
Chapter 7 Mid- and Late Devonian fossil fishes sites of England and Wales

D.L. Dineley

Introduction: palaeogeography and stratigraphy

During Mid- and Late Devonian times, Laurussia, the Old Red Sandstone continent, extended over most of the British Isles, with its southern coastline running across southern Ireland and across England from the Severn Estuary to the Thames (Figure 7.1) and (Figure 7.2); Dineley, 1992). The coastline was not static, however, and continental facies (the Hangman Grits and Pickwell Down Sandstone) fed into north Devon from time to time as the boundary shifted south. Late Devonian marine beds are found within the Old Red Sandstone in South Wales, when the sea moved north.

The Upper Old Red Sandstone of Wales and the Welsh Borders rests unconformably on Lower Old Red Sandstones and coarse elastics prevail, reaching a maximum thickness of about 330 m in south-west Wales. Rivers flowed mainly towards the south-east, and clasts of igneous and sedimentary rock fragments suggest source areas as far as 400 km away in the Moinean–Dalradian of north-west Ireland and the Scottish Highlands. There may also have been a separate landmass on the southern side of the Bristol Channel, as indicated by some northerly palaeocurrent directions in alluvial fans feeding into South Wales. The Upper Old Red Sandstone deposits were mainly relatively thin alluvial sediments that heralded the thicker marine transgressive Carboniferous beds.

Lower Devonian continental rocks are present in south Devon and Cornwall (Dineley, 1966, 1992) and locally contain ostracoderm and other vertebrate remains. The marine Middle and Upper Devonian of Devon and Cornwall may have been deposited in a partly independent basin, although some deltaic elastic sediments fed into North Devon from time to time. Most of the sediments were fully marine, and show increasing evidence of offshore deposition to the south, with extensive limestone and reef formations in south Devon (Dineley, 1992).

Much of the stratigraphy of the Middle and Upper Devonian fish-bearing units of the Cornubian rocks (Figure 7.3) is poorly controlled. Some of the marine beds may be dated readily on the basis of conodonts, goniatites and corals, but facies containing the less stratigraphically useful corals, bivalves and brachiopods are more typical. The Old Red Sandstone is poorly dated. Here and there, fish faunas and rare paly-nomorphs give evidence of age, but only in general terms.

Environments

Late Devonian continental deposits rest unconformably upon the Early Devonian throughout South Wales and the Welsh Borders, indicating a phase of uplift and erosion prior to a resumption of primarily fluvial deposition. The sedimentology of these Upper Old Red Sandstone rocks has been interpreted by Allen (1965). The environments of deposition ranged from fluvial and alluvial, comparable to those in Early Devonian times, to coastal delta fans and lagoons in the south. Devonian continental sedimentation was succeeded by the marine transgression of the Early Carboniferous with its transitional sequence of shales and thin limestones (Webby, 1966).

South of the Bristol Channel the Cornubian basin received several thousand metres of sediment, derived apparently from the north. Conspicuous within these strata are the thick Hangman Grits and the sandy Pickwell Down Sandstone and Baggy and Upcott Beds. Diastrophism has rendered these rocks difficult to decipher for palaeoenvironments, but the general view is that all are predominantly marine proximal facies in north Devon and Somerset, but of deeper water facies in south Devon and Cornwall. Active tectonism and volcanic activity occurred throughout the southern region in Mid- and Late Devonian times.

The agnathan, placoderm and acanthodian fossils in the slates of the north Cornish coast occur in fine-grained lithologies, which elsewhere have marine fossils. They may have occupied marine habitats or at least been interred in shallow coastal lagoons or shelf environments, quite distinct from those to the north.

In the southern part of Devon the section begins with a continental facies in the Dartmouth Slate. This is a facies yielding only rare fossils, but pteraspidean and cephalaspidean fragments have been reported from many sites in South Devon and eastern Cornwall (Dineley, 1966, 1986).

Fish faunas

Fossil fishes occur in the Old Red Sandstone facies and in some shallow marine sediments of the Middle to Upper Devonian in the Anglo-Welsh Basin and Cornubia. Interestingly, the marine fishes of Devon and Cornwall are not markedly different from those of the Old Red Sandstone of the Anglo-Welsh Basin, with the occurrence of typical Late Devonian elements, such as the placoderm *Bothriolepis* and the rhipidistian *Holoptychius*. This could indicate a broad environmental tolerance of those forms, or that they had perhaps been washed into the sea from Old Red Sandstone continent rivers, where they may have been common.

Representation of the Upper Devonian in the Old Red Sandstone of southern Britain was established in mid 19th century from the evidence of its fossil fishes. Comparison with the better known faunas of Scotland was made by the early authors. The Upper Devonian fossil fish assemblages of England and Wales are dominated by remains of *Bothriolepis* and *Holoptychius*, but a relatively small number of other species also occurs. Most are predators. The British Late Devonian continental faunas seem to be far less diverse than those elsewhere.

Bothriolepis is a cosmopolitan antiarch genus known from over 100 described species. These fossils were for a long time the only means of dating otherwise barren strata, but forams and palynomorph assemblages now aid this task.

Fish sites

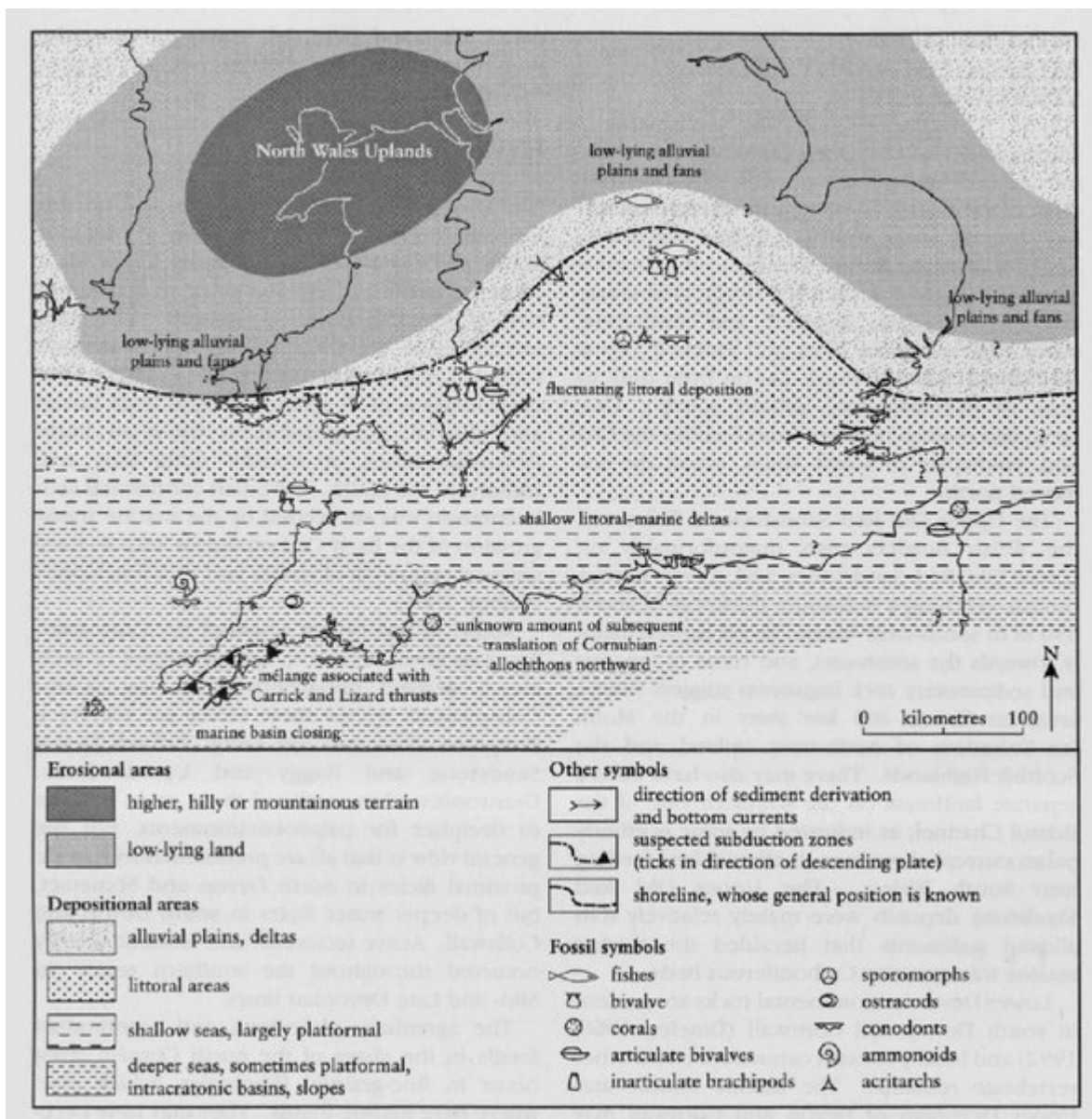
Isolated scales of *Holoptychius* and plates of *Bothriolepis* have been found at many localities in the Upper Old Red Sandstone of the Welsh Borders and South Wales and, more rarely, in the Upper Devonian of north Cornwall and north Devon. Five sites are selected as GCR fish sites for the Mid- and Late Devonian (Figure 7.2), Bedruthan Steps, Cornwall, and Mill Rock, north Devon, in the marine beds of the south-west, and in the Upper Old Red Sandstone, Afon y Waen, Clwyd, Portishead in Avon and Prescott Corner, Shropshire. Each of them has yielded a distinctive assemblage of fossils, and occurs in a distinctive facies, and with differing modes of preservation and accumulation, they are not all exactly coeval, but represent accumulations at different depths and distances from land, or sediment source areas. They are all important in the history of investigation of the Devonian rocks of southern Britain.

Comparison with other regions

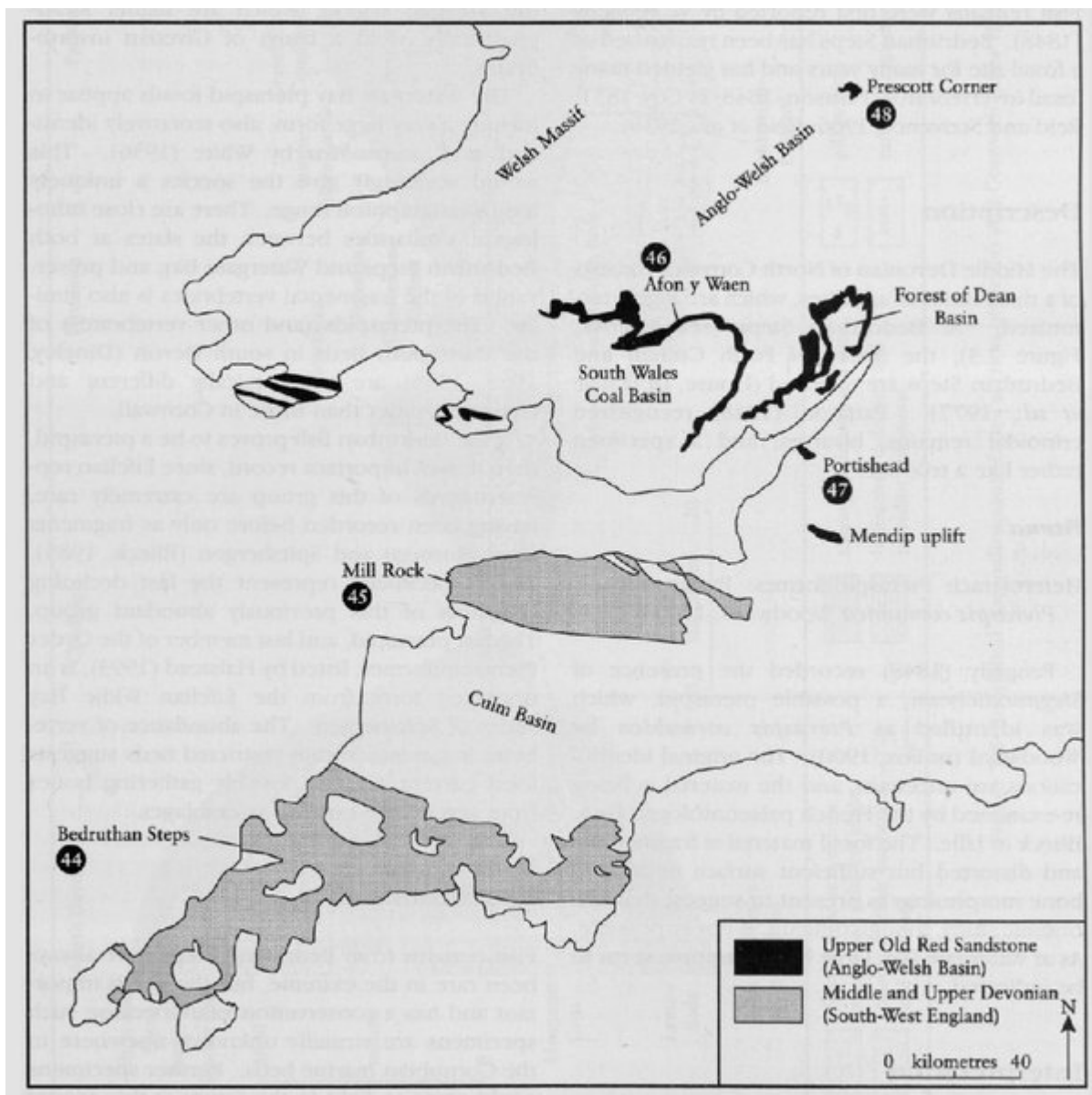
Compared to the fauna of equivalent age in Scotland, the Anglo-Welsh Basin has a small number of vertebrate taxa. It may have had a more distant and tenuous link with the Scottish–Baltic realm and with North America where placoderms are much more in evidence. The Late Devonian accumulations of continental beds in Wales and the heart of England are of small bulk and uncertain chronology (Wills, 1950, p. 30–2; Allen, 1965). The Late Devonian–Early Carboniferous transgression was rapid and the late removal of earlier (i.e. Devonian) deposits may have been extensive prior to the deposition of transgressive beds within the vicinity of the Bristol Channel.

South of the Bristol Channel the Devonian is undoubtedly of impressive thickness, but is largely barren of vertebrates. Biostratigraphy has to rely upon conodont and other faunas and on palynology. There are, however, lenticular thin bone beds in the Pilton Formation which yield a microvertebrate fauna that is yet to be studied.

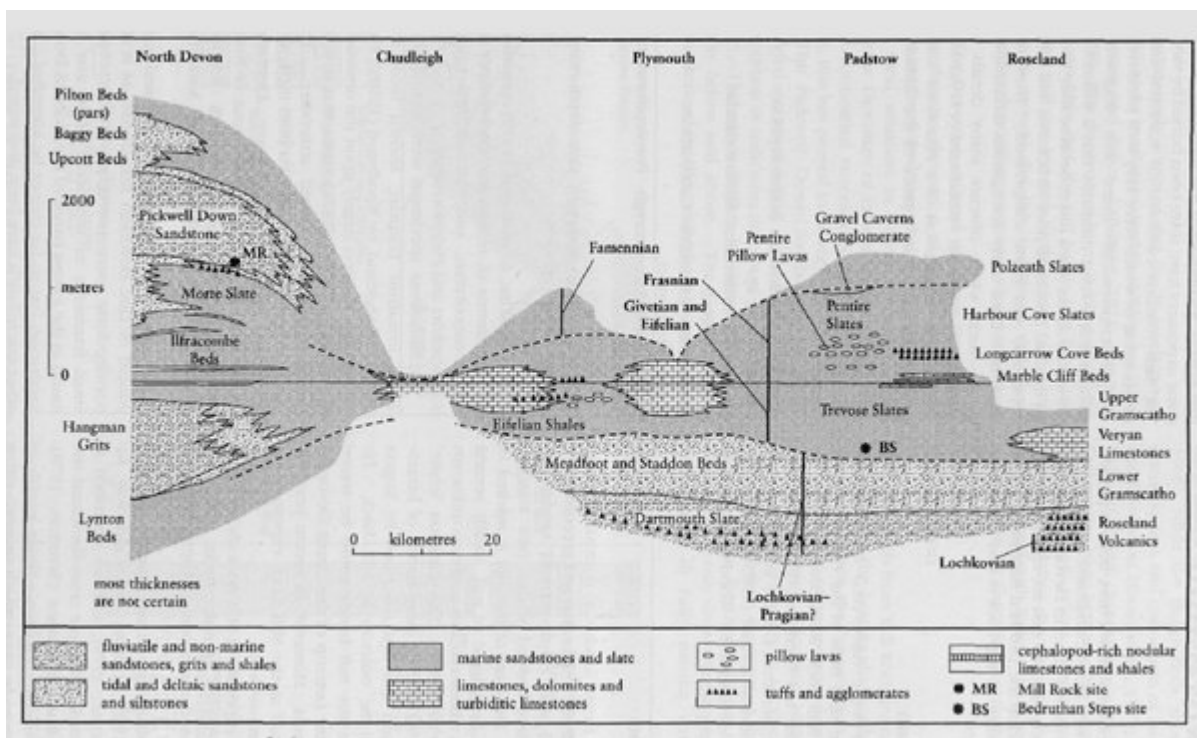
[References](#)



(Figure 7.1) The palaeogeography of southern England and Wales during Late Devonian time (c. 370–365 Ma), based upon outcrop and borehole evidence (after Bluck et al., 1992).



(Figure 7.2) Distribution of Mid and Late Devonian outcrops and GCR sites in England and Wales (site numbers as in Table 1.2).



(Figure 7.3) Simplified non-palinspastic faeces section of Devon and Cornwall (after House, 1975).