Otter Hole

[ST 526 963]

Highlights

Otter Hole contains a profusion of calcite stalactites and massive stalagmites on a scale unmatched by any other cave in Britain, and is the only major cave in the country located entirely within dolomites.

Introduction

Otter Hole lies in the west bank of the River Wye, just north of Chepstow (Figure 1.11). It has more than 3200 m of mapped passages developed entirely in the Lower Dolomite, a 100 m thick sequence of well-bedded dolomites and dolomitic limestones in the Courceyan stage of the Carboniferous Limestone. The main cave roughly follows the strike of the carbonates towards the east; dips are less than 10° to the south, and they swing around shallow flexures which plunge down the dip. The Vicarage Fault and the major joints are orientated NNW, parallel to the plunging flexures. Allogenic water drains into sinks along the boundary of the dolomite with the underlying Lower Limestone Shales, which separate it from the Old Red Sandstone to the north and west. Drainage through the cave flows to a resurgence between high and low water levels on the west bank of the River Wye about 100 m downstream of the entrance. The cave is intertidal at its lowest point, and rises to elevations of about 40 m.

The cave has been described by Elliott *et al.* (1979) and Westlake *et al.* (1989), and its diverse troglobitic fauna is recorded by Chapman (1979).

Description

An abandoned bedding plane passage, opening in the west bank of the River Wye a few metres above high-tide level, is the only entrance to Otter Hole. This joins the active streamway at the lowest part of the system, where backflooding at each high tide creates the unique tidal sump. At low tides, this can be passed to reach the active streamway which extends upstream along a fault-guided rift, and west to where the water emerges from low bedding plane passages with several flooded sections.

Above the active streamway, a series of old high-level passages extends to the west and northeast (Figure 6.20). Crystal Ball Passage is 200 m long to a choke and its rifts are up to 10 m high; there are many gour banks and spectacularly coloured curtains, and the crystal balls are roughly spherical calcite growths developed round the ends of straw stalactites where they dip below the surface of gour pools. The main high-level passage to the west enlarges into the Hall of the Thirty. This chamber has a breakdown floor and contains a magnificent display of stalactites and stalagmite bosses on a scale unparalleled elsewhere in Britain. The most notable features are the many calcite stalagmites up to 6 m high and over a metre in diameter with cylindrical profiles and domed tops (Figure 6.21).

Beyond the Hall of the Thirty, the passage has only extensive mud formations, before it crosses the Vicarage Fault in Fault Chamber. To the west, it is again profusely decorated with gour and crystal pools, flowstone and immense numbers of straw stalactites up to 4 m long. The finest of these are in Long Straw Chamber, where the cave crosses the trough of a shallow plunging syncline. From Tunnels Junction, the larger upstream passage is Tunnels Left, a phreatic tube 4 m in diameter with many high cross-rifts; at its farthest explored limit, this is intersected by a short section of modern streamway, choked in both directions.

Interpretation

Otter Hole is developed within a thick, uniform sequence of dolomites and dolomitic limestones, lithologies which elsewhere in Britain have very limited cave development. Passage location within the carbonates is closely controlled by bedding, with the cave curving round the shallow plunging syncline while maintaining an almost constant elevation. Joints and faults guided the initial flow paths, and greatly influence the passage morphology.

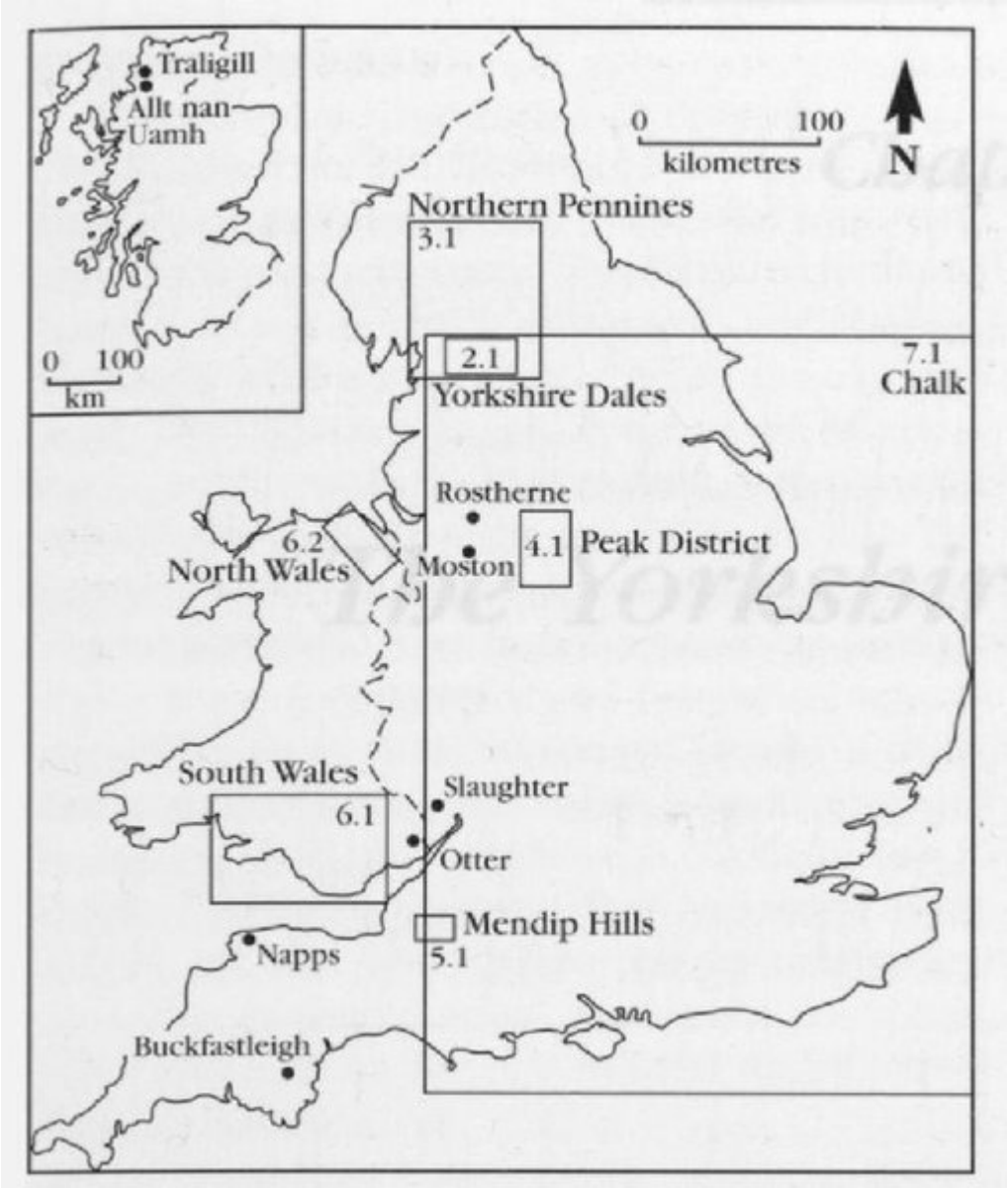
The cave lies at a lower altitude than any other major system in Britain, and its intertidal entrance series provides a unique restriction on access to the passages beyond the tidally fluctuating sump. This low altitude environment, and the sheltered west coast location, may account for the scale of speleothem development in Otter Hole. The massive cylindrical stalagmites are typical of those formed by high inflows of saturated dripwater which continue to deposit calcite as they flow down the stalagmite sides. They are unlike any others in Britain, and are comparable only to those in southern European caves formed in warmer, Mediterranean climates with thick soil and vegetation cover on the carbonate outcrops. Their presence suggests a local climatic regime during parts of the Pleistocene which was significantly warmer than climates in Britain's other karst areas, mostly further north and at higher altitude. Development of the main caves in the dolomites may have been favoured by the warmer climatic conditions in earlier times, but could have been on favourable inception horizons within more fractured or porous secondary dolomites. The old high-level caves were later drained and invaded by the percolation water which formed the calcite decorations.

The sequence of development of the passages in Otter Hole correlates closely with the history of the River Wye, where four levels of terraces at altitudes of 3–60 m lie above a buried channel at least 15 m deep beneath the estuarine alluvium, at Chepstow. In the earliest stage of Otter Hole, the main phreatic drainage flowed from Tunnels Left, along the main high-level cave, and out to a contemporary resurgence beyond the end of Crystal Ball Passage. The downstream end of this passage lies at about 30 m OD, just below the level of the second terrace. Further incision of the Wye, in response to the low sea level of a Pleistocene glacial stage, drained the old phreatic trunk caves into a lower route; this now forms the phreatic elements in the upper part of the active streamway, and the old phreatic passages of the entrance series, which correlate with an old resurgence at the level of the 3 m terrace. Lowering of base level during the Devensian caused vadose entrenchment in the streamway, and abandonment of the old resurgence in favour of the present one. The intertidal position today reflects a subsequent sea-level rise in the Holocene. The higher Wye terraces and the earlier stages of the cave development are not yet dated; analogy with other sites suggests a Hoxnian age for the old trunk cave and an Ipswichian timing for the main stalagmite deposition.

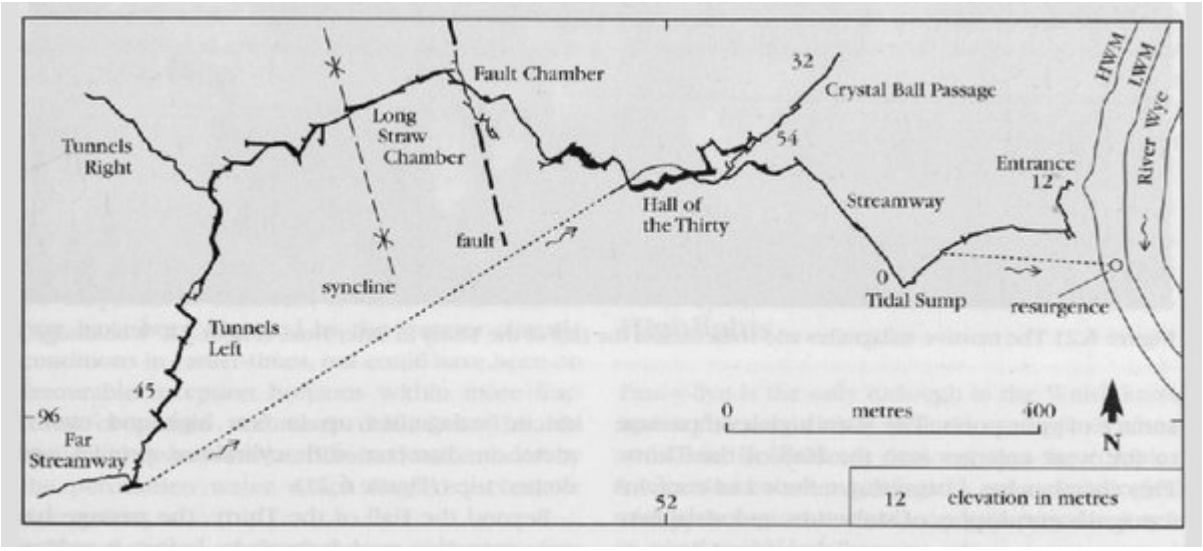
Conclusion

Otter Hole contains the largest stalagmites in Britain, which are comparable with speleothems in caves of the Mediterranean regions, and appear to reflect the southerly site at low altitude. The passage levels correlate with terraces on the River Wye. They are unusual in their extension down into the intertidal zone, and their development within a dolomitic sequence — both features not seen in other large caves in Britain.

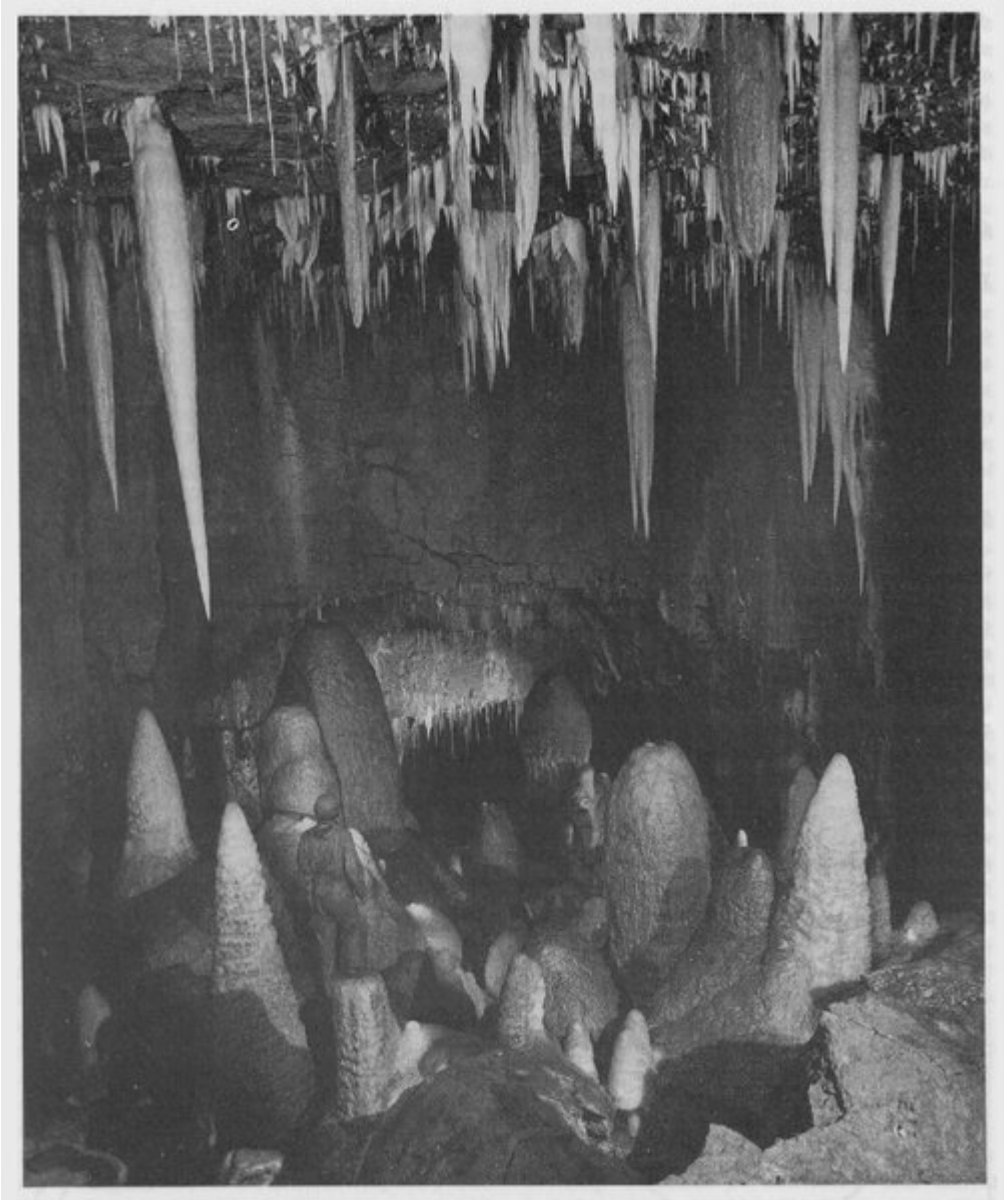
References



(Figure 1.11) Key map showing the coverage of location maps in each chapter, identified by their figure numbers, and also the location of sites which are documented in the text but fall outside the chapter location maps.



(Figure 6.20) Outline map of Otter Hole (from survey by Birmingham University Speleological Society).



(Figure 6.21) The massive stalagmites and stalactites in the Hall of the Thirty in Otter Hole. (Photo: J.R. Wooldridge.)