Barton

[SZ 207 931]–[SZ 227 931]

Introduction

This is the best site for yielding fossil plants from the Barton Clay Formation, of late middle Eocene age. It has yielded 28 species, for five of which this is the type locality. It shows clear evidence of a mixed forest and wetland vegetation, which shows evidence of the initial Eocene climatic cooling.

The Barton Clay Formation has generally yielded only very poor fossil floras. This is unfortunate, as it represents a crucial time, when a marked cooling of the climate was taking place. Gardner (1884, 1887b) described conifer cones and twigs from Barton Cliff; but unfortunately the specimens have been lost, presumably through degradation. A number of fragments were discovered by Burton (1933) and examined by Reid and Chandler. However, a more significant set of plant fossils was collected from the same locality in 1952 by D. Curry, and was the basis of the palaeobotanical study by Chandler (1960). One additional specimen of *Pinus dixonii* cone was documented by Chandler (1964, p. 129), and a second was found in 1980 (Figure 9.3). Chandler (1978) later added a single species to those known from here.

Description

Stratigraphy

The classic paper on the stratigraphy of this site was by Burton (1933), whose classification of the beds is still widely used. More recently, the stratigraphy has been revised by Hooker (1986) (see also Daley in Daley and Balson, 1999). Within the boundary of this GCR site are exposed about 40 m of the Barton Group, including all of the Barton Clay and Becton Sand Formations (Beds A–K of Burton, 1933) (Figure 9.4). They represent upward-coarsening cycles interpreted by Hooker (1986) as representing marine transgressions in a littoral environment.

Palaeobotany

The bulk of the specimens reported by Burton (1933) and Chandler (1960) came from Burton's unit A3 in the Barton Clay, at the top of the first coarsening-upwards cycle. The bed is sometimes referred to as the 'Highcliff Sands', but it should not be confused with the plant bed in the Highcliffe GCR site discussed previously. Plant fossils have also been recovered from Burton's beds Al, C, D and E (Chandler, 1960; Collinson, pers. obs.). Those described by Chandler from A3 were reported to have come from a pocket of sediment, also containing fossil shells that had been trapped on the lee side of a log of wood. Dominant are fruits and seeds of aquatic or sub-aquatic plants, including water soldiers (*Stratiotes hantonensis* Chandler), sedges (*Caricoidea obscura* Chandler), water lilies (*Sabrenia chandlerae* Collinson 1980a) and lythraceaens (*Decodon gibbosus* (Reid) Reid, *Microdiptera minor* (Chandler) Mai, *Palaeolythrum bournense* Chandler), together with the enigmatic *Rhamnospermum bilobatum* Chandler. However, there are also fully terrestrial plants, including members of the families of Chinese gooseberries (*Saurauia crassisperma* (Chandler) *Mai*), grape vines (*Parthenocissus hordewilensis* Chandler), icacinas (*Icacinicarya pygmaea* Chandler, *?Natsiatum eocenicum* Chandler — see footnotes to (Table 8.1) and (Table 8.2), mezerums (*?Daphne* sp.), sweetleafs (*Symplocos* sp.) and teas (*Ternstroemia bartonensis* (Chandler) Mai, *Eurya stigmosa* (Ludwig) Mai). Mai (1976, 2000) and Mai and Walther (1978, 1985) included *Epacridicarpum* within the cyrilla family (two species at Barton: *Epacridicarpum headonense* Chandler and *?E. mudense* Chandler) but Friis (1985) and van der Burgh (1988) have favoured an assigment to the heathers. Also present are conifer remains: *Pinus* sp. and *Sequoia couttsiae* Heer (see Footnote 2 to (Table 8.2)). Taxonomical and nomenclatural work and other records of these species can be found in Chandler (1960) or in Chandler (1961c, p.34 — *Parthenocissus hordewllensis*); Mai and Wather (1978 — *Eurya stigmosa*); Mai and Wather (1985 — *Microdiptera minor, Saurauia crassisperma, Ternstroemia bartonensis*); and Mai (2000 — *Microdiptera minor*).

Conifer remains also came from the clays above the Highcliff Sands. In addition to the above two mentioned taxa, Chandler (1960) identified *?'Araucarites' sternbergii* Goppert from here (see comments on the *'Araucarites'* in the Bracklesham GCR site report). Finally, Chandler (1960) reported *Rutaspermum* sp. from clays below the Highcliff Sands.

Chandler (1960, 1978) also reported taxa whose exact provenance within the sequence is unknown, including *Anonaspermum* spp., *Rutaspermum* sp., *Stizocarya* sp. and *Eomaxtisia rugosa* (Zenker) Chandler.

Chandler (1960) described the bulk of the plant fossils from here as being carbonaceous entities heavily impregnated with pyrite. This makes the fossils extremely vulnerable to degradation and they should be studied as soon as possible after collection.

Interpretation

This is one of the few British sites to have yielded any diversity of plant macrofossils from the lower Bartonian Stage. It demonstrates a continuation of the vegetational trend seen through the British Palaeogene deposits, which is generally interpreted as being due to climatic cooling. As with other sites in the upper middle and lower upper Eocene, such as Highcliffe, the flora consists of a mixture of the remains of wetland and forest vegetation. The forest vegetation includes several families that suggest warm climatic conditions (custard apple, icacina and mastic trees of the dogwood families) but they are less abundant and diverse than in earlier floras. Instead conifers appear to becoming more abundant and diverse.

The remains of wetland plants also show changes. The mangrove palm (*Nypa*) and the '*Scirpus' lakensis* Chandler, both characteristic plants of the early and middle Eocene floras, had disappeared by this time (Collinson, 1996b, 2000a). As with some of the stratigraphically lower localities (e.g. Highcliffe), *Stratiotes* and *Sabrenia* are important components, probably indicating freshwater conditions. The most notable addition seen at Barton is *Decodon gibbosus,* a species better known from the Neogene deposits of continental Europe (Reid, 1920b), and which is similar to the swamp willow of North America (*Decodon verticillatus*).

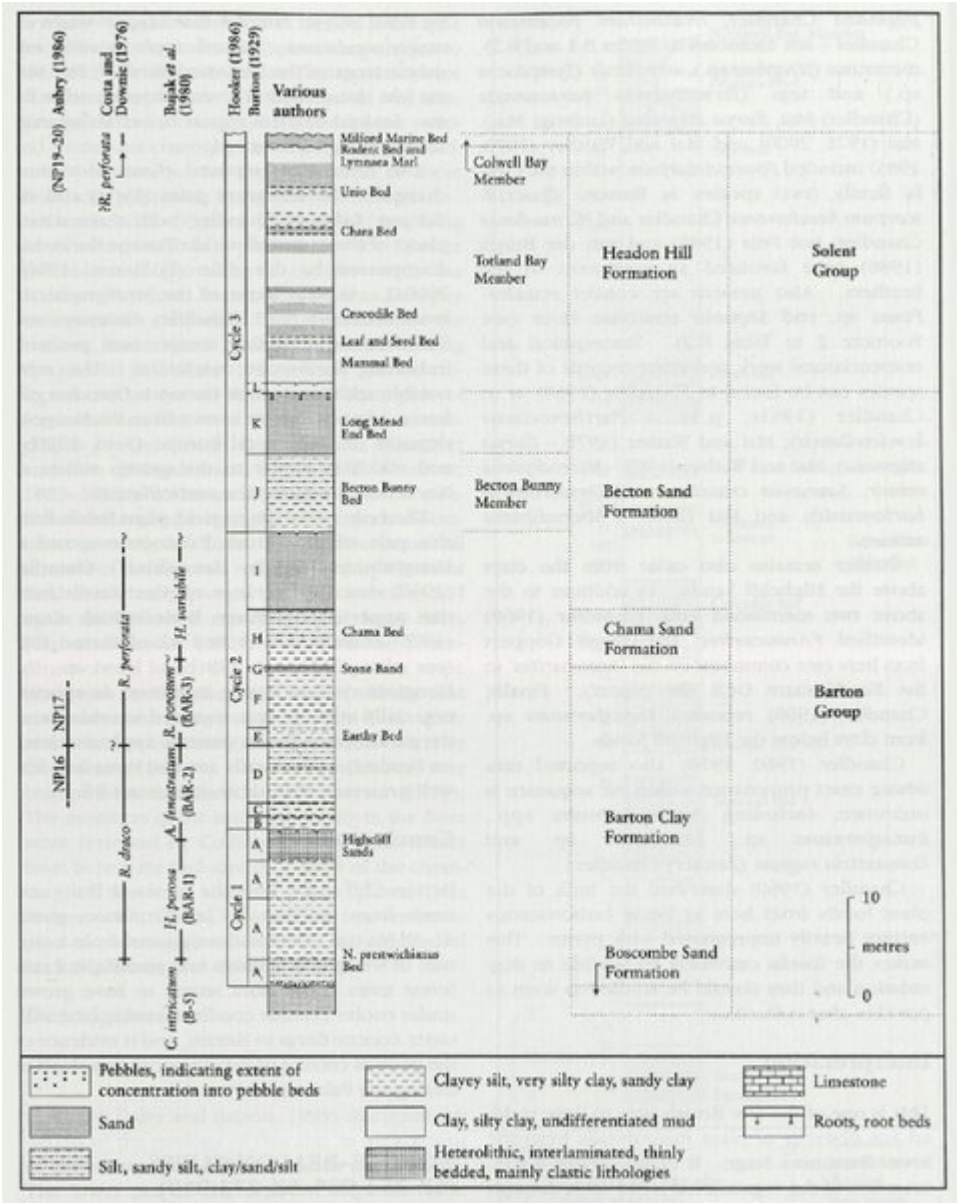
The only other site to yield plant fossils from this part of the British Palaeogene record is Hengistbury Head in Hampshire. Chandler (1960) described a range of plant fossils from the upper Hengistbury Beds, which Curry (1976) correlated with bed A2 of Barton Cliff (see also Collinson, 1996b). However, the Hengistbury flora is not as diverse in species, especially in those taxa regarded as evidence of the paratropical forests (custard apple and icacina families). The fossils are also rarer and less well preserved than those at Barton Cliff.

Conclusions

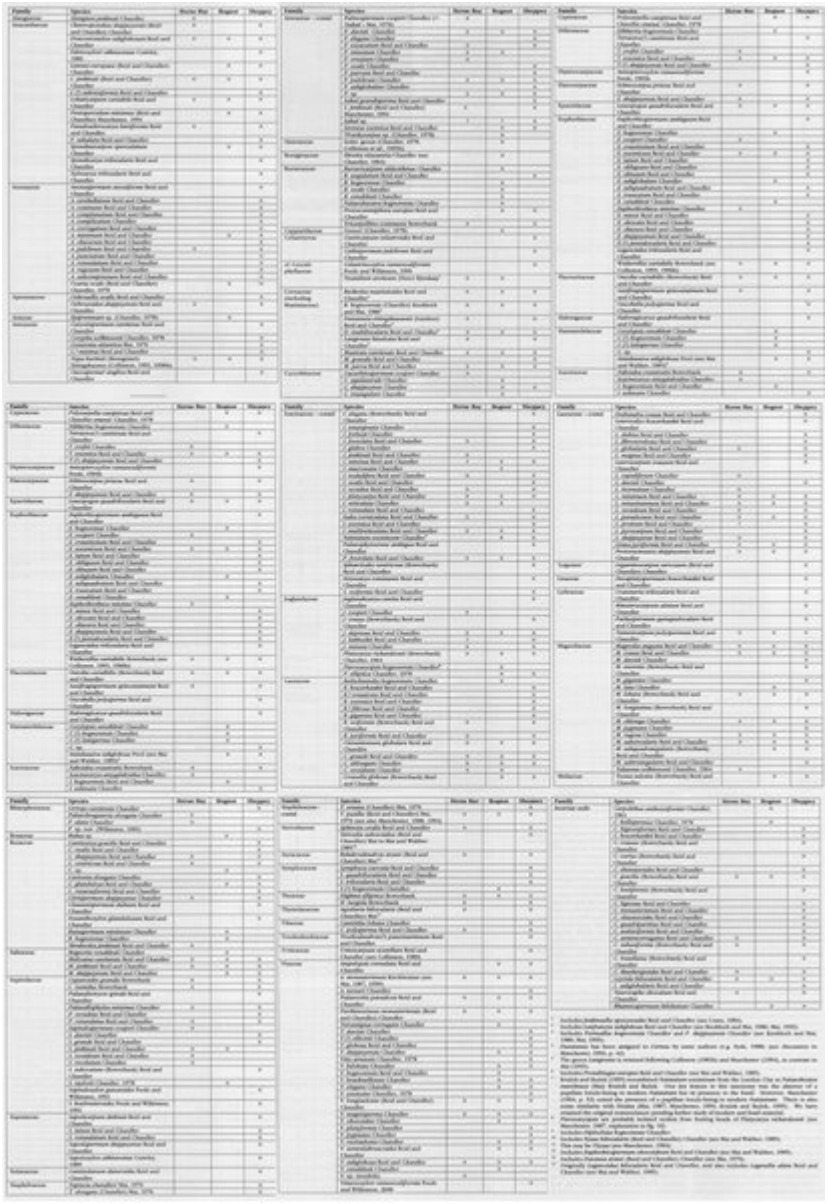
Barton Cliff is the best site for fossil fruits and seeds from the Barton Clay Formation, about 41–38 Ma old. The fossils originated from a mixture of wetland vegetation and paratropical rain forest trees. The flora seems to have grown under cooler climatic conditions compared with older Eocene floras in Britain, and is evidence of the general cooling of the climate that took place during the Palaeogene Period.

References

(Figure 9.3) Cone of Pinus dixonii, a remarkable and rare fossil from Barton found in 1980, × 0.9 (specimen number BMNH V.60468). (Photo: Natural History Museum, London.)



(Figure 9.4) Stratigraphical succession at Barton Cliffs. (After Daley and Balson, 1999, fig. 6.14.)



(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.

Family	Species	Lake	Arne	Studland
Pteridaceae	*Acrostichum lanzaeanum* (Visiani) Chandler		×	×
Schizaeaceae	*Lygodium kaulfussii* Heer *emend.* Gardner and Ettingshausen			×
	L. poolensis Chandler	×		
	Anemia poolensis Chandler	×	×	
	Ruffordia subcretacea (Saporta) Barthel, 1976[1]		×	
Taxodiaceae	*Taxodium labensis* Chandler	×	×	
	Sequoia couttsiae Heer[2]			×
Actinidiaceae	*Saurauia crassisperma* (Chandler) Mai[3]	×		
	S. poolensis (Chandler) Mai, 1970[4]	×		
Anacardiaceae	*Dracontocarya glandulosa* Chandler	×		
	?*Lannea* sp.	×		
	Rhus labensis Chandler	×		
	R. spp.	×		
Apocynaceae	*Apocynospermum acutiforme* Chandler[5]	×		
	A. labense Chandler[5]	×		
Arecaceae	*Calamus daemonoropa* (Unger) Chandler	×		
	?*Sabal* sp.		×	
Boraginaceae	*Ehretia labensis* Chandler	×		
Burseraceae	*Palaeobursera labensis* Chandler	×		
Capparaceae	*Bartonella emarginata* Chandler	×	×	×
	Palaeocleome labensis Chandler	×		
	Capparidispermum eocenicum Chandler	×		
Caprifoliaceae	*Sambucus parenda* Chandler	×		
Cornaceae (including Mastixiaceae)	*Dunstania labensis* Chandler[6]	×		
	Eomastixia rugosa (Zenker) Chandler (see Mai, 1995)	×	×	
	E. urceolata Chandler	×		
	?*Mastixia cantiensis* Reid and Chandler[7]		×	
	Mastixicarpum crassum Chandler (see Mai, 1995)	×		
	Sutda quadriloculatis (Chandler) Mai, 1999[8]	×		
Cucurbitaceae	*Cucurbitospermum labense* Chandler	×		
	C. obliquum Chandler	×		
Cyperaceae	*'Scirpus' labensis* Chandler	×	×	
	?*Scirpus* sp.	×		
	Caricoidea arnei Chandler		×	
	C. obscura Chandler	×		
	?*Caricoidea* sp.	×		
	Gladiocarya minima (Chandler) Mai in Mai and Walther, 1978[9]		×	
Ebenaceae	*Diospyros headonensis* Chandler	×		
Euphorbiaceae	*Euphorbioibeca labensis* Chandler	×		
	E. platysperma Chandler	×		
	E. tuberculata Chandler	×		
	E. digitata Chandler	×		
	Euphorbiospermum punctatum Chandler	×		
	Wetherellia variabilis Bowerbank		×	
Flacourtiaceae	*Oncoba rugosa* Chandler		×	
Hamamelidaceae	*Steinhauera subglobosa* Presl[10]	×		

Family	Species	Lake	Arne	Studland
Icacinaceae	*Iodes acutiformis* Chandler	×	×	
	Natitiatum eocenicum Chandler[11]	×		
	?*Palaeophytocrene foveolata* Reid and Chandler	×		
	Icacinicarya inornata Chandler	×	×	
Lauraceae	*Laurocarpum* spp.	×		
Lythraceae	*Ammannia labensis* Chandler	×		
	Alatospermum labense Chandler	×		
Menispermaceae	*Tinospora armensis* Chandler	×	×	
	Palaeococculus labensis Chandler	×	×	
	Wardenbeppeya poolensis (Chandler) Eyde, 1970		×	
Moraceae	*Ficus luciba* Chandler (see Collinson, 1989)	×		
	F. sp.			×
?Moraceae	*Orocarpum reticulatum* Chandler (see Collinson, 1989)		×	
Nymphaeaceae	*Palaeonymphaea eocenica* Chandler (see Collinson 1980a)	×		
Nyssaceae	*Nyssoidea eocenicum* Chandler	×	×	
Rosaceae	*Rubus acutiformis* Chandler			×
Rutaceae	*Phellodendron costatum* Chandler		×	
	Rutaspermum excavatum Chandler		×	
	R. glabrum Chandler	×		
	R. magnificum Chandler		×	
	R. striatum Chandler	×		
Sabiaceae	?*Meliosma sheppeyensis* Reid and Chandler	×		
Sapotaceae	?*Sapoticarpum* sp.		×	
Solanaceae	*Solanum armense* Chandler		×	
	Solanispermum reniforme Chandler		×	
Styracaceae	*Styrax elegans* Chandler	×		
Symplocaceae	*Symplocos headonensis* Chandler		×	
	S. labensis Chandler	×	×	
Theaceae	*Cleyera? obliqua* Chandler	×		
	?*Gordonia* sp.	×		
Thymelaeaceae	*Thymelaeaspermum labense* Chandler	×	×	
	T.? sulcatum Chandler	×		
Vitaceae	*Vitis ambigua* Chandler	×		
	V. armensis Chandler		×	
	V. cuneata Chandler	×		
	V. excavata Chandler	×		
	V. labensis Chandler	×		
	V. lusatica Czeczott and Skirgiello[12]	×	×	
	V. platysperma Chandler	×	×	
	V. poolensis Chandler	×		
	V. pygmaea Chandler	×	×	
	V. goodhartii Chandler	×	×	
	V. symmetrica Chandler	×		
	V. triangularis Chandler		×	
	Tetrastigma acuminata Chandler		×	
	?T. lobata Chandler	×		
Zingiberaceae	*Alpinia armense* (Chandler) Mai in Mai and Walther, 1985[13]		×	
Incertae sedis	*Rhamnospermum bilobatum* Chandler	×	×	
	Carpolithus armense Chandler		×	

(Table 8.2) Composition of floras from the Dorset Pipe Clays, Hampshire Basin. Species descriptions, or references to them, can be found in Chandler (1962), unless otherwise referenced. Discussions on some of these species can also be found in Manchester (1994), Mai and Walther (1978, 1985), Mai (2000) and Collinson (1996b, in press a). The family classification used here is summarized in Chapter 1 of the present volume