# **Colwell Bay**

[SZ 330 884]

### Introduction

Colwell Bay is another of the classic lower Tertiary stratigraphical sites in southern Britain, and it is described in detail by Daley (in Daley and Balson, 1999). It is the only site yielding plant fossils from the Linstone Chine Member (upper Headon Beds of earlier authors), of late Eocene age. The flora consists mainly of aquatic plants and includes over 40 species, for some of which this is the only known site.

The plant fossils that occur here in the late Eocene Linstone Chine Member have been described by Chandler (1955, 1963a) and Collinson (1980a,b). Chandler (1961c, p. 101) also described a small flora from the Totland Bay Member here (see (Table 9.2)). Charophytes occur at various levels (Feist-Castell, 1977).

## Description

#### Stratigraphy

The sequence has been described by Keeping and Tawney (1881), Reid and Strahan (1889) and Daley (in Daley and Balson, 1999). There are *c*. 33 m of the Headon Hill Formation, between the Totland Bay and Osborne Marls Members (Figure 9.20) and (Figure 9.21). The plant fossils mostly occur in carbonaceous bands within a unit of laminated clays and sands, at the base of the Linstone Chine Member. This unit contains abundant fossils of the bivalve *Potamomya*, indicating brackish conditions.

#### Palaeobotany

The plant fossils found here are mainly carbonaceous fruits and seeds, often with replacement by amorphous pyrite. Chandler (1963a) states that there are some 38 taxa known from here, 27 of which were named to species. Angiosperms are by far the commonest, and over half of these are aquatic or marsh plants, including rushes, water soldiers, water lilies and pondweeds ((Figure 9.22); a full list of the angiosperm fruits and seeds found here is given in (Table 9.2)). The remains of plants that grew in drier conditions are much scarcer, although fragments of twigs, seeds and cone-scales of the taxodiaceous conifer *Sequoia couttsiae* Heer (see Footnote 2 to (Table 8.2), this volume) are locally common. In addition, there are rare fruits of elder (*Sambucus*), *fig (Ficus* — see comments by Collinson, 1989), bog-myrtle (*Myrica*) and silkwood (*Zanthoxylon*).

Ferns are uncommon here, but Chandler (1955) described a single fertile pinnule of the schizaeacean Anemia colwellensis Chandler. Barthel (1976) regarded this species as a synonym of Ruffordia subcretacea (Saporta) Barthel. Ruffordia clearly belongs in a Glade including Anemia and is very similar to Anemia (Collinson, 1996a, in press a). Collinson (1980b) described the megaspore of the water fern Azolla colwellensis Collinson, which is unique to this site, and is the youngest record of the primitive form with many 'floats' in the megaspore (Figure 9.23).

### Interpretation

Chandler (1963a) was of the view that the Colwell Bay flora 'is not a very remarkable or informative one'. It is indeed similar in many ways to that from the lower part of the Headon Hill Formation (Totland Bay Member), such as seen at Hordle, consisting predominantly of aquatic and marsh plants. However, there are many features that make the Colwell Bay flora distinctive and important, not least the fact that it is the type locality for nine species: *Azolla colwellensis, Anemia colwellensis, Carex colwellensis, Cladiocarya colwellensis, Myrica colwellensis, Decodon vectensis, Sambucus colwellensis* (synonymized with *S. parvula* Chandler by Collinson, 1983a), *Epacridicarpum colwellense* and *Carpolithus colwellensis.* The *Anemia* has been tentatively identified from another locality (Chandler, 1964) and is more widespread if

included in *Ruffordia subcretacea* (Barthel, 1976). *Decodon vectensis* ranges up into the early Miocene deposits in Europe; the record from Colwell Bay is the oldest (Mai, 2000).

Colwell Bay is the only site to yield plant fossils from the late Eocene Linstone Chine Member (Headon Hill Formation), and as such is important for establishing the pattern of vegetational and climatic change in southern England during the Palaeogene Period. This is most clearly seen in the aquatic part of the flora. It shows the extinction of *Stratiotes hantonensis*, which becomes replaced by the larger *S. headonensis*, and the youngest possible occurrences of *?Caricoidea angulata* and *?C. obscura. Collinson* (1983a) considered these specimens of *?C. obscura* to be similar to some from the Bembridge Marls but probably distinct from those in older strata. Also here is the first appearance of *Nymphaea* in the British fossil record.

The forest component provides less evidence of the environmental changes occurring at this time, but this is probably merely a function of the scarcity of the fossils of this part of the flora. It is nevertheless of note that these beds include the youngest occurrences of *Ficus lucidus, Hordwellia crassisperma* and *Epacridicarpum headonense*. Bulk sampling has the potential for yielding plant fossils from other levels in this section and it is worth noting that *Stratiotes* has been recovered from the *Venus* Beds (Collinson, pers. obs.). Charophytes, of value in palaeoenvironmental analysis and biostratigraphy, occur throughout the site (Feist-Castell, 1977).

#### Conclusions

Colwell Bay is the only British site to have yielded plant fossils from the Linstone Chine Member (Headon Hill Formation), of late Eocene age (*c*. 36 Ma old). It is thus crucial for understanding variations in the geographical and temporal distribution of these floras. The fossils are mainly the fruits and seeds of aquatic and marsh plants, and they help demonstrate the progressive cooling of the climate that was taking part in southern Britain at this time. Although the flora is not as diverse as at some other Lower Tertiary sites in Britain, it has yielded seven species that are unique to this site.

#### **References**

Family	Species	Hordle	Colwell Bay (Tot- land Bay Member)	Colwell Bay (Linstone Chine	Family	Species	Hordle Cliffs	Colwell Bay (Tot- land Bay Member)	Cobwell Bay (Linstone Chine Mbr)		
				Member)	Myricaceae	Myrica borepana (Heer) Chandler	×		×		
Acanthaceae	Meanthur sp.	ж				M. columbrais Chandler		-	×		
Actinidiaceae	Actividia sp.	×			Nymphaeaceae	Safermia chanalievae Collinson 1990a	х	×	×		
Service and a service of the service	Saurauia crassisperma (Chardler) Mai <sup>1</sup>	×		×		Britsenia giboosa Chandler	×	-	×		
Anacardiaceae	Genus (Spondieae) ?	×			A REAL PROPERTY AND A REAL PROPERTY.	A. obioega Chandler	×				
Araceae	Genus ?	×				Nymphava sp.			×		
Arecaceae	Leaves	×		1	Oleaceae	Ofest beadoneesis Chandler	×				
Berulaceae	Garpinus honeyamus (Heer) Chandler	×		- C C.F.	Potamogetonaceae	Potamogeton pygmanus Chardler (see	×	×	×		
Boraginaceae	Omphalodes platycarpa Chandler	×		- 11 TO -	and the second	Collinson, 1983a)		-			
Burseraccae	Palaeobursera lakensis Chandler	×				P. sp.	×		×		
Caprifoliaceae	Sambucus parendus Chandler <sup>1</sup>	×		×	200 B 1	Linnocarpas forbrail (Heer) Chardler <sup>15</sup>	Χ.	×	×		
Carophellaceae	Hantoia pulchea (Chandler) Chandler	×			Rhamnaceae Rosaceae	Frangula bordwellenair Chandler	×				
	II. plabra Chandler	×				Rubus acutiformis Chandler	ж				
Cercidiphyllaceae	Numidium arcticum (Heer) Ilinakaia <sup>1</sup>	×			and the second second	W. microspormus Reid and Reid	11.10		K.		
Cornaceae (including	Dometania plandulosa (Chandler)	×.			Rataorae	Phellodendron costation Chandler	×		Contraction of the		
Mastistaceae)	Chundler <sup>4</sup>					Acronychia ormata (Chandler) Mai, 1976 <sup>14</sup>	×	and some from	Cardon Larrow		
	Contact of a regional (Center) Chandler	*				Zantheardum bordwellense Chardler	×		×		
	Suida quadrilocularis (Chandler) Mai,	×		Contraction of the		Z contempos Chandler	×				
	1999				Sabiaceas	Melioesa so	×				
-	Genus r	x			Standards	Streets departs Chandler					
Cucurbitaceae	Cacurbitospermum retalit Chandler	×			Summedia and	Superior and the second	2	-			
Cyperaceae	Gartcoidea angulata Chandler*		-	×	Theaceae	Symptocor manufacture Chandler	-	-			
	C miteur (Heer) Chandler			×		A MP.		-			
	C. obscars Chandler	х				Annear costata Chandler	×				
	Cladiocarya minima (Chandler) Mai'	×				Visiona porderitamente (Chancher) Mar	×		-		
	C. colsrellensis (Chandler) Mai	1.1.1		×		Eurya becklowends Chandler	×	-			
	Carex cohvellensis Chundler		and the second second	×		F. sligwood (Ludwig) Ma-	×				
	C spp.			×		Gordonia minima Chandler	×	-			
	(Sciepsoi sp.			×		Polyspora trancata (Chandler) Gregor	×				
	Scievia bordevellenais Chandler	×			Thymelacaceae	Genus?	. X.		1		
Cyrillaceae*	Epacridicarpum beadonense Chandler	×		×	Typhaceae	Typhu sp.			×		
	E. colwellense Chandler			×	Vitaceae	Ampelopsis rotundata Churdler	x				
Droseraceae	Aldronanda onata (Chandler) Chandler	x	×	×		Parthenociame bondwellesis Chandler	×				
Ebenaceae	Diagyros beadonensis Chandler	×				Ternastignus Johata Chandler	×				
Ericaceae	2 Genera ?	×				Vitts uncinate Chardler	×	a state of the second			
Hamamelidaceae	Stetsbauera subgloboas Presl"	×			Zingiberaorae/	Spirrenatosperman avetaleri (Heer)	×	and the second	1		
Hedrocharitaceae	Stratiotec beadownuts Chardler	×	×	×	Musaceae	Chandler®		in the second second			
	S. bantonensis Chandler	×		-	Incertae sedis	Garpolithus fibrosus Chandler	ж				
Icacinaceae	Hoder sp. (or Watstatum)	×		1		C. apocynijornus Chandler	×				
	Judes' bordwellensis Chandler	×		1		C coluellensis Chandler	2010/01/01/01		×		
	Reactinicarius transmenualis Chandler	×		1		C spp.	x		×		
	1 becktonensis Chandler	×				Rhannogerman bilobatum Chardler	×		×		
	Naturation econorcum Chandler <sup>10</sup>	×			A CONTRACT OF A CONTRACT. CONTRACT OF A CONTRACT. CONTRACT OF A CONTRACT OF A CONTRACT OF A CONTRACT. CONTRACT OF A CONTRACT OF A CONTRACT OF A CONTRACT. CONTRACT OF A CONTRACT OF A CO			Sector Contractor	10000		
Lauraceae	Genus?	×			1 Economic Mandauelli	e ensemblements (Chandler) then included within the	Theorem inco	Mai and Walthe	10005		
'Learnes'	2 Genera 7	×			* This tracketer family coherellensis chandler (see Collinson, 1985a).						
Lathracear	Decodor pertensis Chardler			×	See Crase (1966)						
Menispermaceae	Microditions harms Chandler	×			See Fournote 4 to Table 8 1.     Originally Coreas genativilocularis Chandler.						
	Genu?										
	Belangeingenteringe oblige store	÷			4 See Collinson (1985)	4).					
	Chandled Chandles	~	and the second second	And successive	See Mai and Walkher (1978).						
Mommenell	Chlorophone his primeter Chandler	*			" See Footnote 7 to Ta	éle 9.1.					
Moraceae**	Received and a second of the second		-		* Includes tolgasdamhar bordenilensis Chandler and Protabiligia hanzonessis Chandler (see Mat and Walther,						
	An example of the second second second	0			1595).						
	Mororani boogana Chundler"	×	-		** See Roomones to Tables 6.1 and 6.2.						
	Decetoma bastoweau Chandler	×			<ol> <li>See Collinson (1989)</li> <li>Includes Moroidau Boruheillenais Chandler (see Mai and Walther, 1978).</li> </ol>						
	Ficus localus Chandler			×							
					** Ensended by Collinson (1992a).						
					Formerly Rutaperso	um ornatum (Chandler) (see Mai, 1976; Collinson	and Gregor, 19	way.			
					** Formerly Clepenal st	igwoas (Lodwig).	and, townly.				

(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.



(Figure 9.20) Stratigraphical succession at Colwell Bay, Isle of Wight. (After Daley and Balson, 1999, fig. 5.33.)



(Figure 9.21) View looking north in Colwell Bay, spanning Brambles Chine to Cliff End, Fort Albert (now a hotel). The exposures are mainly of the Colwell Bay and Cliff End members, Headon Hill Formation. (Photo: M.E. Collinson.)



(Figure 9.22) Bedding surface in the Headon Hill Formation covered in fruits of the pondweed Potamogeton, × 8, from Colwell Bay. (Photo: M.E. Collinson.)

Family	Species	Lake	Arne	Studland	Family	Species	Lake	Anne	Studlan
Pteridaceae	Acrostichum Ianzaeanum (Visiani) Chandler		ж	×	Icocinaceae	Jodes acutiformis Chandler	×	×	
Schizaeaceae	Lygodium kaufjusti Heer emend. Gardner and	0.000		×	A CONTRACTOR OF THE	Natsiatum ecenticum Chandler <sup>11</sup>	×	111111	
	Ettingshausen			182	and the second se	3Palaeophytocrene foreolata Reid and Chandler	×		
	L poolenuis Chandler	х			and the second sec	kacinicarya inornata Chandler	×	х	
	Anemia poolensis Chandler	×	×		Lauraceae	Laurocarpun spp.	×	1.0	
	Ruffordia subcretacea (Saporta) Barthel, 1976		×		Lythraceae	Ammannia lakensis Chandler	×		
Taxodiaceae	Taxodium labensis Chardler	×	×			Alatospermum lakense Chandler	×		
	Sequola conttilae Heer			×	Menispermaceae	70nosporat armenats Chandler	×	×	
Actinidiaceae	Saunaula crassisperma (Chandler) Mal <sup>5</sup>	x				Palaeococculus lakenais Chandler	×	х	1
	S. poolenais (Chandler) Mai, 1970*	ж				Wardensheppeya poolensis (Chandler) Eyde,		×	
Anacardiaceae	Dracontocarya glandulosa Chandler	×			ne li li	1970			
	Mannea sp.	×			Moraceae	Ficus Incidus Chandler (see Collinson, 1989)	ж.		
	Rhus lakensis Chandler	×				F.sp.		10000	×
	R. spp.	×	-		Moraceae	Ovicarpum reticulation Chandler (see		×	a la companya
Apocynaceae	Apocynospermum acutiforme Chandler*	х			and the second second	Collinson, 1989)			
	A. Jakense Chandler <sup>8</sup>	×			Nymphaeaceae	Palaeonymphaea eocenica Chandler (see	×	100 100 100	1.000
Arecaceae	Calamus daemonorops (Unger) Chandler	ж		11.000	Sector Constants	Collinson 1980a)	and the second		
	/Sahal ap.	ALC: CARLON	×		Nyssaccae	Nyussidea escenicum Chandler	ж	×	
Boraginaceae	Ebretia lakenuis Chandler	×	1		Rosaceae	Rubus acutiformis Chandler			×
Burseraceae	Palaeoburnera labensis Chundler	×			Rutaceae	Phellodendron coatatum Chandler		×	
Capparaceae	Bartonella emarginata Chardler	×	×	×		Rutasperman excavation Chardler		×	
	Palaeocleome lakensis Chandler	ж				R. glabrum Chandler	×	10000	
	Capparidistermum excenicum Chandler	x				R. magnificum Chandler		×.	
Cantifoliaceae	Sambucus parenda Chandler	×	-		and a second state of the	R striatum Chardler	×		
Comaceae	Dunstania labensis Chandler <sup>1</sup>	x			Sabiaceae	Meliosma sheppeyensis Reid and Chandler	x		1.1.1
(including	Eomautizia ruposa (Zenker) Chandler (see Mai,	ж	×		Sapotaceae	Bapovicarpum sp.		×	
Mastixiaceae)	1993)				Solanaceae	Solanum amenue Chandler		×	
	E urceolata Chandler	×			and the second second	Solanispermum reniforme Chandler		×	
	3Mustizuia cawtiewate Reid and Chandler?		×	1.0	Styracaceae	Stynux elegans Chandler	ж	1000	
	Mastinicarpum crasmos Chardler (see Mai.	×			Symplocaceae	Symplocos beaslonensis Chandler	1.11	×	
	1993)				A CONTRACTOR OF	S. Jakenuts Chandler	×	×	
	Socida quadrilocularis (Chandler) Mai, 1999*	ж		-	Theaceae	Cleveral obligua Chandler	×	1000	
Cucurbitaceae	Cucurbitospermum lakense Chundler	×			Thymelaeaceae	Kordonia sp.	×		
	C. oblignom Chandler	ж		-		Thymelaeapermum lakense Chandler	×	ж	
Ceneraceae	'Scienus' labenuis Chandler	×	×			T.) sulcatum Chandler	×		
	Scirbur sp.	×			Vitaceae	Vitts ambigua Chandler	х		
	Caricoldea arnei Chandler		×			V. armenuis Chandler	-	×	
	C. obscuru Chandler	×	1			V. currenter Chandler	X		
	Caricoidea sp.	×				V. enteroste Chandler	×	1000	
	Cladiocarus minima (Chandler) Mai in Mai and		×.			V. Jakenuis Chandler	×		
	Walther, 1978"					V. Jusatica Creczott and Skirgiello <sup>12</sup>	×	×	-
Ebenaceae	Diograpos beadonessis Chandler	x			and the second sec	V. platysperma Chandler	×	×	
Euphorbiaceae	Eutoborbisebeca Lakenzis Chandler	×				V. poolennis Chandler	×		
	E. platysperma Chandler	х				V. pygmawa Chandler	×	×	
	E. tuberculata Chandler	×				V. goodhartii Chandler	×	×	
	E. digitata Chandler	×				V. gymmetrica Chandler	×	1.11	
	Eutoborbioghermum junctation Chandler	×				V. triangularis Chandler		×	
	Wetberellia sariabilis Bowerbank	1.11	×			Tetrastigma acuminata Chandler		×	
Flacourtiaceae	Oncoba rugosa Chandler	-	×			17. Johana Chandler	×		
Hamamelidaceae	Steinhauera subglobosa Presl <sup>10</sup>	x			Zingiberaceae	Alpinia amenae (Chandler) Mai in Mai and		×	
						Wakher, 1985 <sup>10</sup>			
					Incertae sedis	Rhonsoupermum bilohatum Chandler	×	×	
					and a second second				

(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



(Figure 9.23) Megaspore of the water fern Azolla colwellensis from Colwell Bay, with attached microspore massula, viewed under Scanning Electron Micrscope, × 195 (see Collinson, 1980b). (Photo: M.E. Collinson.)