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## Walton-on-the-Naze, Essex

[TM 264 230]–[TM 267 245]

Potential GCR site

### Highlights

The succession here is the best exposed section in the Thames Group north of the River Thames. It is the type section for the Walton Member of the London Clay and is one of the type sections for the offshore facies of the Harwich Formation. It has also proved to be of importance palaeontologically and is particularly significant as regards its plant macrofossils and vertebrate remains.

### Introduction

This site was also independently selected for its fossil plants and birds and Quaternary sediment content, more detailed accounts of which can be found elsewhere in the GCR series (*Mesozoic to Tertiary Palaeobotany of Great Britain* (Cleal and Thomas, in prep.); *Fossil Mammals and Birds of Great Britain* (Benton *et al.*, in prep.); *Quaternary of East Anglia and the Midlands* (Allen *et al.*, in prep.)).

The Neogene geology of this site is discussed in Chapter 11.

From grid reference [TM 264 230] in the south to [TM 267 245] some 1.5 km further north, good sections occur in the cliffs and in the foreshore at low water. The Thames Group is exposed both in the foreshore and the cliffs (Figure 3.22) where, except at the northern end of the section, it is overlain unconformably by the shelly sands of the Red Crag.

George and Vincent's (1977) account of the Walton section mentions references to the geology of the site which date back to the 18th century. Much of the early attraction reflected a concern with the rate of cliff erosion (Defoe, 1724; Buckland, 1824; Cole, 1898; Dalton, 1902). An interest in this aspect of the section has continued in recent times. In the Geologists' Association Guide, Greensmith *et al.* (1973) referred to the presence on the beach of a concrete World War II blockhouse which had been originally built back from the edge of the cliff. George and Vincent (1977) recommended the undergraduate dissertation of Rayner (1971) as a comprehensive source of information on erosion at Walton. Their paper also includes a useful summary and references for the local copperas and Roman Cement industries.

Early stratigraphical studies include those of Prestwich (1854b) and Whitaker (1877), whilst 19th century field meetings were reported by Holmes (1890, 1891). Earlier palaeontological work produced a limited list of fossils (e.g. Johnson, 1901; Davis, 1937). Following the account of the section by Davis and Elliott (1951a), it has been examined by members of the Tertiary Research Group (Cooper, 1970; George and Packman, 1970; George and Vincent, 1977). Jolley and Spinner (1991) sampled the site in their study of spore-pollen associations of the lower 'London Clay', whilst reference to the presence of the ash layers was made in Knox and Harland (1979, p. 252) and King (1981, p. 51).

### Description

At Walton, the London Clay is succeeded unconformably by Pliocene–Pleistocene sediments comprising 3–4 m of Red Crag overlain by about 3 m of gravels and silts.

### Lithological succession

King's section (1981, text-fig. 14) shows the Harwich Formation to comprise muds including two ash bands, with a glauconitic bioturbated sandy silt with abundant lignite and scattered pebbles near the top. The Walton Member in the cliff above comprise muds and silty muds with sandy partings and laminae (see (Figure 3.23)).

## Stratigraphy

Davis and Elliott (1951a) recorded up to 12 m of 'London Clay' in the cliffs, whilst Greensmith *et al.* (1973) estimated the amount exposed at 14+ m. Including 'London Clay' exposures on the foreshore, the thickness is somewhat greater but difficult to determine. In a useful discussion of the stratigraphy, George and Vincent (1977) suggested that the 'London Clay' of the foreshore is slightly greater than c. 21 m above the London Clay 'Basement Bed'. Davis and Elliott (1951a) estimated that from just above high watermark the latter was at a depth of c. 20.5 m, with the Harwich Stone Band at almost 19 m down. King (1981, text-fig. 14) portrays an exposed succession of just above 18 m, which he assigned to the upper part of his Harwich Member and the lower part of the overlying Walton Member.

The best modern account of the 'London Clay' at Walton is that of George and Vincent (1977). A 3.3 m sequence measured by them from the upper foreshore and lowest part of the cliff extends across the boundary between the former Harwich and Walton Members. In their detailed 11 unit succession, units 2 and 4 represent the highest ash bands of the Walton Member (King, 1981, p. 51).

The relationship of the Walton-on-the-Naze succession to that of Wrabness, Ferry Cliff [TM 278 486] and the Shotley Gate borehole [TM 244 346] is shown in (Figure 3.24) (after King, 1981).

## Palaeontology

Many of the units of George and Vincent (1977) contain a significant and varied biota, much of which comprises current-concentrated lags in what have been called 'woody pockets'.

A short floral and faunal list for Walton-on-the-Naze appears in Cooper (1970). A historical review of the fossils collected may be found in George and Vincent (1977) who also included a more comprehensive biotic list. This includes five birds, 17 fishes, a few reptiles (including a snake and turtle remains), a small molluscan fauna (six gastropods, three bivalves, plus the pteropod *Spiratella mercinensis*), a brittle star (*Ophiura*) and an echinoid (*Salenia*). In addition, King (1981) found barnacles and rare solitary corals. As well as woody material, the plant macrofossils present include fruit, seeds and leaves. George and Vincent (1977) listed 17 plant genera, some tentatively. The foraminifer *Astrorhiza* is present, whilst King (1981, p. 51) reported a restricted calcareous microfauna containing *Cytheretta aff nerva* and *Cytheridea unispinae* close to the upper ash band.

Logs occur in the Walton Member (often in concretions; Cooper, 1970). There is no calcareous fauna but King (1981, p. 51) has recorded microfossils from the Walton Member including pyritized diatoms and small agglutinated foraminifera.

Jolley and Spinner (1991) collected spore-pollen samples from both the Harwich Formation and Walton Member here, but gave no further details of their distribution. Reference to the section and its palynoflora has, however, been made more recently by Jolley (1996) as part of a broader study.

## Interpretation and evaluation

Walton-on-the-Naze has the most extensive and best exposed cliff section in the Thames Group north of the River Thames. Cliff erosion is rapid which guarantees a constant supply of fresh material. King (1981), the acknowledged expert on the London Clay, considers this section as one of the classic 'London Clay' sections, along with Sheppey Cliffs, Whitecliff Bay, Alum Bay and Bognor Regis.

## Stratigraphical significance

The Walton section is clearly important as the type section for the Walton Member of the London Clay, whilst the junction with the underlying Harwich Formation is better seen here than at Wrabness. The value of the site is clearly enhanced by the fossiliferous Red Crag which overlies the Thames Group unconformably (see the Neogene section of this volume).

## Palaeontology

Whilst, as at most other localities (King, 1981, p. 26), the Walton Member at Walton-on-the-Naze has a paucity of calcareous fossils, the Palaeogene sediments here have produced a sufficiently important macroflora and vertebrate fauna for it to be notified as a GCR site for both the appropriate Palaeobotany and Vertebrate Palaeontology blocks.

Walton-on-the-Naze is the only 'London Clay' locality to yield angiosperms in the form of carbonaceous compressions, invaluable for the study of small seed fossils, and is considered a key Tertiary palaeobotanical locality.

It is also described as an exceptional avifaunal site of considerable importance in the study of bird evolution. Indeed, Lucy (1989) quotes the NCC as saying that 'The London Clay at Walton-on-the-Naze contains the best preserved Tertiary bird fauna in the world'. Interestingly, an avifauna thought to be of similar age has been recorded from the Mo Clay of Denmark, a formation of upper *A. hypercanthum* age, and agreed to be a distant correlative of the Harwich Member (Knox and Harland, 1979).

## Conclusions

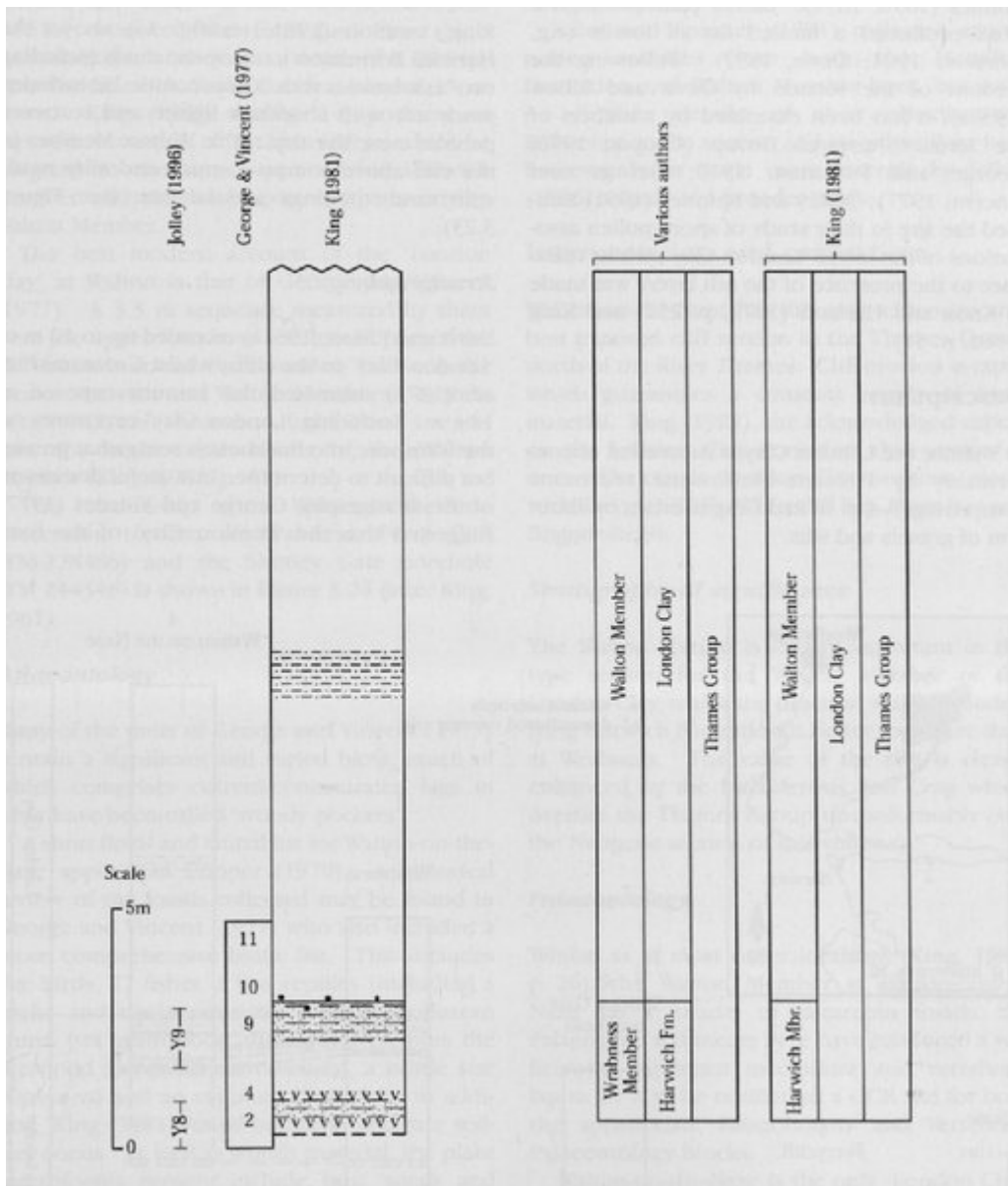
Walton-on-the-Naze is a classic Thames Group site and provides the most extensive cliff section in the group north of the River Thames.

Both the Harwich Formation and the Walton Member of the London Clay are well exposed in the cliffs and foreshore at low tide. Parts of the succession have a flora and fauna offering considerable potential for research, from which a better understanding of contemporary environmental conditions will inevitably arise.

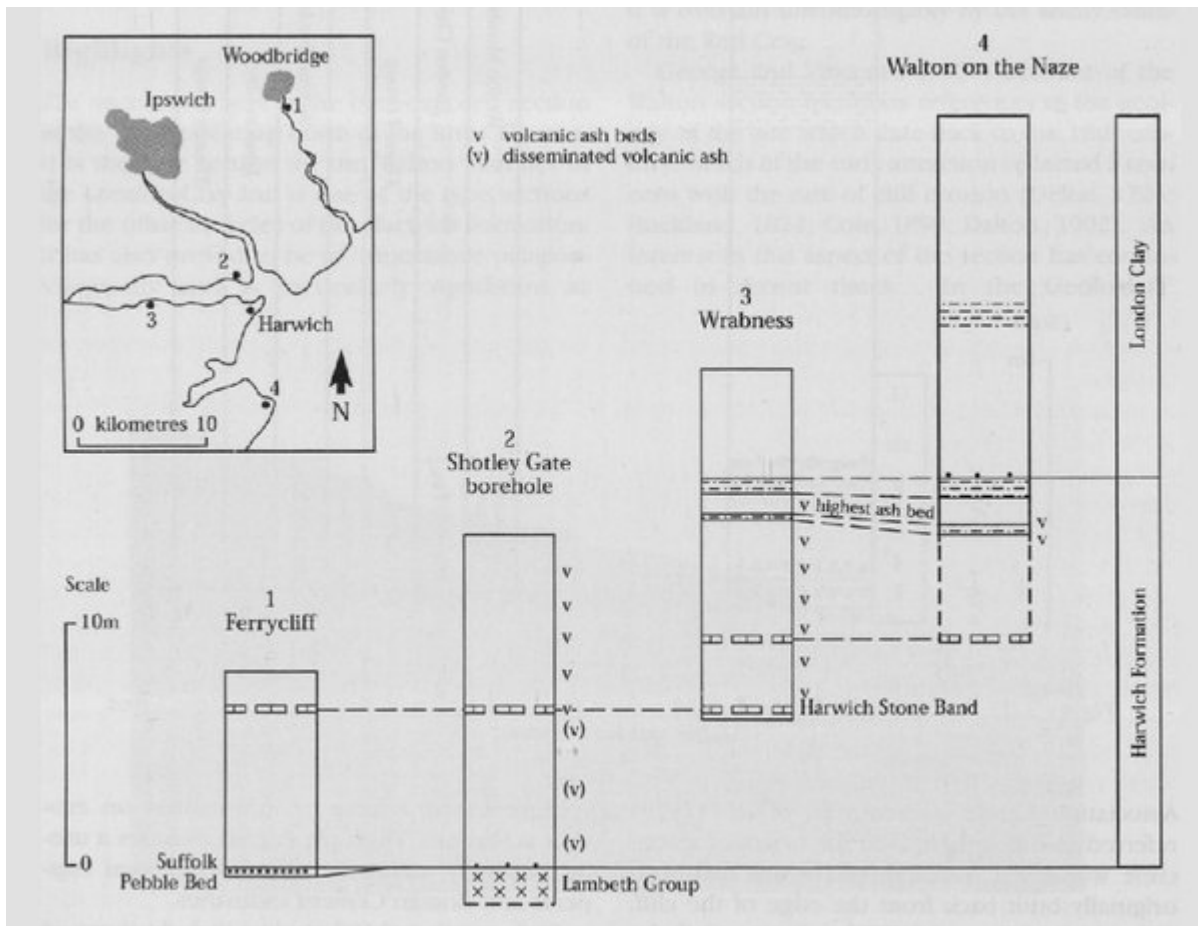
## References



(Figure 3.22) Walton-on-the-Naze, Essex. London Clay exposed on the foreshore at low water. In the cliffs behind, the London Clay is overlain unconformably by the Red Crag. (Photograph: P Balson.)



(Figure 3.23) Succession in the Harwich Formation and London Clay at Walton-on-the-Naze, Essex (after various authors)



(Figure 3.24) Correlation of the Harwich Formation and London Clay of Ferrycliff, Sussex, Shotley Gate borehole, Wrabness and Walton-on-the-Naze (after King, 1981, text-fig. 14).