# Hordle–Beacon Cliffs

[SZ 254 925]-[SZ 273 919]

### Introduction

This is one of the classic Tertiary palaeobotanical sites in Britain, having yielded the best-studied late Eocene fruit and seed flora. Over 80 species are known and for over half of these it is the type locality. In many cases, the species are unique to this site. It is the only British Tertiary site where conifer stumps can still be studied *in situ*. Several different stratigraphical levels have yielded numerous charophytes, which are of considerable importance for the correlation of these beds with sequences in continental Europe.

Hordle Cliffs (Figure 9.6) and (Figure 9.7) has long been recognized as a classic site for Eocene palaeobotany, providing a contrast with the London Clay floras from places such as Sheppey (see previous chapter). The importance of the site was first realized by Starkie Gardner during the second half of the 19th century and he collected much material from here. Examples of ferns and conifers were described in his monographs on the British Eocene floras (Gardner and von Ettingshausen, 1879–1882; Gardner, 1883–1886a). However, Gardner never published the angiosperms, which form such a dominant part of the flora. The palaeobotanical interest of the site was rediscovered by Clement Reid in the early part of the 20th century, and again he collected much material from here. Reid and Groves (1921) described the charophytes from here, but the angiosperms were dealt with by Chandler (1925–1926), in the first comprehensive review of the Hordle flora. After much further collecting, the flora was revised by Chandler (1961c). In-situ coniferous tree stumps were described by Fowler *et al.* (1973). The members of the mulberry family in the flora were reviewed by Collinson (1989) and fossils from here were included in a study of the chemistry of the seed coats of water plants (van Bergen *et al.*, 1994b). The earliest known examples of rodent-gnawed seeds have been found here (Collinson and Hooker, 2000).

### Description

#### Stratigraphy

Daley (in Daley and Balson, 1999) discusses the details of the geology of this site, in an account of the stratigraphy of Barton Cliffs (Figure 9.5). The lower part of the exposed sequence here consists of *c*. 22 m of the Barton Clay and Becton Sand Formations (with Bed K (Burton, 1933) yielding plant fossils — Chandler 1960). These are overlain by *c*. 24 m of the Totland Bay Member (lower Headon Hill Formation), described in detail by Edwards and Daley (1997). The main palaeobotanical interest at the site is in the Totland Bay Member, which is a unit of mainly freshwater to brackish deposits formed as the Barton marine basin became progressively silted-up (Curry, 1965).

The plant remains occur in lenses and laterally more persistent deposits occur at various levels through the sequence, including Bed L of Burton (1933) and Beds 9, 10, 13 and 28 of Tawney and Keeping (1883; Figures 9.4 and 9.5). They mostly represent deposits formed in marsh and lagoonal settings, and one layer (known as the 'Leaf and Seed Bed', Bed 10 of Tawney and Keeping, 1883), includes a lignite layer and in-situ tree stumps.

#### Palaeobotany

The bulk of the plant fossils found here are carbonaceous fruits and seeds. They are often in a soft condition, but uncrushed (Figure 9.8), and can therefore be dissected with care, to reveal details of the anatomy. Most of the accumulations of fruits and seeds are from aquatic angiosperms. For instance, the Mammal Bed has yielded *Stratiotes, Caricoidea* and *Sabrenia*, while the Rodent Bed has *Stratiotes, Limnocarpus* and *Aldrovanda* (Collinson and R. Gardner, pers. obs.). *Limnocarpus* is recorded from the Crocodile Bed, and *Sabrenia, Spirematospermum, Stratiotes* and *Caricoidea* are from the *Chara* Bed (Bed 28 of Tawney and Keeping, 1883; Chandler, 1961c; Collinson, pers. obs.). However, one level, known as the `Leaf and Seed Bed', has yielded a much more diverse assemblage and was the main

source of the material studied by Chandler (1925–1926, 1961c, 1962). In addition to the above types of aquatic plant, there is also a range of forest taxa, including members of the icacina, mulberry, rue, sweetleat tea and grape families, and mastic trees of the dogwood family. The full list of 76 species of angiosperm fruits and seeds (both of aquatic and forest plants) found at Hordle is given in (Table 9.2).

Chandler (1925–1926) recorded *Nypa* from here based on leaves found in the Leaf Bed. They indeed bear some resemblance to the leaves of the living *Nypa* but many other palms also have similar foliage. As there is no evidence here of the characteristic large fruits, such as occur so abundantly in the early Eocene deposits of southern England (see Chapter 8), this record of *Nypa* (which would be aberrant as by far the youngest from the British Tertiary record) should be rejected.

Hordle has also yielded the ferns *Acrostichum lanzaeanum* (Visiani) Chandler, *Salvinia mildeana* Göppert foliage and *Azolla prisca* Reid and Chandler megaspores (Collinson, 1980b). Conifers are mainly represented by remains of the probable taxodiaceous conifer *Sequoia couttsiae* Heer (see Footnote 2 to (Table 8.2), this volume), including twigs, cones, cone-scales and seeds (Chandler, 1922, 1925, 1961c, 1962). The Leaf and Seed Bed here has yielded in-situ coniferous stumps with taxodiaceous wood (*Glyptostroboxylon*), which on the basis of association have been suggested to have been produced by the same plant that yielded *S. couttsiae* foliage, cones and seeds (Fowler *et al.*, 1973).

The Mammal Bed (Bed 9 of Tawney and Keeping, 1883), at the base of the Totland Bay Member at Hordle, yields far fewer plant fossils (see earlier). However, Crane and Plint (1979) have also described petrified angiosperm roots of an aquatic plant from this unit under the name *Lacunoradix headonensis* Crane and Plint.

Stonewort remains are scattered throughout the succession here, but better assemblages occur at a number of restricted horizons, including Beds 9, 10, 14, 15, 17, 28 and 30 of Tawney and Keeping (1883) (Reid and Groves, 1921; Groves, 1926; Collinson, pers. obs.). The most productive level is of limestone (Bed 17 of Tawney and Keeping, 1883), but good assemblages were also found in the Mammal Bed and Rodent Bed. The charophytes include both isolated gyrogonites and vegetative remains, although only the former are named. The following list is based on the work of Reid and Groves (1921) and Groves in Reid and Chandler (1926) as emended in part by Feist-Castel (1977). *Gyrogona wrightii* (Salter) Pia, *G. caelata* (Reid and Groves) Pia, *Grovesichara distorta* (Reid and Groves) Horn af Rantzien, *Stephanochara edwardsii* Grambast, *Psilochara polita* (Reid and Groves) Grambast, *P. bitruncata* (Reid and Groves) Horn af Rantzien, *Sphaerochara headonensis* (Reid and Groves) Horn af Rantzien, *S. parvula* (Reid and Groves) Horn af Rantzien, *Harrisichara vasiformis* (Reid and Groves) Grambast and *Chara subcylindrica* Reid and Groves.

(Table 9.2). Angiosperm floras from the Headon Hill Formation. Species descriptions or reference to them may be found in Chandler (1961c, 1963a), unless otherwise referenced. Discussion and other records for some of these species may be found in Mai and Walther (1978, 1985, 1991) and Mai (2000). The family classification used here is summarized in Chapter 1 of the present volume.

Family	Species	Hordle Cliffs	Colwell Bay (Totland Bay Member)	Colwell Bay (Linstone Chine Member)
Acanthaceae	?Acanthus sp.	×		
	Actinidia sp.	×		
Actinidiaceae	<i>Saurauia crassisperma</i> (Chandler) Mai <sup>1</sup>	×		×
Anacardiaceae	Genus (Spondicae) ?	×		
Araceae	Genus ?	×		
Arecaceae	Leaves	×		
Betulaceae	<i>Carpinus boveyanus</i> (Heer) Chandler	×		
Boraginaceae	Omphalodes platycarpa Chandler	×		
Burseraceae	<i>Palaeobursera lakensis</i> Chandler	×		

Caprifoliaceae	<i>Sambucus parvulus</i> Chandler <sup>2</sup>	×		×
	Hantsia pukhra			
Carophyllaceae	(Chandler) Chandler	×		
	H. glabra Chandler	×		
	Nyssidium arcticum			
Cercidiphyllaceae	(Heer) Iljinskaja <sup>3</sup>	×		
	Dunstania glandulosa			
	(Chandler) Chandler <sup>4</sup>	×		
	Eomastixia rugosa			
Comaceae (including	(Zenker) Chandler	x		
Mastixiaceae)	Swida quadrilocularis			
	(Chandler) Mai, 1999 <sup>5</sup>	x		
	Genus ?	×		
Cucurbitação	Cucurbitospermum	~		
Cucurbilaceae	reidii Chandler	X		
	Caricoidea angulata			~
	Chandler <sup>6</sup>			x
	C. nitens (Heer)			~
	Chandler			^
	C. obscura Chandler	×		
	Cladiocarya minima	~		
	(Chandler) Mai <sup>7</sup>	*		
Cyperaceae	C. colwellensis			~
	(Chandler) Mai <sup>7</sup>			^
	Carex colwellensis			~
	Chandler			^
	C. spp.			×
	?Scirpus sp.			×
	Scleria hordwellensis	~		
	Chandler	^		
	Epacridicarpum	¥		×
Cyrillaceae <sup>8</sup>	headonense Chandler	~		^
	E. colwellense Chandle	r		×
Droseraceae	Aldrovanda ovata	×	×	×
Diocolacoao	(Chandler) Chandler	~	^	~
Ebenaceae	Diospyros headonensis	×		
	Chandler	~		
Ericaceae	2 Genera ?	×		
Harnamefidaceae	Steinhauera	×		
Tamanonadodo	subglobosa Presl <sup>9</sup>	~		
	Stratiotes headonensis	×	×	x
Hydrocharitaceae	Chandler			
	S. hantonensis	x		
	Chandler			

	?lodes sp. (or			
	?Natsiatum)	×		
	lodes? hordwellensis			
	Chandler	×		
	Icacinicarva			
Icacinaceae	transversalis Chandler	×		
	L becktonensis			
	Chandler	×		
	Natsiatum eccenicum			
	Chandler <sup>10</sup>	×		
		~		
Lauraceae	2 Gonora 2	×		
Legumes	2 Genera :	×		
	Decodori vecterisis			×
1				
Lythraceae	Microdi ptera parva	×		?
	Chandler			
	Genus ?	×		
	Palaeosinomenium			
Menispermaceae	obliquatum (Chandler)	×		
	Chandler			
	Chlorophora bicarinata	×		
	Chandler			
	Broussonetia rugosa	×		
	Chandler	~		
Moraceae <sup>11</sup>	Moroidea boveyana	~		
	Chandler <sup>12</sup>	×		
	Becktonia hantonensis			
	Chandler	X		
	Ficus lucidus Chandler			×
	Myrica boveyana (Neer)	)		
	Chandler	×		×
Myricaceae	M. colwellensis			
	Chandler			×
	Sabrenia chandlerae			
	Collinson 1980a	×	×	×
	Brasenia spinosa			
Nymphaeaceae	Chandler	×		×
	B oblonga Chandler	×		
	Nymphaea sp			×
	Ωlea headonensis			~
Oleaceae	Chandler	×		
	Dotomogoton			
	r olaniogelon pygmaous Chandlor	~	~	~
		×	×	×
Potamogetonaceae	(see Collinson, 1983a)			
	P. sp.	x		×
	Limnocarpus forbesil	×	×	×
	(Heer) Chandler'			
Rhamnaceae	Frangula hordwellensis	×		
	Chandler			

	Rubus acutiformis	
D	Chandler	×
Rosaceae	?R. microspermus Reid	
	and Reid	
	Phellodendron	
	costatum Chandler	×
	Acronychia ornata	
Dutasas	(Chandler) Mai, 1976 <sup>14</sup>	×
Rutaceae	Zanthaxylum	
	hordwellense Chandler	×
	Z. compressum	
	Chandler	×
Sabiaceae	<i>Meliosma</i> sp.	×
Sturacecece	Styrax elegans	
Siyracaceae	Chandler	x
	Symplocos	
Symplocaceae	headonensis Chandler	x
	S. sp.	×
	Anneslea? costata	
	Chandler	×
	Visnea hordwellensis	
	(Chandler) Mai <sup>15</sup>	×
	Eutya becktonensis	
<b>T</b> h	Chandler	×
Ineaceae	<i>H. stigmosa</i> (Ludwig)	
	Mai <sup>16</sup>	×
	Gordonia minima	
	Chandler	×
	Polyspora truncates	
	(Chandler) Gregor <sup>8</sup>	×
Thymelaeaceae	Genus?	×
Typhaceae	<i>Typha</i> sp.	
	Ampelopsis rotundata	
	Chandler	×
	Parthenocissus	
Vitaceae	hordwellesis Chandler	×
	Tetrastigma lobata	
	Chandler	×
	Vitis uncinata Chandler	×
	Spirematospermum	
Zingiberaceaei/Musace	a <b>ø</b> ve <i>tzleri</i> (Heer)	×
	Chandler <sup>17</sup>	
	Carpolithus fibrosus	
	Chandler	×
	C. apocyniformis	
	Chandler	×
Incertae sedis	C. colwellensis	
	Chandler	
	C. spp.	×
	Rhamnospermum	
	bilobatum Chandler	×

×

×

×

×

×

×

<sup>1</sup>Formerly *Hordwellia crassisperma* (Chandler) then included within the Theaceae (see Mai and Walther, 1985).

<sup>2</sup> This includes *Sambucus colwellensis* Chandler (see Collinson, 1983a).

<sup>3</sup> See Crane (1984).

<sup>4</sup> See Footnote 4 to (Table 8.1).

<sup>5</sup> Originally *Corpus quadrilocularis* Chandler.

<sup>6</sup> See Collinson (1983a).

<sup>7</sup> See Mai and Walther (1978).

<sup>8</sup> See Footnote 7 to (Table 9.1).

<sup>9</sup> Includes *Eoliquidambar hordwellensis* Chandler and *Protaltingia hantonensis* Chandler (see Mai and Walther, 1985).

<sup>10</sup> See footnotes to Tables 8.1 and 8.2.

<sup>11</sup> See Collinson (1989).

<sup>12</sup> Includes Moroidea hordwellensis Chandler (see Mai and Walther, 1978).

<sup>13</sup> Emended by Collinson (1982a).

<sup>14</sup> Formerly *Rutaspermum orrzatum* (Chandler) (see Mai, 1976; Collinson and Gregor, 1988).

<sup>15</sup> Formerly *Campylospermum hordwellensis* Chandler
(see Mai and Walther,
1991).

<sup>16</sup> Formerly *Cleyera? stigmosa* (Ludwig).

<sup>17</sup> See text under Hordle site for discussion of *Spirematospermum.* 

### Interpretation

This is the best locality for the study of the late Eocene floras of the lower Headon Hill Formation. Of the 76 species of angiosperm fruits and seeds found here (Table 9.2), for 17 species this is the only British locality: *Broussonetia rugosa, Chlorophora bicarinata, Hantsia glabra, Palaeosinomenium obliquatum, Acronychia ornata, Zanthoxylum cornpressum, lodes? hordwellensis, Icacinicarya transversalis, Ampelopsis rotundata, Vitis uncinata, ?Anneslea costata, Visnea hordwellensis, Eurya becktonensis, Gordonia minima, Omphalodes platycarpa, Cucurbitospermum reidii* and *Scleria hordwellensis.* The Hordle flora also contains the earliest records of several species that range up into Miocene or Pliocene deposits of continental Europe (e.g. *Amoelopsis rotundata, Tetrastigma lobata* (Mai, 2000). It is also the type locality for another 26 angiosperm species, reflecting the long history of palaeobotanical research that there has been on this flora. No other palaeobotanical site in the late Eocene deposits of Britain can match this for diversity and history of research.

The Totland Bay Member marks the return of brackish to non-marine conditions in southern England and thus provides a more abundant and diverse plant fossil record than the immediately underlying beds, such as seen at Barton. It is markedly different from the earlier Barton Clay floras, especially among the aquatic component. The aquatic flora at Hordle has a different composition (both of genera and species), higher diversity and more widespread occurrence than the earlier floras. Among the aquatic plants, true *Brasenia* appears. This genus had been previously recorded from lower horizons (e.g. Crane, 1977) but this was based on records of *Brasenia ovula*, which are now assigned to *Sabrenia thandlerae* Collinson, 1980a. Also in the Totland Bay Member, we see the first appearance of *Stratiotes headonensis*, which starts to take over from the earlier occurring *S. hantonensis* (Collinson *et al.*, 1981), and of the *Azolla*. Earlier occurring species that do not occur in the Totland Bay Member include '*Scirpus*' *lakensis, Decodon gibbosus* and *Microdiptera minor. Nypa burtinii* has also disappeared by this level, if one discounts the indeterminate foliar remains.

Like the aquatic plants, the forest species at Hordle show clear signs of the climatic change that was taking place during late Eocene times. The palms had all but disappeared, being only represented by some indeterminate foliage. Many of the families found in earlier Eocene floras and thought to reflect warm conditions have either disappeared or have their last rare and low-diversity occurrences here: moonseed, custard apple, sumac, icacina, dillenia, flacourtia, mezerum, ebony, styrax, olive and squash families. The tea family occurs rarely above the Totland Bay Member, but has undergone a significant decline by this level.

Sequoia couttsiae (see Footnote 2 to (Table 8.2), this volume) is the most widespread of the taxodiaceous conifers found in the upper Eocene and lower Oligocene deposits of southern England. The presence of these conifers invites comparison between southern England at this time and the taxodiaceous swamps of today in southern Florida (e.g. Fowler *et al.*, 1973). Hordle is the best single locality for the study of this plant, having yielded cones, cone-scales, seeds, twigs and probable roots and stumps. Furthermore, the specimens from here have generally suffered less pyritization than those from other localities and thus tend to yield better-preserved cuticles. Consequently, Hordle has proved central to the development of our ideas about this important extinct conifer.

Among the angiosperms found at Hordle, the presence of *Nyssidium arcticum* is of particular interest. This member of the katsura-tree family is best known from the Palaeogene–Eocene transition interval (see Chapter 7) and until the mid-1980s was unknown above the London Clay. However, Crane (1984) found that specimens from the London Clay that Chandler (1961a) had referred to as *Carpolithus gardneri* were probably the same as his better-preserved material from the Reading Formation. Chandler (1961c) had also tentatively identified *C. gardneri* from Hordle and Crane included this material within *N. arcticum*.

Hordle has yielded four species of the mulberry family, which is more than any other British site. They have been reviewed by Collinson (1989). Some have the same level of organization as the fruits of living forms, such as *Chlorophora* and *Broussonetia*, while *Moroidea* seems to show features of more than one living genus. The taxonomic position of *Becktonia is* uncertain.

Small roots are generally rare and poorly preserved in the British Tertiary deposits. A notable exception is the anatomically preserved *Lacunoradix headonensis* Crane and Hint, 1979, which is to date known only from Hordle. These

show a small stele and well-developed system of air spaces, features normally found in roots of aquatic plants. However, because of their generalized character, it has proved impossible to link them to any of the known aquatic plants from Hordle.

Hordle is the best site in Europe for late Eocene stoneworts and is the basis of the Verzenay Biozone (Grambast, 1972). Hordle is the type locality for seven of the most widespread species of that zone. Both vegetative and fertile remains can be found here, thus providing considerable potential for work on the palaeobiology of these plants.

Hordle has yielded bulk samples of seeds (e.g. of *Sabrenia* from Bed L) and specific taxa that have been important for the application of new organic geochemical studies. These studies have revealed chemosystematic affinities and tapho-nomic histories of ancient plants (reviewed in van Bergen *et al.*, 1995, 2000). For instance, *Spirematospermum* seeds from here were shown to carry a chemosystematic affinity of the Musaceae (van Bergen and Collinson, 1999), supporting an affinity proposed by Manchester and Kress (1993) on morphological grounds. Because this work has not been fully published, we have not formally altered the family affinity in this volume.

Hordle has also yielded the earliest examples of trace fossils (from Bed 28 of Tawney-Keeping (1883), named *Gfirotremmorpha*, Collinson and Hooker, 2000) representing gnawing by glirid rodents in *Stratiotes* seeds. This shows that the gnawing mechanism used by the ancient rodents was similar to that used by modern wood mice.

## Conclusions

Hordle has been the subject of a longer history of palaeobotanical study than any other Upper Eocene site in this country and has yielded the types of over 40 species. It yields a mixture of aquatic and forest plants and thus provides a broad insight into the vegetation growing in southern Britain at that time. It was a time of climatic cooling in Britain and the Hordle flora reflects changes taking place in both the aquatic and forest vegetation. For instance, many of the families characteristic of the earlier floras (Barton and Bracklesham Groups and below) and thought to represent tropical to subtropical conditions, have disappeared by this time. Hordle is particularly important because several levels in the succession yield material in sufficient abundance to enable organic geochemical studies to be undertaken that are throwing a new light on the affinities and preservation of these fossils. These abundant fossil floras also enable the recovery of very rare items such as rodent-gnawed seeds. Hordle is the best site for the remains of taxodiaceous conifers, including their stumps, which invites comparison with the taxodiaceous swamps of south-eastern USA. Hordle is also the best site in Europe for stoneworts (charophytes) of the Verzenay Biozone, including both vegetative and reproductive structures. The site is clearly of international importance for the study of late Eocene floras (*c*. 37 Ma old).

#### **References**



(Figure 9.6) View of Hordle cliffs looking west from Long Mead End towards Becton Bunny, and showing sampling of Bed L rich in Sabrenia seeds (Headon Hill Formation). (Photo: M.E. Collinson.)



(Figure 9.7) View of Hordle cliffs looking east from Becton Bunny. Lower part is Becton Sand Formation, the upper part Headon Hill Formation. (Photo: M.E. Collinson.)



(Figure 9.5) A composite succession for the Totland Bay Member (Headon Hill Formation) at the eastern end of 'Barton Cliffs' (Hordle Cliff) (after Edwards and Daley, 1997). The bed numbers are those of Tawney and Keeping (1883).



(Figure 9.8) Compound fruiting head of Steinhauera subglobosum with bilocular fruits, in carbonaceous preservation, from the Hordle GCR site, × 6 (see footnotes to (Table 9.2)). (Photo: M.E. Collinson.)

Family	Species	Hordle Cliffs	Cobwell Bay (Tot- land Bay Member)	Colwell Bay (Linstone Chine	Family	Species	Hordle Cliffs	Colwell Bay (Tot- land Bay Member)	Colwell Bay (Linstone Chine Mbr
				Member)	Myricaceae	Myrica boreparat (Heer) Chandler	х		×
Acanthaceae	Meanthur sp.	ж				M. cohordlenuis Chandler		-	×
Actinidiaceae	Actividia sp.	×			Nymphaeaceae	Saferenta chanallevae Collinson 1990a	х	×	×
	Sawrausa crassisperma (Chandler) Mai <sup>1</sup>	×		×		Brannia spinosa Chandler	×	-	×
Anacardiaceae	Genus (Spondieae) ?	×			A CONTRACTOR OF A CONTRACTOR OF A	A. obionga Chandler	×		
Araceae	Genus ?	×		1.000		Nymphaw sp.			×
Arecaceae	Leaves	×		5.000	Ofeateate	Oleat beadoneousts Chandler	×		
Berulaceae	Garpinus borepanus (Heer) Chandler	×		10 million (12)	Potamogetonaceae	Polamogeton pygmanus Charidler (see	×	×	×
Boraginaceae	Omphalodes platycarpa Chandler	×		6 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (	a subscription of the local sector	Collinson, 19854)			
Burseraccae	Palaeobursera lakensis Chundler	×		-		P. sp.	×		×
Caprifoliaceae	Sambucus parendus Chandler <sup>1</sup>	×		×	-	Lawnocarpas Jorbeau (Heer) Chardler"	×	×	×
Carophyllaceae	Hantnia pulchea (Chandler) Chandler	×		11000	Khamnaceae	Frangula borduetienais Chandler	×	-	-
	H. glabra Chardler	×		1	Rosaceae	Aubus acutiformis Chandler	×	-	
Cercidiphyllaceae	Nysstidium arcticum (Heer) Iljinskaja <sup>1</sup>	×.		-		W. microspormus Reid and Reid		-	R.
Cornaceae (including	Domstania glandolosa (Chandler)	Ж.,		Participant and the second second	Kutaorae	Phellodendron costation Chandler	×		No.
Mastixiaceae)	Chandler <sup>4</sup>				and the second second second	Acronychia ornata (Chandler) Mai,	×	-	Contraction of the
	Eomastixia ragoaa (Zenker) Chandler	ж		10 m m m	and a second second second second	1976			
	Suida quadrilocularis (Chandler) Mai,	×		1	Second and the second	Zanthoryinn bordsellense Chardler	×	-	×
	1999	and some or a				Z compression Chandler	× .	-	
	Genus ?	×			Sabiaceae	Melioana sp.	×	-	
Cucurbitaceae	Cacurbitospermum reidii Chandler	×			Styracaceae	Styrux elegans Chandler	×	_	
Cyperaceae	Garicoidea angulata Chandler <sup>4</sup>			×	Symplocaceae	Symplocos beadonensis Chandler	×	-	
	C miteur (Heer) Chandler			×		S. sp.	×		
	C. obscara Chandler	ж		100 C 100	Theaceae	Annealest costata Chandler	×		
	Chadiocarya minima (Chandler) Mai <sup>7</sup>	×			000-0501111	Vissea bordwellenats (Chandler) Mai <sup>th</sup>	×		
	C coluellennis (Chandler) Mai	1.1		×	and the spinster of the second strength	Eurya becktonensis Chandler	×		
	Garey cohorlingis Chandler			×	and the second second second	E atigmoar (Ludwig) Mai <sup>28</sup>	×		
	C sen			×		Gordonia minima Chandler	×	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	Parateur en			×	1.00.00	Polyspora trancata (Chaodler) Gregor <sup>6</sup>	ж		
	Science Involuellenair Chardler	×			Thymelacaceae	Genus?	ж		
Certilaceae <sup>3</sup>	Provide attant hookseens Chardler	¥		~	Typhaceae	Typha sp.			×
	E. cohoellessee Chandler			×	Vitaceae	Ampelopais rotundata Chardler	×		
Decouraceae	Aldronanda cousta (Chandler) Chandler	×	×	×	Contraction of the second	Parthenociasus bondcellesis Chandler	×		
Deniceae	Discharge headsmark Chardler	×			And the second second second second	Ternastiona Johata Chardler	×		
Edicaceae	2 Cenera 1	~			and the second s	Vitte uncinate Chandler	×		
Hamamelidaceae	Steinhourne enhelsheur Prest	×			Zingiberaogae/	Strinematosteremane acetaleri (Heer)	×		
Hadron barbarra	Structure handowenets Chardler	¥.	~	~	Musaccar	Chandler		-	
Teydrochantaceae	S. Ametooragis Chandler	~		~	Incertae sodia	Gerbolithus fibrosus Chandler	ж		
London service	Hoder on for Phateleters)					C abocusiformis Chandler	×		
POSCHORE SEC.	Indeed for deadloads ( headlos	-				C cobsellensis Chandler			×
	Posterio de la companya de Chandler	~			and the second se	C spp.	×		×
	L hashbaranis Charder				And the second second	Rhannostermun hilohatum Chardler	×		×
	National econoran Chandle	Ŷ				and the second se			1000
Louisener	Constant Proposition Chanter	-					-		and a second
2 construction	Dennas 7	~			Porticity North entry 3 This includes french	revanaperwar (Chandler) then included within the	Thesenate (see	Mai and Wallhe	v, 1989).
Legenes	2 Genera /				1 Sec Cross (1986)	can consider and the company's taken			
Lyttraccae	Decision recientiti Chandler	~		-	4 See Ecompose 4 to Ta	Ale 6.1			
	Automphina paina Chandler		-	1	1 Originally Corner on	advikcularis Chandler.			
	Genus r	×.			* See Collesson (1985)	1			
Menapermaceae	The first Chardin	×	in the second	A Distances	7 See Mat and Walkher	(1978).			
	(Chandler) Chandler				* See Footnote 7 to Ta	ble 9.1.			
MORECHE	Casoropeona Ascarsnava Chandler	×	-		* Includes Folgaddam	that bordentlenuis Chandler and Protabiligia hanz	towenals Chand	fler (see Mai and	Wakher.
	Broastonivita ragoas Chandler	×			2995).				
	Aboronana Boorpana Chundler"	×			" See footnotes to Tab	les 6.1 and 6.2.			
	Becktonia bastonessis Chandler	×	-		** See Collinson (1989)	the second s			
	Ficus lucidus Chandler			×	Includes Moroialea 8	conducellonais Chandler (see Mai and Walther, 1978)	F		
					<ul> <li>Emended by Collins</li> <li>Formerly Rutasperm</li> <li>Formerly Campylog</li> <li>Formerly Cleperal at</li> <li>Sea test under Head</li> </ul>	on (19954). um ornalism (Charodier) (see Mai, 1976; Collinson versuum Jonaloptiensis Charodier (see Mai and Wald genous (Ludwig). Is aire for disconten of Johrsmatouterenam.	and Gregor, 1 ser, 1991).	968).	

(Table 9.2). Angiosperm floras from the Headon Hill Formation. Species descriptions or reference to them may be found in Chandler (1961c, 1963a), unless otherwise referenced. Discussion and other records for some of these species may be found in Mai and Walther (1978, 1985, 1991) and Mai (2000). The family classification used here is summarized in Chapter 1 of the present volume.

Perificace         Accuracione Josephane Josephanes         N         N           Accuracione Josephanes         Inconsorte         Notatione consume Chandler         N         N           Accuracione Josephanes         N         N         Notatione consume Chandler         N         N           Accuracione Josephanes         Notatione consume Chandler         N         N         N         N           Accuracione Josephanes         Accuracione Josephanes         N         N         N         N         N           Accuracione Josephanes         Accuraciones         N	Family	Species	Lake	Arne	Studland	Family	Species	Lake	Arec	Studlan
Skitzersere         Spanise Number Der ennel Gaber and Z poolenis Chandler         N         N           Scitzersere         A poolenis Chandler         N         N           Trochance         Spanise Chandler         N         N           Spanise Chandler         N         N         N           Standausser         Spanise Chandler         N         N           Spanise Chandler         N         N         N<	Pteridaceae	Acrostichum Ianzaeanum (Visiani) Chandler		ж	×	Icacinaceae	Jodes acutiformis Chandler	×	×	100000
Bingshaven's         No         Product Chandler         N         N           Admis Josofnat Chandler         N         N         N         N           Constant         Specific Contrains Dander         N         N         N         N           Standar cassing mentions instructure (Dander) Mail         N         N         N         N         N           Standarcess         Specific Contrains Elord         N         N         N         N         N           Standarcess         Specific Contrains Elord         N         N         N         N         N         N           Specific Contrains Elord         N         N         N         N         N         N         N           Specific Contrains Elord         N         N         N         N         N         N         N         N           Specific Contrains Elord         N         N         N         N         N         N         N         N           Specific Contrains Elord         N         N         N         N         N         N         N         N         N         N         N         N         N         N         N         N         N         N         N	Schizaeaceae	Lygodium haufjusti Heer emend. Gardner and	0.000		×	A CONTRACTOR OF THE	Natsiatum econicum Chandler <sup>11</sup>	×	1.	
I         Decinit Chandler         ×            Facodian advertiance (harder)         × <td></td> <td>Ettingshausen</td> <td></td> <td></td> <td>1.1.22</td> <td>and the second second</td> <td>3Palaeophytocrene foreolata Reid and Chandler</td> <td>×</td> <td></td> <td></td>		Ettingshausen			1.1.22	and the second	3Palaeophytocrene foreolata Reid and Chandler	×		
Aeenia prodesia Chandler         N <td></td> <td>L poolesuis Chandler</td> <td>×</td> <td></td> <td></td> <td>and the second sec</td> <td>kacinicarya inornata Chandler</td> <td>×</td> <td>ж</td> <td></td>		L poolesuis Chandler	×			and the second sec	kacinicarya inornata Chandler	×	ж	
Refine adventace (space) Bartlel, 1979         x         x           Secondaria density adventace (space) Bartlel, 1979         x         x           Space of contrast lister         Space of contrast (Sandier         x         x           Space of contrast (Sandier) Mail         x         Adventegreman datues (Dandier)         x         x           Bar adventace (Space)         x         x         x         x         x           Assess of the second (Candier) Mail         x         x         x         x         x           Space of controls         x         x         x         x         x         x           space of controls         x         x         x         x         x         x           space of controls         x         x         x         x         x         x           space of controls         x         x         x         x         x         x           space of controls         x <td></td> <td>Anemia poolensis Chandler</td> <td>×</td> <td>×</td> <td></td> <td>Lauraceae</td> <td>Laurocarpun spp.</td> <td>×</td> <td>1.0</td> <td></td>		Anemia poolensis Chandler	×	×		Lauraceae	Laurocarpun spp.	×	1.0	
Tanola laberal Chandler         ×         ×         ×         Alataperson fabora Chandler         ×            Visitaliance         Samata crassifyerms (Chandler) Mal <sup>2</sup> ×          Nature 1         × <td></td> <td>Ruffordia subcretacea (Saporta) Barthel, 1976'</td> <td></td> <td>×</td> <td></td> <td>Lythraceae</td> <td>Ammannia lakensis Chandler</td> <td>×</td> <td></td> <td></td>		Ruffordia subcretacea (Saporta) Barthel, 1976'		×		Lythraceae	Ammannia lakensis Chandler	×		
Sequest countils lived*         Sequest countils lived*         X         X           Charactal creating the sequences of the sequence	Taxodiaceae	Taxodium lakensis Chardler	×	×			Alatospermum lakense Chandler	×		
Standalow         Sanzale crassiporms (Daudler) Ma! "V"         ×         Palancescale         Palancescale         Palancescale         N         ×           Uncertaince         Deconstructures identifies (Daudler)         ×          ×<		Sequoia conttitae Heer <sup>4</sup>			×	Menispermaceae	Tinosporat armenuts Chandler	×	×	
S. posemit (Chandler) Nai, 1970"         x         Wardenbegrey booknown (Chandler) Pick.         x           Harmers op.         x         -	Actinidiaceae	Sauraula crassisperma (Chandler) Ma <sup>h</sup>	×	1.1.1.1.1.1.1.1			Palaeococculus lakensis Chandler	×	х	1.000
Drassenticarya         Drassenticarya glanditogo Chandler         x         1979           Amore op         Amore op         X         1979         1979         1979           Amore op         Amore op         X         1979         1979         1979         1979           Appropriates         Appropriate Chandler         X         1979         1979         X         X           Appropriate Chandler         X         1979         1979         1979         X         X           Appropriate Chandler         X         X         1979         1979         X         X         X           Appropriate Chandler         X         X         1979         X		S. poolenais (Chandler) Mai, 1970*	ж				Wardensheppeya poolensis (Chandler) Eyde,		×	1.000
Barnesson         X         A         A           Base labousit Chandler         X         A         A           Apportance         A polymospresson actig/ower Chandler         X         X           A labour Chandler         X         A         A           A labour Chandler         X         A         A           A labour Chandler         X         A         A           A labour Chandler         X         X         A           Brone Socie         Elevision Labourity Chandler         X         X         X           Brone Socie         Elevision Labourity Chandler         X         X         X           A labour Chandler         X         X         X         X           Depressone         Elevision Labourity Devision Chandler         X         X         X           Approximation and theoretic Chandler         X         X         X         X           Approximation allowesis Chandler         X         X         X         X           Approximation allowesis Chandler         X         X         X         X           Approximation allowesis Chandler         X         X         X         X           Approximation alabousis Chandler	Anacardiaceae	Dracontocarya glandulosa Chandler	×				1970			
Bhe labouit Chandler         x		Lannea sp.	×			Moraceae	Ficus Incidus Chandler (see Collinson, 1989)	×		
K. gp.         X.         No.         X.           A lowue Chandler'         X.         X.         X.         X.           tercacze:         Calamaa dawam candjown Chandler'         X.         X.         X.           Songrinacce:         Bereite Jahenei Chandler         X.         X.         X.           Songrinacce:         Flactochymera Iakenei Chandler         X.         X.         X.           Jappersce:         Flactochymera Iakenei Chandler         X.         X.         X.           Andreau aparanali Chandler         X.         X.         X.         X.           Antonici Iakenei Chandler         X.         X.         X.         X.           Calgberdingermann constraint Chandler         X.         X.         X.         X.           Calgberdingermann constraint Chandler         X.         X.         X.         X.           School constraint Chandler         X.         X.         X.         X.           S		Rhus labenuis Chandler	×			1000	F sp.		10000	×
Appopulation         Appoint Chandler         ×            A Laboration Chandler         ×		R. spp.	×			Moraceae	Ovicarpum reticulation Chandler (see		х	and the second
A Lakewar Chandle*     ×       Calassear abanessoring (Logic) Chandler     ×       Songinacese     Calassear abanessoring (Logic) Chandler     ×       Songinacese     Patacolument fabrenis Chandler     ×       A Lakewar Chandler     ×     ×       Songinacese     Patacolument fabrenis Chandler     ×     ×       A Lakewar Chandler     ×     ×     ×       A Lakewar Chandler     ×     ×     ×       Saprescele     Patacolument analysis (Chandler     ×     ×       A Lakewar Chandler     ×     ×     ×       Saprescele     Samuerus parends (Chandler     ×     ×       Calgori fabrenis (Chandler)     ×     ×     ×       Calgori fabrenis (Chandler)     ×     ×     ×       Samuerus (Chandler)     ×     ×     ×       Matrixic carbon (Chandler)     ×     ×     ×       Matrixic carbon (Chandler)     ×     ×     ×       Subscrate     Songinacese     Songinacese     Songinacese     Songinacese     Songinacese     Songinacese     Songinacese     Songinacese     Nationacese     ×     ×       Jappen Signary (Damaler)     ×     ×     ×     ×     ×     ×       Subscrate     Songinacesement Chandler	Apocynaceae	Apocynospermum acutiforme Chandler <sup>1</sup>	×				Collinson, 1989)			
Callaren damma damm		A. Jakense Chandler <sup>3</sup>	×			Nymphaeaceae	Palaeonymphaea eocenica Chandler (see	×	10.000	a constant
Stability         Stability <t< td=""><td>Arecaceae</td><td>Calamus daemonorops (Unger) Chandler</td><td>ж</td><td>-</td><td></td><td>100 C 100 C</td><td>Collinson 1980a)</td><td></td><td></td><td>-</td></t<>	Arecaceae	Calamus daemonorops (Unger) Chandler	ж	-		100 C	Collinson 1980a)			-
Elevents case         Elevents ( Lanordier         ×         <		/Sahal ap.	Carl Colores	×		Nyssaccae	Nyusoidea escenicum Chandler	ж	×	
Inserscent         Patronomic many fixed Dandler         ×	Boraginaceae	Ebretia lakensis Chandler	×	1000		Rosaceae	Rubus acutiformis Chandler	1000		×
Barbonelia ensanguata (Dandler         X <th< td=""><td>Burseraceae</td><td>Palaeobursera lakensis Chandler</td><td>×</td><td></td><td></td><td>Rotaceae</td><td>Phellodendron coatatum Chardler</td><td></td><td>×</td><td></td></th<>	Burseraceae	Palaeobursera lakensis Chandler	×			Rotaceae	Phellodendron coatatum Chardler		×	
Palacocloses         Palacocloses         Participation         Participat	Capparaceae	Burtonella emarginata Chandler	×	×	×	and the second second second	Rutasperman excavation Chardler	1.1	×	1
Gapparishipersona     Chandler     ×     ×       Symbolizacea     Summanisi lakensis Chandler     ×     ×       Demaraticis regions (Echandler)     ×     ×       Mastiticicen)     Emaraticis regions (Echandler)     ×     ×       Including     Emaraticis regions (Echandler)     ×     ×       Mastiticen regions (Echandler)     ×     ×     ×       Solazecea     Sipplecorphysics (Echandler)     ×     ×       Mastiticen regions (Echandler)     ×     ×     ×       Solazecea     Sipplecorphysics (Echandler)     ×     ×       Colosensis Chandler     ×		Palaeocleome lakensis Chandler	×				R. glabrum Chandler	×	1000	
Supplicitizene including hasixiaceie/     Namenie Chandler     N     N       Dimentrisier negoene (Zenker) Chandler (see Mai, 1993)     N     N     N       Le necedats Chandler     N     N     N       Mastixia cantionis Neid and Chandler     N     N       Steldar guadriticularis (Chandler)     N     N <td< td=""><td></td><td>Capparidisperman eccenicum Chandler</td><td>×</td><td>1</td><td></td><td>And States and States</td><td>R. magnificum Chandler</td><td></td><td>×.</td><td>·</td></td<>		Capparidisperman eccenicum Chandler	×	1		And States	R. magnificum Chandler		×.	·
Densense         Densense is fabreals Chandler         ×<         ×<	Caprifoliaceae	Sambucus parenda Chandler	×			and a second second second	R. striatum Chandler	×	10.000	
Including Mastinizacian (astinizacian)     Promeutrism regional (Zender)     Charlier     X       1993)     Another constructs Reid and Chandler     X     X       Massinizacian)     Massinizacian)     X     X       Massinizacian)     Social guadrilocularis (Chandler)     X     X       Massinizacian)     Social guadrilocularis (Chandler)     X     X       Massinizacian)     Social guadrilocularis (Chandler)     X     X       Social guadrilocularis (Chandler)     X     X       Massinizacian)     Social guadrilocularis (Chandler)     X     X       Social guadrilocularis (Chandler)     X     X     X       Social guadrilocularis (C	Cornaceae	Dunstania labensis Chandler <sup>5</sup>	×			Sabiaceae	Meliosma abeppeyensis Reid and Chandler	X	1.000	1.1
Hastisticaceir)     1993)     Image: Chandler     X       Encreaceiries field and Chandler     X     X       Mastistica cantineus field and Chandler     X     X       Mastistica cantineus field and Chandler     X     X       1993)     Section field space field and chandler     X     X       1993)     Section field space field and chandler     X     X       1993)     Section field space field sp	(including	Eomathinia rugosa (Zenker) Chandler (see Mai,	ж	×	Contraction in the local division of the	Sapotaceae	Bapoticarpant sp.		×	
Encredents Chandler     N     Soldar granderits chandler     N     N       Maarticki combenst Related Chandler     N     N     N     N       1993)     Soldar granderits Chandler     N     N     N       Soldar granderits Chandler     N     N     N     N       Soldar granderits Chandler     N     N     N     N       Courbitingermann Laberage Chandler     N     N     N       Steptar sp.     N     N     N     N       Steptar sp.     N     N     N     N       Concortingermann Laberage Chandler     N     N     N       Steptar sp.     N     N     N     N       Controlodes annee Chandler     N     N     N     N       Controlodes annee Chandler     N     N     N     N       Contrologen weinverse Chandler     N     N     N     N       Steptar in Principae Chandler     N     N     N     N       Denaacea     Dinophycebiacea     K     N     N<	Mastiniaceae)	1993)		100		Solanaceae	Solanian amenia Chandler		ж	
Matrixis continues Reid and Chandler         x         x           Masticis continues Reid and Chandler         x         x         x         x           Masticis continues Reid and Chandler (see Mai, 1993)         x         x         x         x         x           Social quadrificularis (Chandler) (see Mai, 1993)         x         x         x         x         x         x           Converbitacese Coolinguum Chandler         x         <		E. urceolata Chandler	×	10030000		and the second s	Solanispermum reniforme Chandler		×	1
Matrixicarpum channelier (see Mai, 1993)     X     Symplocose Posadoneuris (Chandler)     X       Coordia quadrificularis (Chandler) Mai, 1999*     X     Image: Configure Statement Chandler     X       Coordia quadrificularis (Chandler) Mai, 1999*     X     Image: Configure Statement Chandler     X       Coordinations (Chandler) Mai, 1999*     X     Image: Configure Statement Chandler     X     X       Coordinations (Chandler)     X     X     Image: Configure Statement Chandler     X     X       Stepton in     Conformation (Chandler)     X     X     Image: Configure Statement Chandler     X     X       Concordination (Chandler)     X     X     Image: Configure Statement Chandler     X     X       Concordination (Chandler)     X     X     Image: Configure Statement Chandler     X     X       Concordination (Chandler)     X     X     Image: Chandler     X     X       Concordination (Chandler)     X     X     Image: Chandler     X     X       Denacceae     Diophysics bandoneesis (Chandler)     X     X     Image: Chandler     X       E platyperma Chandler     X     X     Image: Chandler     X     X       E platyperma Chandler     X     Image: Chandler     X     X     Image: Chandler     X		2Mastixia cantienate Reid and Chandler	1.11	×	Color Manager Red	Styracaceae	Styrax elegans Chandler	ж	227	
1993)     Sadda genderficularis (Chandler) Mai, 1999"     X     Thesees     Schywar bhlense Chandler     X     X       Cookingsons Chandler     X     X     Theseese     Colorent bibligse Chandler     X     X       Steftyer ighensis Chandler     X     X     Theseese     Colorent bibligse Chandler     X     X       Steftyer igh     X     X     Theseese     Colorent bibligse Chandler     X     X       Carloolder op.     X     X     X     X     X       Carloolder op.     X     X     X     X       Carloolder op.     X     X     X     X       Devacue     Diopyrow beadownia (Chandler)     X     X     X       Walter, 1978''     X     X     X     X       Stephorehostee     Chandler     X     X     X       Eplophorehostee     X     X     X     X       Stephorehostee     Chandler     X     X     X       Eplotypernat Chandler     X     X     X     X       Eplotype		Mastixicarpum crassion Chandler (see Mai,	×			Symplocaceae	Symplocos beadonensis Chandler	100	×	
Section proceedings     Chardiery Mai, 1999"     N     Construction     Chippenson Chardier     N       Concritiones     Confignent Chardier     X     X     X     X       Sections     Sections     X     X     X     X       Sections     Sections     X     X     X     X       Concording on the main Chardier     X     X     X     X       Concording on the main Chardier     X     X     X     X       Concording on the main Chardier     X     X     X     X       Concording on the main Chardier     X     X     X     X       Concording on the main Chardier     X     X     X     X       Concording on the main Chardier     X     X     X     X       Denaccea     Disciption bandonewit Chardier     X     X     X       Englober/solder newei Chardier     X     X     X     X       Englober/solgermson chardier     X </td <td></td> <td>1995)</td> <td></td> <td></td> <td></td> <td>ANT OF THE OWNER OF</td> <td>S. Jakenuts Chandler</td> <td>×</td> <td>×</td> <td></td>		1995)				ANT OF THE OWNER OF	S. Jakenuts Chandler	×	×	
Decumbingerman laborage Chandler     X     X       C oblighmen Chandler     X     X       Steppar Jo     X     X       Carloidous sp.     X     X       Denaccae     Diogynos biadionensis Chandler     X     X       Eplotyperma Chandler     X     X     X       Planetrow Chandler     X     X     X       Parcadulos sp.     X     X     X       Denaccae     Diogynos biadionensis Chandler     X     X       Inploritizere     X     X     X       E platyperma Chandler     X     X     X       Inploritizere     X		Sueida quadrilocularis (Chandler) Mai, 1999 <sup>8</sup>	ж			Theaceae	Clepera? obligua Chandler	×	10.00	1
C     C-obliguestic Chandler     N     N       Stripper Schemist Chandler     X     X     X       Stripper Schemist Chandler     X     X       Controller annel Chandler     X     X       Demactea     Diophysics backdownels Chandler     X       Department and Stripter Mixing Chandler     X     X       Stripter	Cucurbitaceae	Cucurbitospermum lakense Chandler	×			- And State	Kiordonia sp.	×		
Speracese         Stripse's laboratio Chandler         X         X           Setzpus sp.         X         X         X         X           Carloider annel Chandler         X         X         X         X           Denaccar         Diopyros beadownuit Chandler         X         X         X         X           Imphorbiogenesis Chandler         X         X         X         X         X         X           E platyphorbiogenesis functioner Chandler         X         X         X         X         X         X         X           E platyphorbiogenesis functioner Chandler         X         X         X         X         X         X         X         X         X         X         X		C. oblignom Chandler	ж			Thymelaeaceae	Thymelaeaspermum lakesue Chandler	×	х	
Surgeor sp.     x     x       Carbonids area Chandler     x     x       Cohours Chandler     x     x       Witter State     x     x       Denacese     Dioptycos badonensis Chandler     x     x       Lphorbiothera balonnis Chandler     x     x       E phyporbiothera balonnis     x     x       Facourtiacea     Netherelist annablis Bowerbank     x       Technitigues acconsiste Chandler     x     x       Facourtiacea     Strinbauera askylobour Presl <sup>th</sup> x       Immeridaceae     Strinbauera askylobour Presl <sup>th</sup> <td< td=""><td>Cyperaceae</td><td>'Sciepus' labenuis Chandler</td><td>×</td><td>×</td><td></td><td></td><td>T.? sulcation Chandler</td><td>×</td><td>1</td><td></td></td<>	Cyperaceae	'Sciepus' labenuis Chandler	×	×			T.? sulcation Chandler	×	1	
Garicoldea anset Chandler     x     x     x       C obscient Chandler     x     x     x       Carlocoldea sp.     x     x     x       Chandler Sp.     x     x     x       Chandler Sp.     x     x     x       Wather, 1978     X     x     x       Suphorbischer Labenuts Chandler     x     x     x       Taphorbischer     K     x     x       Labitographic bischer Labenuts Chandler     x     x     x       Labitographic bischer Labenuts     x     x     x		2Scarptus sp.	ж			Vitaceae	Vittis ambigua Chandler	ж		1
E. concent Chandler     X		Caricoidea arnei Chandler		×			V. armenuis Chandler	1	×	
Karricoldes sp.         X         X         X           Charlicoury serviews (Chardler) Mai in Mai and Walther. 1978'         X         X         X         X           Denances         Dissignment Chandler         X         X         X         X         X           haphorbisheeca baphorbisheeca Lephorbisheeca Labernuis Chandler         X         X         X         X         X         X           Lephorbisheeca Labernuis Chandler         X <td></td> <td>C. obscura Chandler</td> <td>×</td> <td>1000</td> <td></td> <td></td> <td>V. cameata Chandler</td> <td>×</td> <td></td> <td>and the second second</td>		C. obscura Chandler	×	1000			V. cameata Chandler	×		and the second second
Charactery invitions (Charactery Mail in Mail and Walther, 1978)     ×     ×     ×       Demacrate     Dispyros bisadionensis Charactery     ×     ×     ×       Imphorbiscese     Epologynos bisadionensis Charactery     ×     ×     ×       Epologynos bisadionensis Charactery     ×     ×     ×     ×       Epologynos bisadionensis Charactery     ×     ×     ×     ×       Epologynos bisadionensis Charactery     ×     ×     ×     ×       Epologynos charactery     ×     ×     ×     ×       Epologynos charactery     ×     ×     ×     ×       E observatista Charactery     ×     ×     ×     ×       E observatista Charactery     ×     ×     ×     ×       Placopatista Characte		3Garicoidea sp.	×	1000			V. emenate Chandler	× .	No. Concern	
Walter, 1978         K. Santia Creccon and Skinglello <sup>10</sup> X         X           Deraceare         Diophysoc bandonessic Chandler         X         X         X           Diphorbischera Lakemät Chandler         X         X         X         X           E plotportschera Lakemäter         X         X         X         X         X           E plotportschera Lakemäter         X         X         X         X         X         X           - E plotportschera Lakemäter         X         X         X         X         X         X           - Robordschaft Chandler         X         X         X         X         X         X           - Roconstracear         Oncode rugosa Chandler         X         X         X         X         X           - Roconstracear         Oncode rugosa Chandler         X         X         X         X         X           - Roconstracear         Oncode rugosa Chandler         X		Gladiocarpst minima (Chandler) Mai in Mai and		×		The second s	V. Inhemats Chandler	ж	1.111	1000
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(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

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(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.

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daha excavala (Chandler) Gregor
daliostermum ornatum Chandler
misbermum reniforme Chandler
nus?
arra so
va dubia (Chandler) Mal <sup>5</sup>
na stiomond (Ludwis) Mal <sup>6</sup>
wa mudensis Chandler
rdonia truncata Chandler'
melaeastermum bournense Chardler
wia minima Chandler
c sn
tralithus echinatus Chandler
enatus Chandler
audance Chandler
otstobellum binnatifidum Reid and Chandler
annothermore hildhatum Chendler
servia fibrosa (Chandler) Chandler

authors.

(Table 9.1) Composition of the angiosperm flora from the Boscombe Sand Formation, Highcliffe. Species are described in Chandler (1963b) unless otherwise referenced. Some are also discussed by Mai and Walther (1978, 1985) and Mai (2000). The family classification listed here is summarized in Chapter 1 of the present volume.