Hampton Rocks Cutting

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Highlights

Hampton Rocks Cutting was one of the first Pleistocene sites described from Somerset and Avon. It provides fine exposures through the low terrace of the Bath Avon and is nationally important for its calcretes — soil carbonate induration features. It is the type-site for the Bathampton Member and Bathampton Palaeosol of the Avon Valley Formation.

Introduction

Hampton Rocks railway cutting is one of a series of sites chosen to conserve representative examples of the terrace gravels of the Bath Avon. Hampton Rocks Cutting GCR site [ST 778 667] is important for a number of reasons. It was selected as the best-available area of river gravels from the lowest (and therefore probably youngest) river terrace of the Avon. It has historical importance as one of the first sites described from Somerset and Avon, and it demonstrates good examples of cold-stage fluvial and aeolian sedimentation as well as a cold-stage fossil mollusc assemblage. There are fragmentary mammal remains. More significant, however, are the calcretes, which are extremely rare in the British Quaternary record. At Hampton Rocks Cutting, these are especially well developed and well preserved.

The site was initially described by Weston (1850), who recorded horizontal beds of fine gravel and coarse sand, with clast lithologies including flint, Greensand, oolitic limestone, Carboniferous Limestone, Millstone Grit and Old Red Sandstone. The section was re-described by Woodward (1876), who noted 3 feet of reddish-brown clay overlying 'an irregular bed of sand and small gravel' about 6 feet thick. The site was revisited in 1984 in the course of the GCR and again in 1990, and the stratigraphy, sedimentology, clast lithology and palaeontology of the gravels re-described (Hunt, 1990b). The site was nominated as the type-locality of the Bathampton Member (gravels) and the Bathampton Palaeosol (calcreted soil) by Campbell *et al.* (*in* prep.). The gravels of the Bathampton Member were attributed to Oxygen Isotope Stage 6 and the Bathampton Palaeosol to Stage 5e.

Description

The Bathampton Member is a terrace deposit of the River Avon. The deposits lie at *c.* 30–35 m OD, some 3 m above the floodplain, and are thus part of Davies and Fry's (1929) 'Lower Terrace'. The description given below follows Hunt (1990b), but also includes new data (maximum bed thicknesses in parentheses).

6. Dark brown, silty sandy clay soil with occasional pebbles and extremely rare 'blue and white' (19th-20th century) potsherds and modern sheep bones. (0.2 m)

5. Strong brown, slightly clayey, fine sandy silt with occasional stones, some vertical. This bed has a sharp but somewhat involuted boundary with bed 4. (0.35 m)

4. Pale brown, imbricated, clast-supported, medium trough cross-bedded gravels. The bedding is disturbed at the top, probably by cryoturbation, and irregular masses up to 0.6 m across of calcrete (pedogenic calcium carbonate induration) have formed, often emphasizing and respecting the disturbed bedding and sometimes appearing to have the shape of the roots of substantial trees. The transition to the underlying bed occurs over a distance of 0.05 m. (0.55 m)

3. Pale brown, trough cross-bedded fine gravels and coarse sand, with channel-fills of pale brown, plane-bedded, sandy silty clays with occasional pebbles and extremely rare mollusc remains. (0.30 m)

2. Pale brown, mottled strong brown, trough cross-bedded sandy gravel and gravelly sand, with occasional openwork lenses, generally fining upwards. Trough cross-beds are 0.05–0.10 m deep, 2 to > 3 m wide. Maximum clast size in the bed is 0.25 m diameter. (2.0 m)

1. Brown, mottled black, sandy fine gravel, fining upwards, and strongly manganese indurated. Contains occasional very large clasts, mostly Jurassic limestones, up to 0.35 m, at base of horizon and often partially embedded in the bedrock. This bed has a sharp but very irregular junction with Fuller's Earth bedrock. (0.10 m)

The gravels of beds 1 and 2 are relatively well sorted and show a strong imbrication. The clast orientation data are heavily dominated by eastward dips. The clasts comprise two main groups of materials. The most numerically important includes oolitic and micritic limestones, Jurassic fossils, phosphate, flint, beef, Greensand and Greensand chert. All these lithologies have parent outcrops upstream of Bathampton. The other lithologies either have outcrops downstream in the Bristol district (yellow and red sandstones of the Carboniferous and Devonian or Permo-Triassic, Carboniferous Limestone, Bunter Quartzite, and possibly the igneous rocks) or farther afield (metamorphosed siltstones and mudrock probably originating from the Midlands or Wales). Others, such as limonite, are untraceable.

The palaeochannel-fills of bed 3 are laterally very discontinuous. They contain rare *P. muscorum, Succinea* cf. *oblonga, Trichia* cf. *hispida* and *Pisidium* sp. Fragments of elephant or mammoth tusk ivory and unidentifiable mammal bone were found evenly distributed in the gravels.

The upper parts of the gravel (bed 4) are somewhat involuted, with many vertical stones. Irregular masses of calcrete are present at the top of the gravels. These seem to have formed after the involutions had formed. These deposits are overlain by homogeneous sandy silts (bed 5), which in some places are disturbed by ploughing.

Interpretation

The stratigraphy can be interpreted in the following way. The trough cross-bedded gravels (bed 2) are the product of deposition by a braided (multichannel) stream. Such streams are typical of environments with little vegetation cover and a seasonal precipitation pattern, such as deserts and arctic–alpine areas (Briggs and Gilbertson, 1980). This environmental diagnosis is supported by the molluscan data. The few fossils recovered are typical of cold-stage mollusc assemblages in the British Isles (Kerney, 1976b; Jones and Keen, 1993). The molluscs present have well-known environmental tolerances at the present day and the environment at the time of deposition can therefore be deduced. *P. muscorum* prefers dry, exposed habitats, while *Succinea oblonga* (Draparnaud) inhabits wet muddy places. *T. hispida is* a generalist with a particular liking for wet grassy places. Members of the genus *Pisidium are* all aquatic. A dry landscape, with little vegetation except near watercourses is suggested. The climate was probably arid and rather cold. The terraces of the Bath Avon are famous for their mammal remains, but the 'Low Terrace' is regarded as virtually devoid of them (Davies and Fry, 1929). There is a high probability that the durable fragments found during the GCR re-survey are recycled and therefore of little palaeoenvironmental significance. Their presence, however, raises the interesting possibility that other, larger fragments of greater significance may be preserved elsewhere in the deposit.

Clast orientations in the gravels are consistent with deposition by a westward-flowing river. The clast lithological data suggest the input of erratic material into the catchment, probably by the ice sheet which laid down the glacial deposits now found at Bath University and elsewhere in Avon (this chapter; Hawkins and Kellaway, 1971; Gilbertson, 1974).

The upper part of the deposit was disrupted by frost action, which led to the formation of involutions and to the stones being turned into an upright position (bed 4). Subsequently, the masses of calcrete formed, most probably around the roots of trees, judging by the morphology of the calcrete bodies. Calcrete does not form at the present day in the British Isles, but is forming in the Mediterranean basin, suggesting a warm, relatively arid climate when this calcrete formed. The last time it was sufficiently warm for calcrete formation in this country was during Oxygen Isotope Stage 5e. Following this episode, the climate deteriorated and wind-blown coversands' were laid down. These have been altered significantly by later pedogenic processes to give rise to bed 5.

Conclusion

Hampton Rocks Cutting is important for a number of reasons. It provides an excellent example of the low terrace of the Bath Avon and therefore has stratigraphical significance. It contains a good example of cold-stage river sedimentation, dating from the last part of the Middle Pleistocene. It contains non-local pebbles which can only have been brought into the area by glacial action and thus provides compelling evidence for a former glaciation of the Bath area. Its greatest importance is for its calcretes, extremely unusual soil carbonate induration features probably dating from the last interglacial, Oxygen Isotope Stage 5e.

References