Walton-on-the-Naze

[TM 267 238]

Introduction

The London Clay division A1 exposed at Walton-on-the-Naze has yielded numerous fruits and seeds preserved as carbonaceous fossils. This mode of preservation makes it easier to compare the fossils with other early Tertiary fruit and seed floras, and with the fruits of living plants. It is also important as one of the few places where bulk samples of a Palaeocene–Eocene plant bed with fruits and seeds can be collected from a cliff section.

The presence of fossil fruits and seeds here was first noted by Johnson (1901) in a local naturalists' journal. They appear to have been overlooked by Reid and Chandler (1933) in their classic work on the 'London Clay' plant fossils, but were noted by Chandler (1961a) in her first supplement to that monograph. George and Vincent (1977) also briefly mention them in a field guide to the area. Collinson (1983b) lists most of the species at that time known from here and figured several specimens.

Description

Stratigraphy

Davis and Elliott (1951), George and Vincent (1977) and Daley (in Daley and Balson, 1999) have described the geology here. The plant bed here is within three to six metres of silty clays, which are exposed in the lower part of the cliff and the foreshore, underlying deposits of the Red Crag. The deposits are silty clay and were assigned by King (1981) to the uppermost A1 division of the London Clay, and hence fall in the Palaeocene–Eocene transitional interval (see 'Stratigraphical Background', earlier in this chapter).

Palaeobotany

In contrast to most London Clay Formation plant sites, the fruits and seeds here are preserved as carbonaceous fossils (Figure 7.23). Because of their mode of preservation, the fossils have not been concentrated on the beach by wave action (compare with the situation at Sheppey). The fossils must instead be carefully sifted from the mudstones and siltstones collected *in situ.* Collinson (quoted in George and Vincent, 1977) and Collinson (1983b) stated that 18 species are known from here, of which the following were listed:

Annonaceae

Anonaspermum commune Reid and Chandler

Cercidiphyllaceae

Nyssidium arcticum (Neer) Iljinskaja (=*Jenkinsella apocynoides*)

Cornaceae

?Eomastixia sp.

?**Euphorbiaceae**

Wetherelliia variabilis Bowerbank

Icacinaceae

Icacinicarya amygdaloidea Chandler

Iodes corniculata Reid and Chandler

Palaeophytocrene ambigua Reid and Chandler

Juglandaceae

Platycarya richardsonii (Bowerbank) Chandler

Lauraceae

Cinnamomum sp.

?Litsea bournensis Bandulska

Menispermaceae

?Palaeococculus lakensis Chandler

Tinospora excavata Reid and Chandler

Wardensheppeya davisii (Chandler) Eyde

Rutaceae

Rutaspermum spp.

Sapindaceae

?Sapindospermum sp.

Staphyleaceae

Tapiscia pusilla (Reid and Chandler) Mai

Symplocaceae

?Durania sp.

Vitaceae

Vitis pygmaea Chandler

See (Table 8.1) for references to nomenclatural revisions.

Interpretation

Far fewer species have been reported from here compared with the more classic, slightly younger, Ypresian plant sites such as Herne Bay and Bognor. This is probably because the site has only recently been investigated and because the fossils have to be sifted from the mudstones and siltstones obtained from the in-situ plant bed, making it difficult to obtain the sorts of quantities that can be obtained where the fossils have been concentrated by the action of the sea. The general balance of the reported assemblage agrees with that normally found in the slightly younger London Clay sites with a predominance of 'tropical' elements, such as species of the custard apple, icacina, mastic trees of the dogwood family, moonseed and soapberry families, together with some taxa indicating cooler conditions, such as species of the walnut family.

What makes Walton-on-the-Naze palaeobotanically important is the. preservation of the fossils. Ypresian fruits and seeds of the London Basin are normally preserved as pyrite petrifactions. This mode of preservation has many benefits for the palaeobotanist, not least that the fossils often preserve internal cellular detail, especially of the softer, pulpy tissue (Chandler, 1978; Wilkinson, 1983). As pointed out by Collinson (1983b), however, it also presents the palaeobotanist with some difficulties. The permineralizing fluids might produce only a partial replacement of the fruit, showing what appear to be quite different features from a fossil representing a complete fruit. The analogy given by Collinson (1983b) is what would happen if an orange were to be petrified by pyrite: the fossil might be a cast of the whole orange, a cast of the inside of the skin (i.e. a cast whose outer surface looks like the inside of the skin), a cast of the orange minus the skin showing the segments, a cast of the cavity in the fruit where the seed was positioned, or a cast of the seed itself. Furthermore, a particular fossil might show more than one type of preservation, such as a cast of the whole orange, but with part of the skin removed. This is easy to interpret in the case of an orange, where we have prior knowledge of what we are looking at. However, in the case of extinct taxa where we only have the fruit, things are not so easy. The permineralization can also sometimes distort the cells, making the anatomy and sometimes even the morphology difficult to interpret (Chandler, 1978).

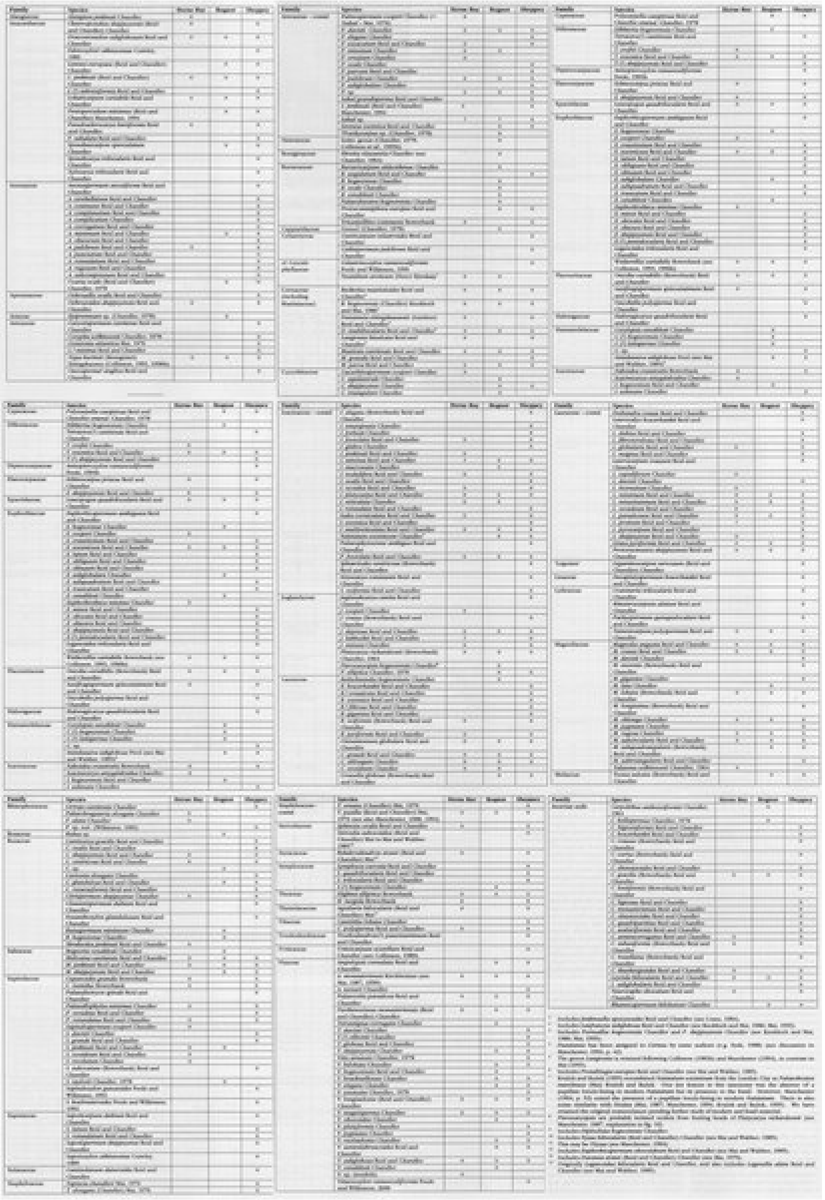
These problems can be partially overcome by the study of carbonaceous fossils, where there has been little or no pyrite replacement. Walton-on-the-Naze is the best available site for London Clay carbonaceous fruits and seeds in the London Basin. They are obviously not so robust as their pyritized counterparts and they fragment more easily. Some of the internal cellular detail may also be lost, but these fossils will often demonstrate the gross morphology of the fruit or seed far more clearly than their pyritized counterparts, enabling more straightforward comparisons both with living relatives and fruits and seeds from other formations. By studying these carbonaceous fossils in tandem with the pyritized petrifactions, a far more complete understanding can be obtained of the London Basin flora, especially of the fruits and seeds.

Conclusions

Walton-on-the-Naze is the best site for carbonaceous fossils of fruits and seeds from the uppermost part of the Palaeocene–Eocene transitional interval of the London Basin. The preservation of these fossils complements the better-known pyrite petrifactions in younger strata and provides an insight into the early stages of development of the 50 Ma old paratropical rain forest of Early and Middle Eocene times.

References

(Figure 7.23) Endocarp of Wardensheppeya davisii (Menispermaeae) in carbonaceous preservation, × 38 (see Collinson, 1983b). Walton-on-the-Naze, London Clay Bed Al. (Photo: M.E. Collinson.)



(Table 8.1) Angiosperm fruit, seed, wood and twig fossils from the Eocene London Clay GCR sites. Species and details from Reid and Chandler (1933) and Chandler (1961a), unless otherwise referenced. The family classification used here is summarized in Chapter 1 of the present volume.