Abbey Wood, Greater London

[TQ 480 786]

Introduction

Abbey Wood is one of the most important Early Eocene sites in Britain. The site is a temporary excavation in a wooded hillside (Figure 3.7) and has produced a wide range of mammals, birds, reptiles and fishes (White, 1931; Hooker *et al.,* 1980; Hooker, 1998). Despite the bulk sampling techniques being used to collect, continued careful excavation will preserve this site for many years to come.

The first excavations at Abbey Wood took place during the early part of the 20th century (White, 1931; Cooper, 1932a,b). Since then interest in the site waned until the 1960s, when renewed collecting brought to light new mammalian taxa (Simons, 1962; Van Valen, 1965; Kühne, 1969; Hooker, 1979, 1980). Since 1992, the Tertiary Research Group has run a programme of annual excavations (Dineley and Metcalf, 1999), and much new material is coming to light (Hooker, 1996c, 1998; Hooker and Dashzeveg, 2003).

Description

The site displays a sequence of sediments that range from the Chalk (Late Cretaceous) to the Blackheath Beds (Early Eocene), although intervening strata have not been exposed. The fossiliferous horizon, the Lessness Shell Bed, occurs in the lower part of the Blackheath Beds.

The Blackheath Beds belong to the diverse series of sediments that form basal transgressive deposits of the Thames Group. They consist of cross-bedded unconsolidated pebble beds and cemented conglomerates that commonly fill deep depressions within older units (Thanet, Upnor and Woolwich formations; (Figure 3.5)). At Abbey Wood the Blackheath Beds perhaps fill a large channel cut into the underlying units (Epps and Priest, 1933; Rundle, 1970; Hooker, 1975, 1991b). These facies are overlain by sands with a more marine shelly fauna (the Oldhaven Formation) further east in Kent (Chandler, 1923; Collinson *et al.,* 2003). At Abbey Wood the upper part of the Blackheath Beds takes the form of massive pebble beds. The lower part is composed of sands with scattered pebbles that interdigitate with the Lessness Shell Bed, an intermittent shell coquina with fine-grained sand and scattered well-rounded black flint peb bles derived from lower units (Durkin and Baldwin, 1968). The Lessness Shell Bed reaches a maximum thickness of *c.* 2 m and is seen approximately 1.5 m below ground level (Durkin and Baldwin, 1968).

Fauna

The fauna at Abbey Wood consists of a variety of molluscs, as well as fishes, reptiles and birds. The fishes include seven or eight species of shark. The reptiles are fragments of the soft-shelled turtle *Trionyx* (Walker and Moody, 1974). Although the early years of collecting at Abbey Wood produced only a few fossils representing a limited faunal diversity, recent changes in collecting techniques, including bulk sampling, screen-washing to 0.5 mm mesh size and acid preparation, have increased the numbers of specimens and species diversity. The mammal fauna listed below is from Collinson and Hooker (1987) and Hooker (1998).

MAMMALIA

Multituberculata

Neoplagiaulacidae

Ectypodus childei (Kühne, 1969)

Marsupialia

Herpetotheriidae

Amphiperatherium brabantense Crochet, 1980

A. maximum? Crochet, 1980

Rodentia

Paramyidae

Paramys ageiensis Michaux, 1964

Meldimys? sp.

Pantrogna russelli (Michaux, 1964)

'Micropararnys' sp.

Lipotyphla

Amphilemuridae

Macrocranion cf. nitens

Neomatronella sp.

Chiroptera

Emballonuridae

Eppsinycteris anglica (Cooper, 1932b)

Plesiadapiformes

Paromomyidae

Arcius fuscus (Russell, Louis and Savage, 1967)

Primates

Adapidae

Cantius eppsi (Cooper, 1932b)

Omomyidae

Omomyidae undet.

Didelphodonta

Cimolestidae

Didelphodus? sp.

Pantolesta

Pantolestidae

Palaeosinopa? sp.

Apatotheria

Apatemyidae

Apatemys sp.

Tillodontia

Esthonychidae

Esthonychidae indet.

Pantodonta

Coryphodontidae

Coryphodon eocaenus Owen, 1846

Creodonta

Oxyaenidae

Oxyaena gulo Matthew, 1915

Palaeonictis cf. *occidentalis* Osborn, 1892

Hyaenodontidae

Prototomus? sp.

Carnivora

Miacidae

'Miacidae' indet.

'Condylarthra'

Arctocyonidae

Arctocyonides sp.

Hyopsodontidae

Hyopsodus wardi Hooker, 1979

Lessnessina packmani Hooker, 1979

Phenacodontidae

Phenacodus lemoinei Thewissen, 1990

Artiodactyla

'Diacodexeidae

Diacodexis sp.

Perissodactyla

Equidae

Pliolophus vulpiceps Owen, 1858

The mammalian fauna from Abbey Wood is especially diverse, although early collections represented mainly larger animals such as the primitive horse *Pliolophus* and the pantodont *Coryphodon,* but jaw material of the primitive primate *Cantius* and a tooth of a creodont (Cooper, 1932b; Epps and Priest, 1933) were also found. Abbey Wood is the type locality for five mammalian species, namely the multituberculate *Ectypodus childei,* the primate *Cantius eppsi,* the condylarths *Hyopsodus wardi* and *Lessnessina packmani* and the bat *Eppsinycteris anglica.*

The primate '*Protoadapis' eppsi* Cooper ((Figure 3.8)a,b) was made type of the new genus *Cantius* by Simons (1962), distinct from similar small 'lemuroid' primates of France and Germany.

An unusual faunal element was added by Kühne (1969) when he described the multituberculate *Charlesmooria childei,* since reassigned to the neoplagiaulacid genus *Ectypodus.* This is a late-surviving genus of multituberculate, ranging from Paleocene to Eocene times and occurring in Europe and North America.

More recently, two new species of condylarths (primitive ungulates) have been discovered in the Blackheath Beds at Abbey Wood. These taxa, *Lessnessina packmani* ((Figure 3.8)c,d) and *Hyopsodus wardi* ((Figure 3.8)e,f), are represented by several fragments of jaw and isolated teeth (Hooker, 1979). Abbey Wood is the type locality for both species. Recent finds of *L. packmani* have resulted in the genus being located also in France and Mongolia, leading to the idea of dispersal across the Turgai Straits in Russia (Hooker and Dashzeveg, 2003).

'Adapisorex' anglicus Cooper, 1932b, originally was described as an insectivoran but recently reinterpreted as the oldest emballonurid (sheath-tailed) bat (Hooker, 1996c) and the species recombined as *Eppsinycteris anglica.*

The horse *Pliolophus vulpiceps* is reported from Abbey Wood ((Figure 3.8)h) on the basis of several jaw fragments, teeth and some post-cranial elements (Hooker, 1980, 1984, 1989a, 1994a). The type of *P. vulpiceps* Owen, 1858, was named from the Harwich Stone Band (London Clay Formation) of Harwich ((Figure 3.8)i). Abbey Wood has produced teeth that although but not completely identical are judged to be within the range of variation of a single species.

Interpretation

The sedimentary characteristics and invertebrate fauna of the shell lens suggest a high-energy, low-salinity marine shoreface environment. The terrestrial fauna is generally well-preserved, which suggests that the palaeoshoreline was fairly close to their habitats. The clasts in the pebble-rich Blackheath Beds are mainly reworked chalk flints. They are well rounded and may be secondarily reworked from the underlying Reading and Upnor formations, and they form the coarse basal nearshore units heralding the London Clay Formation sea. The molluscs are brackish and nearshore marine forms; brackish taxa are the more common.

The fossil horse remains from Abbey Wood form part of a succession of early forms in Europe ((Figure 3.8)g–j) that reflect a combination of evolutionary trends and dispersal events (Hooker, 1980, 1994a).

The Abbey Wood fauna traditionally was classed as 'Spamacian', one of an extensive series of faunas in France, Belgium and England, which was assigned an earliest Eocene age (e.g. Savage and Russell, 1983, pp. 65–70). This age assignment was based largely on lithological and mapping criteria and comparisons of mammalian faunas between Europe and North America. The Sparnacian faunas, dominated by '*Hyracotherium', Cantius* and *Paramys,* are directly comparable with the Wasatchian faunas, dominated by these three taxa plus the artiodactyl *Diacodexis,* which is also present at Abbey Wood. However, re-dating of the type Sparnacian in the Paris Basin has shown it to be equivalent in age only to lower and middle parts of the London Clay Formation (Laurain *et al.,* 1983) and thus younger than either

Abbey Wood or Ferry Cliff. The Neustrian European Land Mammal Age (Fahlbusch, 1976) is used instead to typify these earliest Eocene mammal faunas.

Re-assessments of the ages of European Paleogene faunas (Schmidt-Kittler, 1987; Hooker, 1991b) assigned the Abbey Wood fauna to Mammal Palaeogene Reference Level MP8–9, which equates to the French localities Avenay, Mutigny, Pourcy and Meudon and covers a broad time-span. However, a more detailed biostratigraphical calibration of Neustrian mammal faunas (Hooker, 1996a) places Abbey Wood in Zone PEIII, younger than Meudon but older than Mutigny or even Pourcy. Thus the Abbey Wood fauna occurs at a time unrepresented by mammals elsewhere in Europe. A number of independent biostratigraphical indicators (nannoplankton, dinocysts, charophytes) in the London Clay Formation and associated units confirm the position of the Blackheath Beds in Early Eocene time (King, 1981; Riveline, 1984; Knox, 1990; Hooker, 1998).

Comparison with other localities

Several of the mammal species from Abbey Wood (e.g. *Cantius eppsi, Pantrogna russelli, Lessnessina packmani, Hyopsodus wardi, Pliolophus vulpiceps*) are known from other localities in continental Europe, in particular the French site of Pourcy. In addition, many of the genera also are common to North America, namely *Cantius, Coryphodon, Diacodexis, Didelphodus, Ectypodus, Hyopsodus, Pliolophus, Macrocranion, Apatemys, Oxyaena, Palaeosinopa, Phenacodus* and *Prototomus.* Significantly, the species *Ectypodus childei, Coryphodon eocaenus* and *Oxyaena gulo* occur also in North America. The short range of *O. gulo* allows a detailed correlation with part of the North American Wasatchian Land Mammal Age (Hooker, 1998). The extensive Early Eocene faunas shared by both continents show the possibility of extensive interchange of terrestrial faunas at the time, probably largely via a land connection through Greenland that bridged the still narrow North Atlantic Ocean. An additional dispersal route has been identified from Asia to Europe via the Turgai Straits (a southern narrowing of the West Siberian sea that divided Asia and Europe in Paleocene and Eocene times) based on the shared presence of *Lessnessina* at Abbey Wood (and in France) and in Mongolia (Hooker and Dashzeveg, 2003). In contrast, few species are represented at other British sites, restricted to *Pliolophus vulpiceps* and *Coryphodon eocaenus* in lower parts of the London Clay Formation and *Hyopsodus wardi* in the Suffolk Pebble Beds.

There are therefore two significant Early Eocene mammalian faunas from the London Basin: Abbey Wood and that recovered from the Suffolk Pebble Beds. These faunas contain different taxa of different ages, that from the Suffolk Pebble Beds being older than that from Abbey Wood. The apparent contradiction posed by the contemporaneity of the Suffolk Pebble Beds and the Blackheath Beds is most likely to result from reworking of the mammals in the former.

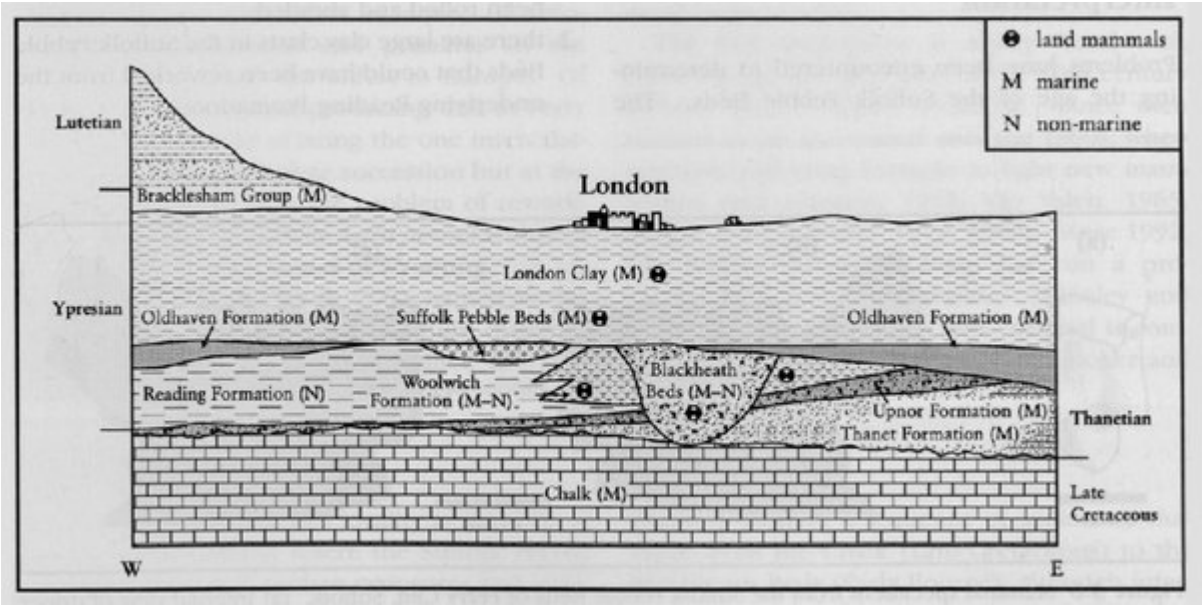
Conclusions

Abbey Wood is the most important Early Eocene fossil mammal site in Britain and has produced many specimens of birds, reptiles and mammals. The fossil mammals described from this locality are diverse and include multituberculates, insectivorans, a bat, primates, rodents, condylarths, artiodactyls and perissodactyls (including *Pliolophus:* the oldest known ancestor of modern horses). The site is also the type locality for five mammalian species and the only site where *Eppsinycteris anglica* and *Lessnessina packmani,* and the genus that the aforementioned defines, are known. *Eppsinycteris anglica* is also the oldest known emballonurid bat. The Abbey Wood fauna is internationally important in that it fills a gap in the European mammal record between Meudon and Pourcy and forms the closest link so far between the European faunas and those in North America and Asia.

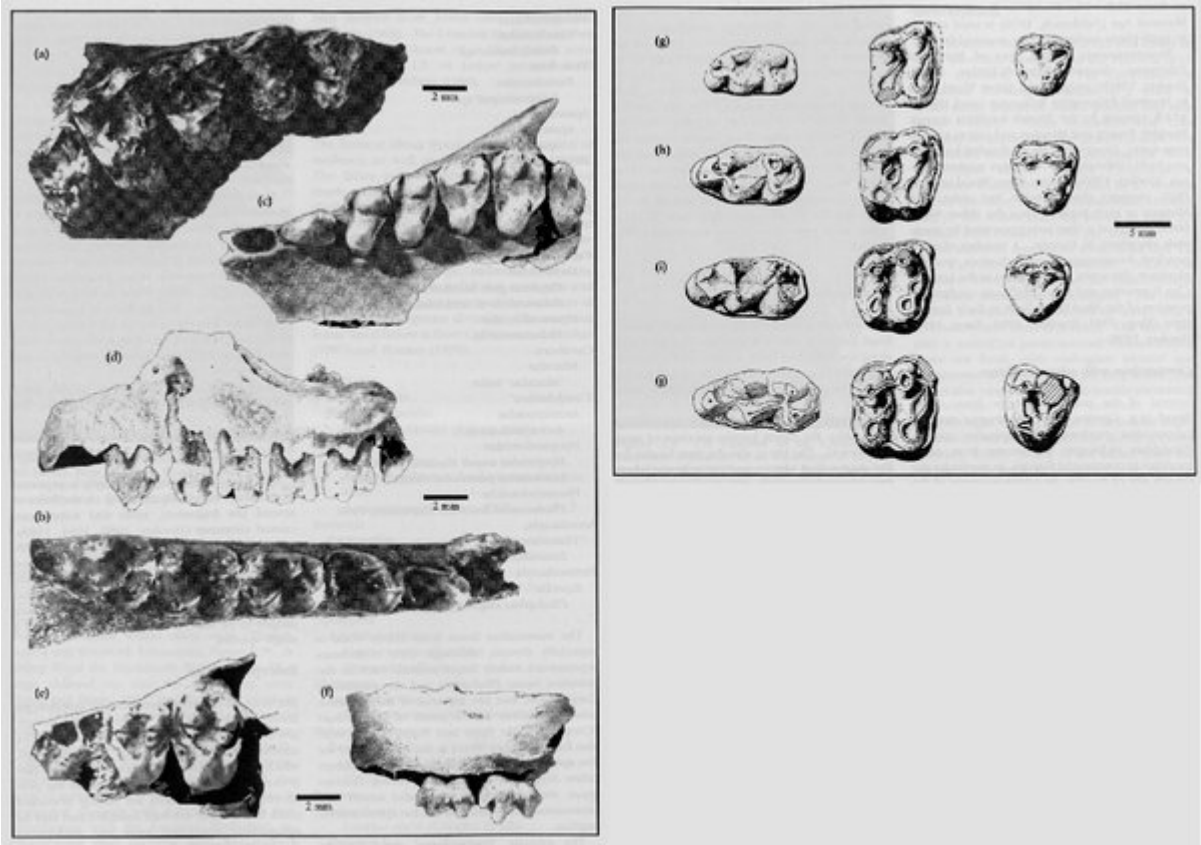
The site has great potential for future study, provided it is excavated carefully. Techniques of bulk sampling and sieving will ensure that our understanding of this fauna continues to grow.

References

(Figure 3.7) The exposure of the fossiliferous Blackheath Beds at Abbey Wood, Greater London. Shown here is the Lessness Shell Bed, overlain by non-shelly sand. (Photo: J.J. Hooker.)



(Figure 3.5) The Paleocene and Eocene sediments of the London Basin shown in a cross-section running from west to east across London. The Suffolk Pebble Beds are projected in from farther north. (After Savage and Russell, 1983.)



(Figure 3.8)(a-f) Mammal specimens from the Blackheath Beds of Abbey Wood, Greater London. (a,b) Right maxilla (a) and right lower jaw (b) of the primate Cantius eppsi, both in crown view. (c,d) Left maxilla of the hyopsodontid Lessnessina packmani, in crown (c) and external (d) views. (e,f) Right maxilla (reversed) of the hyopsodontid Hyopsodus wardi in crown (e) and external (f) views. (g-j) Teeth from a succession of horses in stratigraphical order from southern England (in each case, from left to right, lower molar 3, upper molar 1, upper premolar 3); (g) Cymbalaphus cuniculus from the Suffolk Pebble Beds of Kyson, Suffolk; (h) Pliolophus vulpiceps from the Blackheath Beds of Abbey Wood, Greater London; (i), P vulpiceps from the Harwich Stone Band (London Clay Formation) of Harwich, Essex; (j), Hyracotherium leporinum from divisions D and B of the London Clay Formation of Sheppey and Herne Bay, Kent. (After Simons, 1962; and Hooker, 1979, 1980, 1994a.)