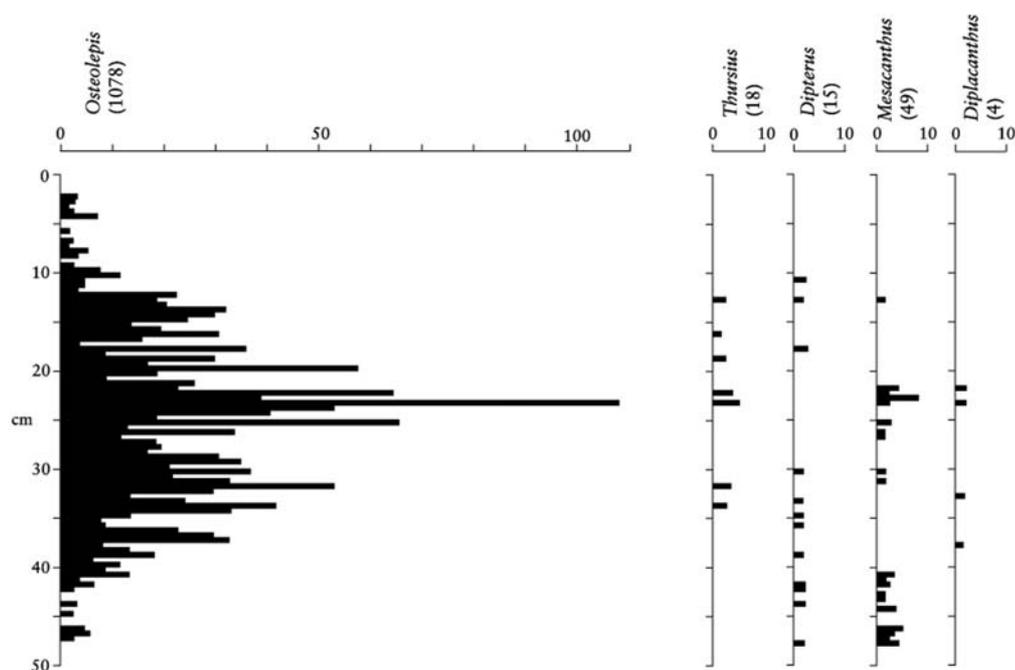


Figure 6.26: Distribution and abundances of fossil fish in Holborn Head Quarry (after Hamilton and Trewin, 1988).

Interpretation

As at other localities, the vertebrate-bearing rocks are interpreted as lacustrine deposits. Fish fossils are found in a dark-coloured siltstone, which may represent an anoxic phase or a salinity crisis leading to a high fish mortality; mass mortality levels are associated with dolomitic laminae and hence with salinity crises (Hamilton and Trewin, 1994). The dominance of *Osteolepis panderi* may be a reflection of the absence of a large predator, and the lack of juveniles of this species suggests that the young kept to other parts of the lake and so were spared the mass mortality event.

Hamilton and Trewin (1994) plotted the distribution and abundance of the fish within the

Holborn Head Quarry fish bed. This band is some 50 cm of dense carbonate or organic laminite, deposited apparently during the deepest part of the lake cycle (Figure 6.26).

Conclusions

The conservation value of Holburn Head Quarry results from the production of excellent specimens of the small osteolepiform *Osteolepis panderi*, as well as a fauna of acanthodians and placoderms typical of Fish Bed 4. Finds have been made recently in an excavation in the quarry floor to reach the fish bed, and there is future potential for more finds.

Reference list

- Crampton, C.B. and Carruthers, R.G. (1914) *The Geology of Caithness*. Memoirs of the Geological Survey of Scotland.
- Donovan, R.N., Foster, R.J. and Westoll, T.S. (1974) A stratigraphical revision of the Old Red Sandstone of North-eastern Caithness. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, **69**, 167–201.
- Egerton, P. de M.G. (1861) British fossils. (Descriptions of *Tristichopterus*, *Acanthodes*, *Climatius*, *Diplacanthus*, *Cheiracanthus*.) *Memoirs of the Geological Survey of the United Kingdom (British Organic Remains)*, Dec. **X**, 51–75.
- Hamilton, R.F.M. and Trewin, N.H. (1994) Taphonomy of fish beds from the Upper Flagstone Group of the Middle Old Red Sandstone, Caithness. *Scottish Journal of Geology*, **30**, 175–81.
- House, M.R., Richardson, J.B., Chaloner, W.G. *et al.* (1977) *A Correlation of Devonian rocks in the British Isles*. *The Geological Society, London, Special Report* **8**, 110 pp.
- Jarvik, E. (1948a) On the morphology and taxonomy of the Middle Devonian Osteolepid fishes of Scotland. *Kungliga Svenska Vetenskaps Akadaemiens Handlingar, Stockholm*, **25**, 1–301.
- Miles, R.S. and Westoll, T.S. (1963) Two new genera of Coccosteid Arthrodira from the Middle Old Red Sandstone of Scotland, and their stratigraphical distribution. *Transactions of the Royal Society of Edinburgh*, **65**, 179–216.
- Murchison, R.I. (1828) Supplementary Remarks on the Strata of the Oolite Series and the Rocks associated with them, in the Counties of Sutherland and Ross, and in the Hebrides. *Transactions of the Geological Society*, **2**, 353–68.
- Pander, C.H. (1860) *über die Saurodipterinen, Dendrodipterinen, Glyptopiden und Cheirolepiden des devonischen Systems*. Akademie für Wissenschaft, St Petersburg.
- Saxon, J. (1978) The radioactive fishes of the north of Scotland. *Earth Science*, **32**, 7–9.
- Traill, T.S. (1841) Notice of the fossil fishes found in the Old Red Sandstone formation of Orkney, particularly a undescribed species, *Dipterus agassis* (sic). *Transactions of the Royal Society of Edinburgh*, **15**, 89–92.
- Trewin, N.H. and Hurst, A. (eds) (1993) *Excursion Guide to the Geology of Eastern Sutherland and Caithness*. Scottish Academic Press for the Geological Societies of Aberdeen and Glasgow, Edinburgh, 123–66.