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# Castlethorpe

[SE 978 077]

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## Introduction

The Flandrian deposits of Humberside are dominated by floodplain alluvium and estuarine sediments, but several outcrops of calcareous tufa and shell marl in the Ancholme Valley provide valuable information on the palaeoenvironments of the past 10 000 years (Wright and Wright, 1933; Preece and Robinson, 1984; Gaunt *et al.*, 1992). Tufa is redeposited calcium carbonate or lime. It usually is produced in and around springs or areas of groundwater movement where the water possesses a high calcium carbonate content. The calcium carbonate solidifies into tufa when the water is subject to an increase in temperature or a decrease in pressure. Evaporation of calcium carbonate-rich water also may produce tufa. Shell marl is a calcareous clay containing abundant freshwater molluscs. The most extensive deposits crop out near Castlethorpe Hall [SE 978 077], North Lincolnshire, immediately west of Brigg (Figure 8.118), where the enclosed remains of freshwater and terrestrial snails document the change from marshland to woodland during the early to mid-Flandrian (Musham, 1933; Kennard and Musham, 1937; Preece and Robinson, 1984). Indications of woodland clearance for agriculture during the Bronze Age also are represented by charcoal deposits within the shell marl.

## Description

Thin deposits of tufa and shell marl, usually less than 2 m in thickness, are widespread in the small tributaries of the Ancholme Valley, incised into the dip slope of the Jurassic escarpment (Fletcher, 1981). The tufas and marls crop out in the embankments of field drains and streams to the west and south of Castlethorpe (Figure 8.118). Shell marl also underlies the peat and alluvium in the area (Smith, 1958b; Fletcher, 1981). The shell marls, which are creamy coloured, calcareous clays, contain abundant freshwater molluscs associated with the streams that cross the outcrops of the Lincolnshire and Snitterby limestones (Preece and Robinson, 1984).

Exhaustive investigations of the palaeoecological information contained within the tufa and shell marls was undertaken by Preece and Robinson (1984) at three major sites at Castlethorpe (numbered 1–3; (Figure 8.118)). The details of the lithostratigraphy and Mollusca and Ostracoda from the three sites are reproduced in (Figure 8.119) and (Figure 8.120). The abundance of the Mollusca allowed Preece and Robinson to identify molluscan assemblage zones (MAZ), defined by the predominance of particular species and based upon a similar sequence of deposits in Kent (Kerney *et al.*, 1980). These zones provide clear indications of changing environmental conditions in the Ancholme Valley.

At Castlethorpe site 1, the Mollusca between 110 and 90 cm (MAZ a) are dominated by swamp species but include some aquatic indicators. The terrestrial Mollusca represent a catholic group, or an assemblage that will tolerate a wide range of habitats, in this case indicative of a wet, open environment. Between 90 and 70 cm (MAZ b) the marshland Mollusca continue to be represented but indicators of more stagnant conditions appear and the terrestrial fauna are enriched. Between 70 and 50 cm (MAZ c) the Mollusca indicate the continuation of swampy conditions but also an environment that is heavily shaded. The Ostracoda at site 1 include 15 species typical of calcareous spring sites. They also indicate that the water at the site was cold and rich in plant debris. Pollen from the underlying peat at site 1 are typical of Late Devensian or Late-glacial assemblages, indicating that the accumulation of the overlying tufa may have spanned the whole of the Flandrian.

At Castlethorpe site 2, the Mollusca in tufa between 165 and 110 cm (MAZ b) is dominated by swamp species with a good proportion of shade-tolerant species. The terrestrial molluscs indicate a wet environment with a thin woodland cover. Between 110 and 30 cm (MAZ c), the swamp species decline to give way to some closed forest species. A thin zone between 30 and 20 cm (MAZ d/e) documents a decline in the woodland mollusc species, giving way to dry

grassland or open country species. Ten species of ostracod at site 2 are typical of spring sites, but there are indications that ponds temporarily dried out.

Between 190 and 180 cm at Castlethorpe site 3, the tufa contained terrestrial Mollusca typical of catholic and shade-demanding species (MAZ b). Overall the Mollusca of this zone were typical of a thinly wooded environment. Between 180 and 150 cm (MAZ c) the swamp species become more frequent but shade-demanding terrestrial species continue. The swamp species increase dramatically between 150 and 85 cm (MAZ d) but there is no change in the land fauna. A change in environmental conditions is documented in the zone between 85 and 30 cm (MAZ e). Below 65 cm a decline in shade-demanding species is offset by an increase in dry, open grassland species. Above 65 cm the open country elements decline to be replaced again by more shade-demanding species. Eleven species of ostracod at site 3 are typical of cool spring sites with the exception of some mildly brackish elements, perhaps originating from the nearby River Ancholme.

Charcoal fragments in the upper layers of the tufa at Castlethorpe site 3 have been radiocarbon dated to 3410 years BP (Preece and Robinson, 1984). The charcoal fragments correspond to the lithostratigraphical boundary between tufa and slopewash deposits, in addition to palaeoecological evidence of an abrupt reversion from wooded to open conditions.

## Interpretation

The molluscs found within tufas and marls provide evidence of a variety of environmental parameters to which they are sensitive. These include the turbidity and oxygenation of the former water body, the degree of shading or openness of the surrounding vegetation and, because they possess a strict temperature tolerance range, the prevailing climate at the time of deposition.

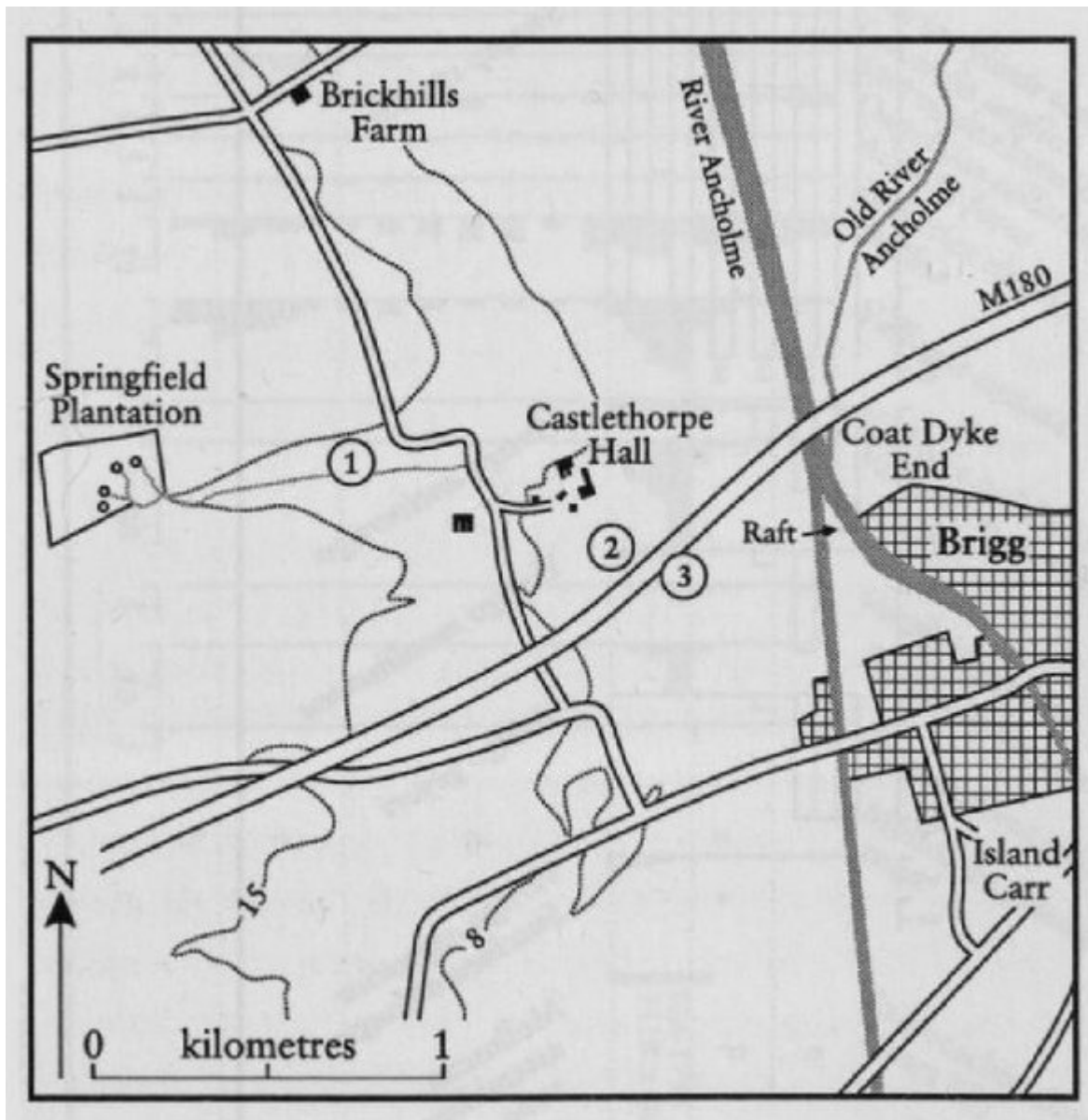
The tufas and shell marls started to accumulate in the early Flandrian in open calcareous marshes that were fed by lime-rich springs and in shallow pools prone to periodic drying out. Accumulation continued in a marshy environment until after the area became shaded by woodland, but ceased at around the time the woodland was cleared by burning (Preece and Robinson, 1984).

A temporary return to open ground conditions is recorded by the palaeoecological evidence and the charcoal layer dated to 3410 years BP. The charcoal is explained as the product of burning and woodland clearance by humans during the Bronze Age. Fossils in this layer indicate a reversion to open conditions and mark an abrupt break in the vegetation succession of the area that was characterized by the gradual encroachment of woodland. Tufa deposition also appears to have ceased at about this time at Castlethorpe, but peat overlying tufa at Coal Dyke, near Brigg (Figure 8.118) yielded a radiocarbon date of 4050 years BP, suggesting that tufa deposition had ceased by that date (Fletcher, 1981). Terrestrial molluscs in the sediments overlying the tufa and shell marl indicate that the area was not farmed after the clearance episode and the woodland eventually re-established itself.

## Conclusions

The Castlethorpe tufas and shell marls contain valuable paleoenvironmental evidence spanning the past 10 000 years. Abundant fossil Mollusca and Ostracoda have enabled the reconstruction of environmental conditions associated with calcareous springs in the Ancholme Valley. The tufa and shell marls began to accumulate some time after the Devensian Late-glacial in open calcareous marshes where cool spring water was moving through shallow pools. Marshy conditions continued but were accompanied by the gradual development of woodland. This woodland was cleared, probably through burning, by humans in the late Bronze Age, as indicated by an abrupt but temporary reversion to open conditions and the abundance of charcoal in the upper layers of tufa at Castlethorpe site 3. Tufa and marl accumulation probably ceased prior to 4000 years BP, a date that appears to be remarkably consistent for the cessation of tufa and marl production in other parts of Britain (Preece and Robinson, 1984). Castlethorpe is a valuable geological site with respect to reconstructions of Holocene palaeoclimate and tufa and shell marl deposition in northern England.

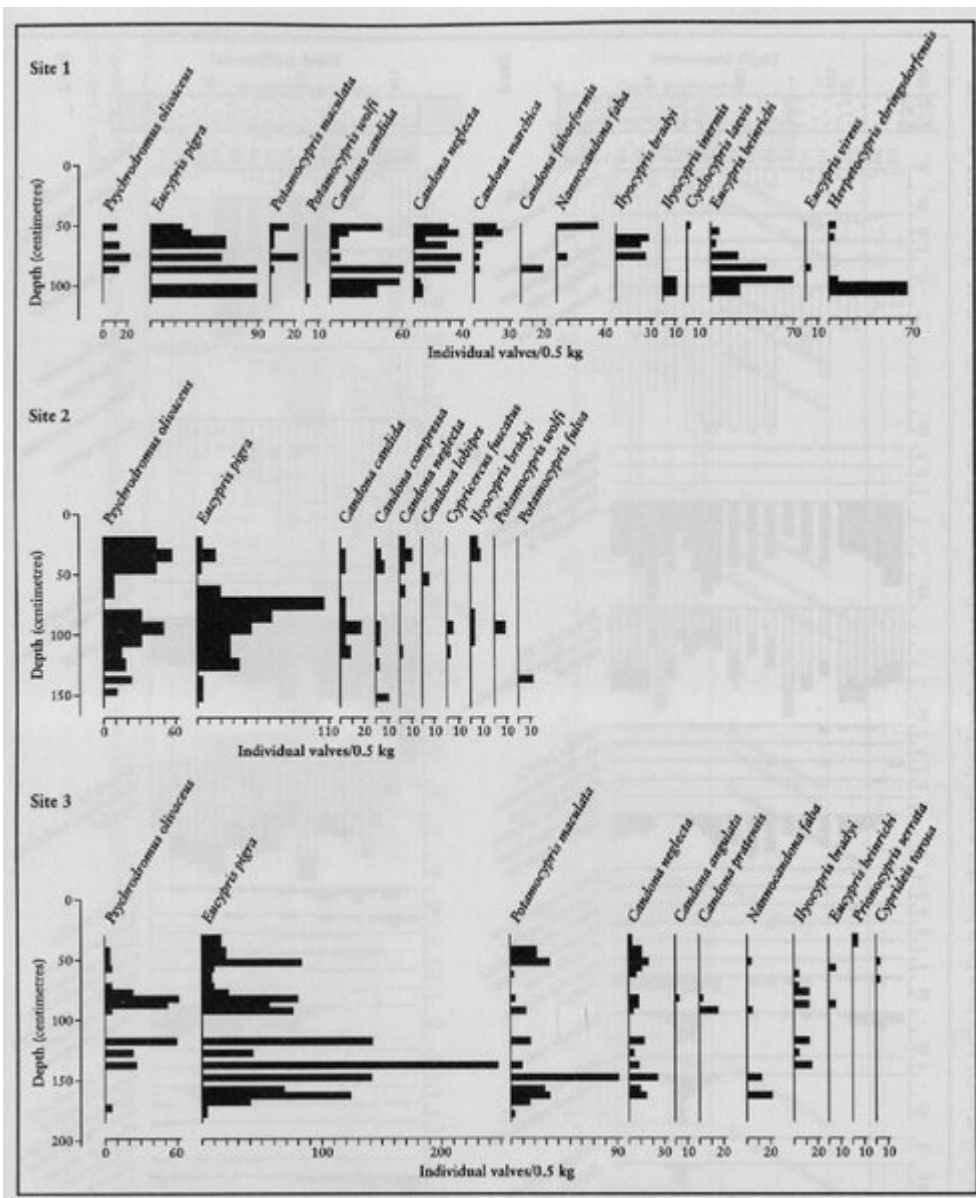
## [References](#)



(Figure 8.118) Location map of the three Castlethorpe tufa and shell marl sites.



(Figure 8.119) Mollusc diagrams with lithostratigraphy of the three Castlethorpe tufa and shell marl sites (after Preece and Robinson, 1984).



(Figure 8.120) Ostracod diagrams with lithostratigraphy of the three Castlethorpe tufa and shell marl sites (from Preece and Robinson, 1984).