Headon Hill and Totland Bay

[SZ 305 857]–[SZ 323 875]

Introduction

Plant fossils have been found at various stratigraphical levels through this classic section of the late Eocene succession on the Isle of Wight, from the upper Barton Clay Formation to the Bembridge Limestone Formation. They provide information on the vegetation and their habitats for this crucial part of the late Eocene, when climatic change was having a significant impact on this part of Britain.

Reid and Strahan (1889) and Chandler (1963a, 1964) have recorded plant fossils from here, but no single horizon has so far yielded a significant flora. However, the extensive exposures and the associated mammalian faunas allow the palaeoecology to be investigated (Hooker *et al.,* 1995). Specimens from here were used in a study of the chemistry of water-plant seed coats (van Bergen *et al.,* 1994a).

Description

Stratigraphy

Exposed along this part of the Isle of Wight coast is an almost unbroken succession of late Eocene strata, including the Barton Clay, Headon Hill and Bembridge Limestone Formations (Figure 9.12), (Figure 9.13) and (Figure 9.17). Of particular interest are the lignite bands that occur at several levels through the succession, the thickest being the Hatherwood lignite (Figure 9.16), some 8 m above the *Chara* Bed. Keeping and Tawney (1881) and Insole and Daley (1985) document the stratigraphy of this site. Daley (in Daley and Balson, 1999) deals with its broader significance.

Palaeobotany

Plant fossils occur here in the Totland Bay Member (lower Headon Hill Formation; (Figure 9.14) and (Figure 9.18)). Fruits and seeds have never been described in the literature, but come from the same level (*Limnocarpus* band) as those described by Chandler (1961c) from nearby Colwell Bay and Hordle (see (Table 8.2)). The flora is exclusively aquatic, including pondweeds (*Limnocarpus*), water lilies (*Sabrenia*) and water soldiers (*Stratiotes*) (Collinson, pers. obs.).

Coniferous tree stumps from here with *Glyptostroboxylon* wood, together with those at Hordle, are the only in-situ tree stumps in the Tertiary deposits of the Isle of Wight (Fowler *et al.,* 1973).

Reid and Strahan (1889) reported the presence here of a Leaf Bed from the Fishbourne Member (upper Headon Hill Formation). No fossils have ever been described from the Leaf Bed at this locality but the flora is likely to be similar to that found at Chapel Corner on the east side of the island (see GCR site report).

Chandler (1963a) reported calcite casts of *Celtis edwardsii* Chandler from the lower part of the Bembridge Limestone Formation. It was the only species found at this level at this locality and has not been found since. Hooker *et al.* (1995) reported other, mainly aquatic, plant remains including charophytes, and fruits of *Stratiotes* (Figure 9.19) and *Caricoidea.* Other significant fossils include leech cocoons and pellets of wood-feeding termites (Hooker *et al.,* 1995).

Charophytes were described by Feist-Castel (1977) from several horizons through the Headon Hill Formation along this stretch of coast. The sequence demonstrated the difference between what Feist-Castel referred to as the Verzenay and Bembridge Charophyte Zones. The former (lower Headon Hill Formation) included characterisic forms such as *Stephanochara edwardsii* Grambast, *Psilochara polita* (Reid and Groves) Grambast, *P. bitruncata* (Reid and Groves) Feist-Castel and the early form of *Harrisichara vasiformis* (Reid and Groves) Grambast. These taxa were missing from the higher horizons, and instead *Chara attenuata* Grambast, *Grambastichara tornata* (Reid and Groves) Horn aff.

Rantzien and the transitional forms of *Harrisichara vasiformis–H. tuberculata* were found.

Interpretation

There have been few detailed palaeobotanical studies along this stretch of coast on the Isle of Wight and its full potential has therefore still to be established. However, nowhere else in Britain are there such good exposures of plant-bearing strata through the upper Eocene, and the site holds considerable potential for further collecting, as well for palaeoecological study.

Significant work here has been on the palaeoecology of the Bembridge Limestone Formation (Figure 9.15) by Hooker *et al.* (1995), where the macropalaeobotany was integrated with palynological, mammal, invertebrate, organic geochemistry and stable isotope evidence. This revealed apparently conflicting results. The mammal evidence strongly indicated that the freshwater lake in which these deposits were formed was surrounded by a forest or closed woodland, with no more than a narrow belt of open habitat around the shore. However, the other lines of evidence all indicate that there was an extensive zone of marshland around the margins of the lake. The only evidence of trees was the calcified endocarps of *Celtis,* and bisaccate pollen, both of which were capable of being transported over considerable distances. There is clearly much potential here for similar work, which may help reconcile these apparently conflicting lines of evidence.

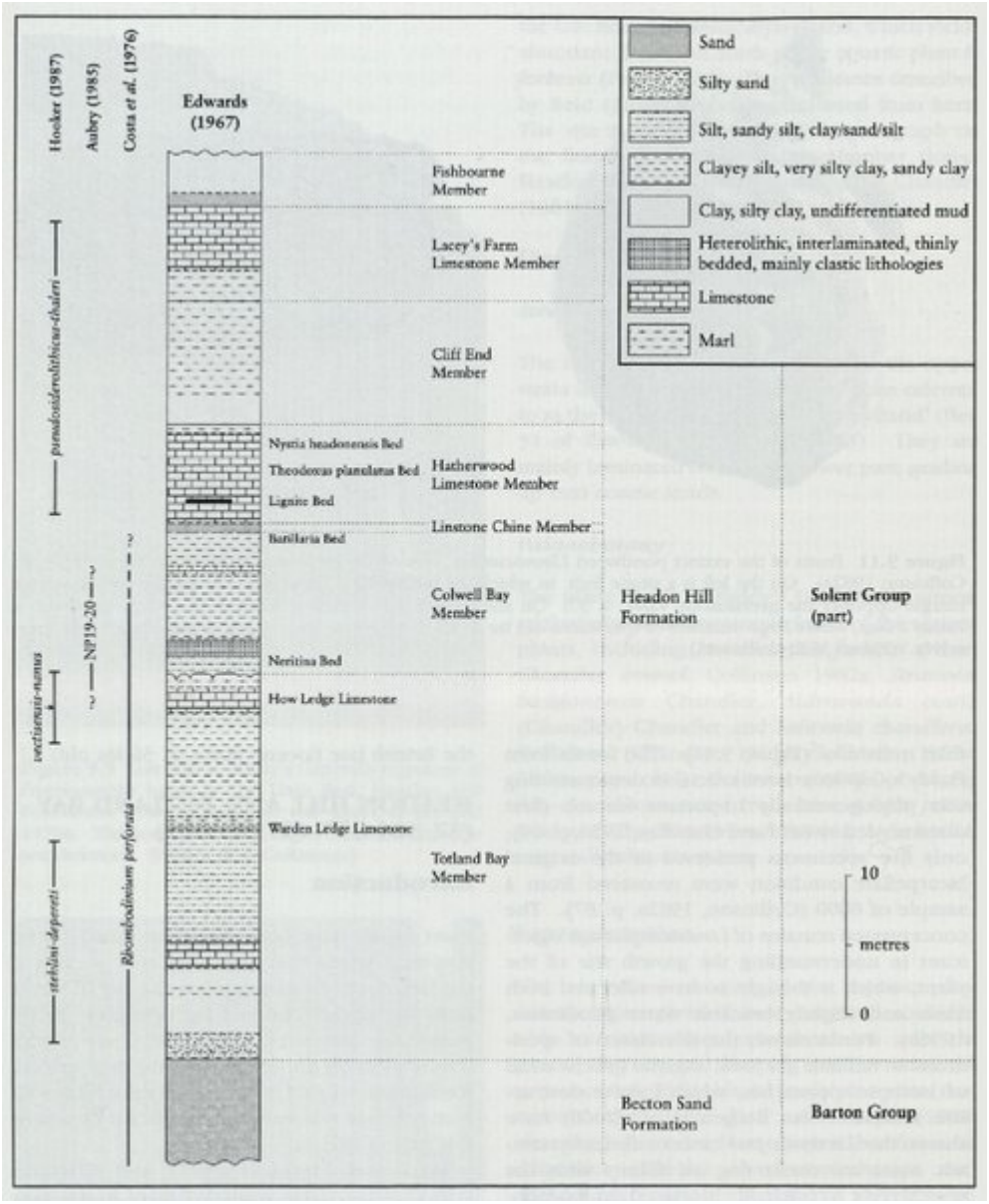
The exposures near Totland and on Headon Hill are important for their aquatic angiosperm flora, found in the Totland Bay Member. The deposits here are more freshwater-dominated than those seen at the Hordle Cliffs site, which has yielded the classic flora from the lower Headon Hill Formation. If they sample only local vegetation this may explain the absence of fruits and seeds of forest plants. Paddy's Gap may represent a similar situation.

Headon Hill is the best section in Britain for the study of late Eocene charophyte biostratigraphy. Nowhere else in this country has it been possible to document the succession of charophytes through the rocks of this age, and it is the only site in Europe where they can be seen in a continuously exposed succession.

Conclusions

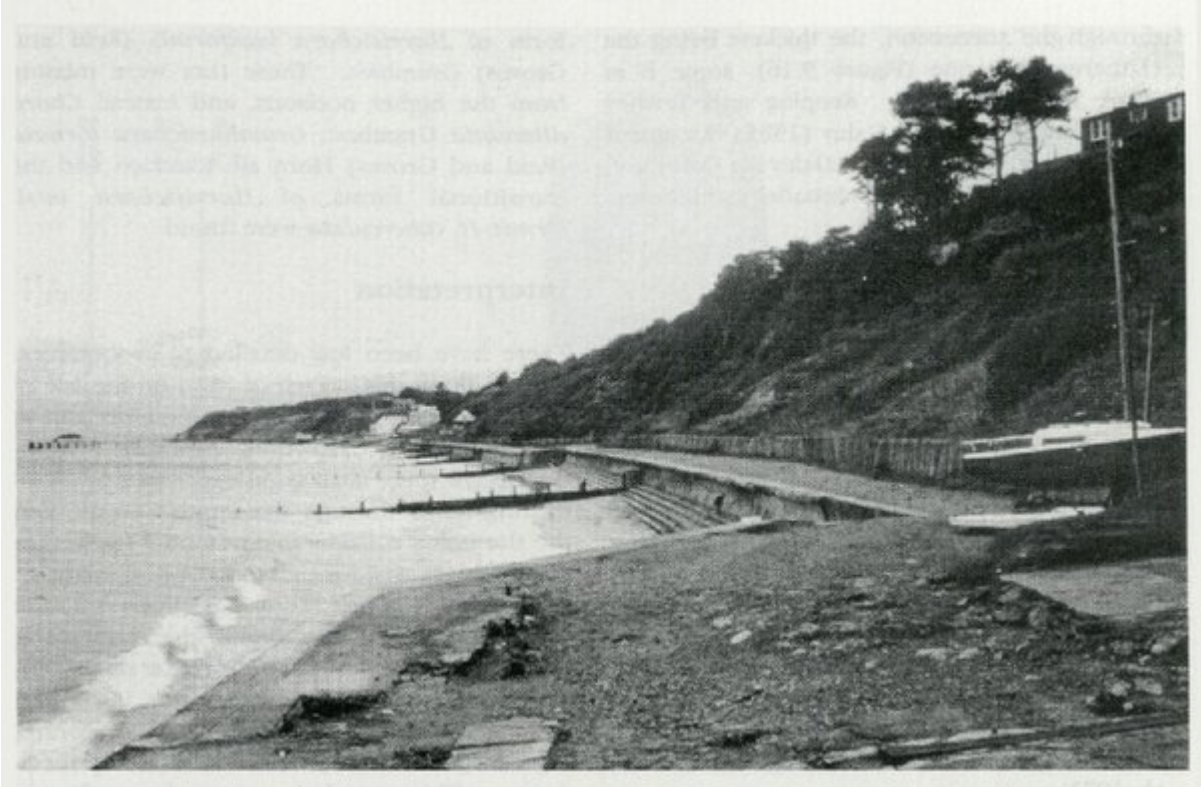
Headon Hill has the best-exposed sequence of plant-bearing rocks of late Eocene age in Britain. It provides excellent opportunities for studying the vegetational habitats of Britain as they were 35–37 Ma ago. The section is especially valuable because of the association of fossil plants with the remains of mammals and other tetrapods, enabling the study of their co-evolution.

References

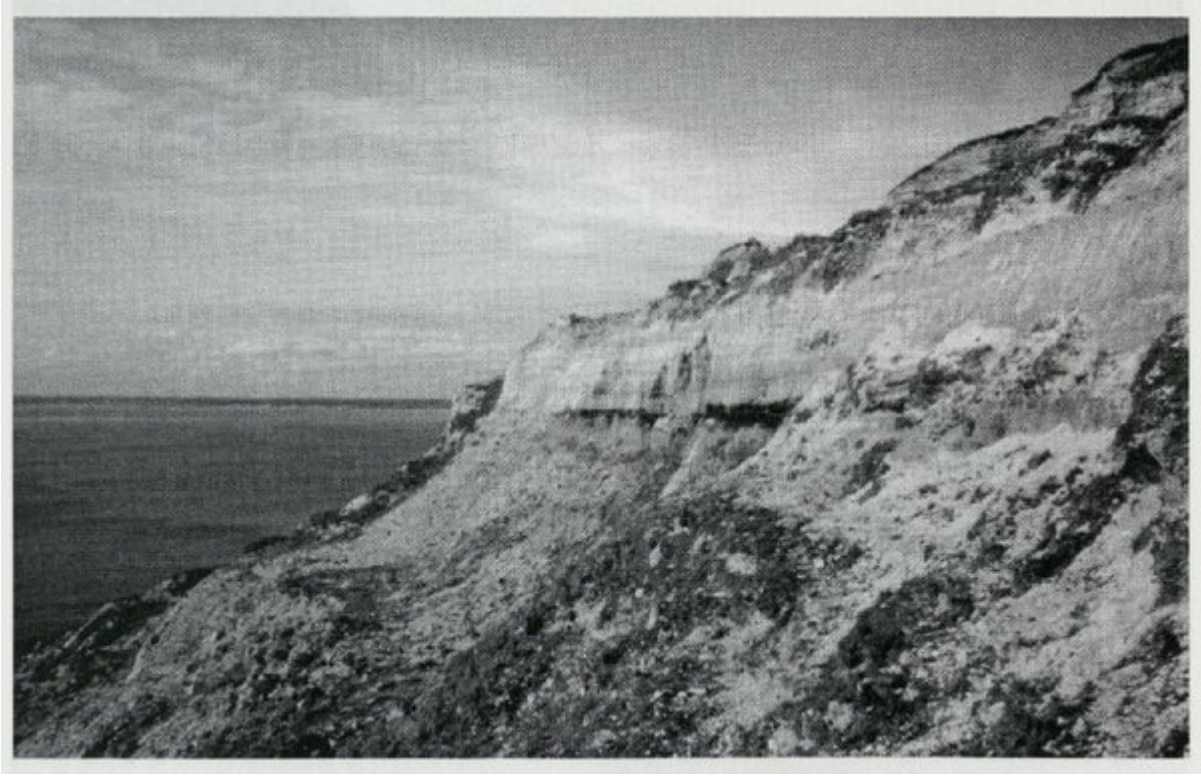


(Figure 9.12) Stratigraphical succession at Alum Bay, Isle of Wight, which includes the plant beds at Headon Hill and Totland Bay. (After Daley and Balson, 1999, fig. 5.28.)

(Figure 9.13) View of Alum Bay and Headon Hill, Hatherwood Point, as seen from the Needles Headland. (Photo: M.E. Collinson.)

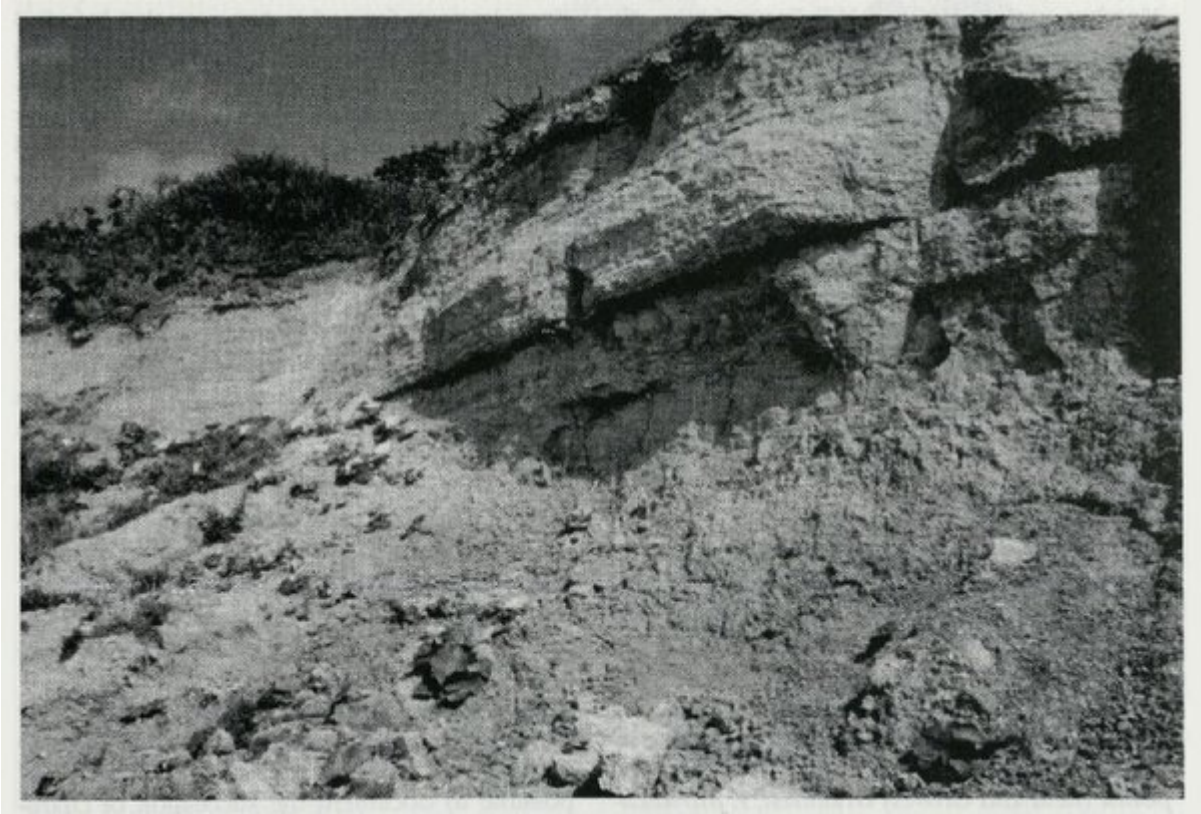


(Figure 9.17) View of Totland Bay looking north, showing exposures of Totland Bay Member (Headon Hill Formation) in the distance. (Photo: M.E. Collinson.)



(Figure 9.16) The Lignite Bed in the Hatherwood Limestone Member and overlying beds exposed at Hatherwood Point, Headon Hill. (Photo: M.E. Collinson.)

(Figure 9.14) Headon Hill Formation exposed at Headon Hill, including plant fossiliferous Totland Bay Member at lower left. (Photo: M.E. Collinson.)

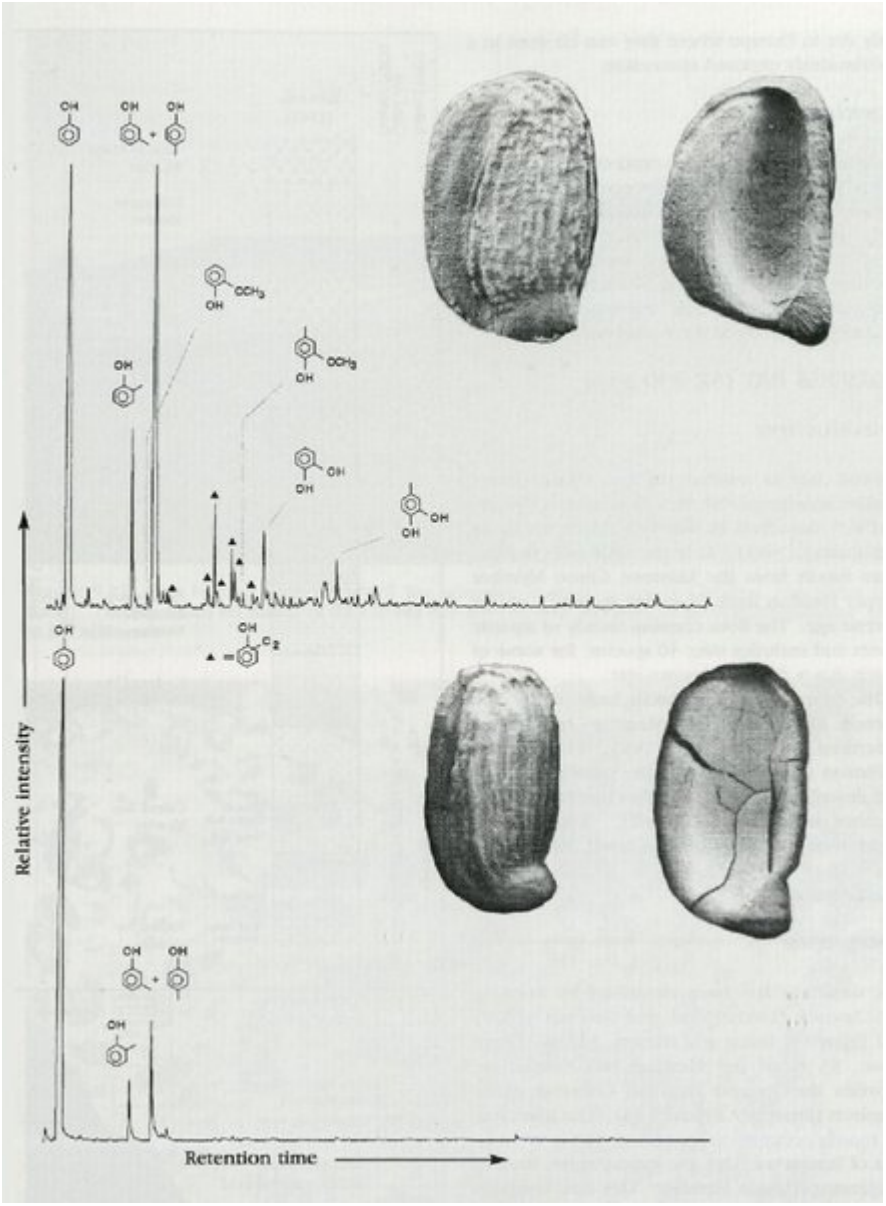


(Figure 9.18) Close up of exposures of the Totland Bay Member (Headon Hill Formation) at the north end of Totland Bay. (Photo: M.E. Collinson.)

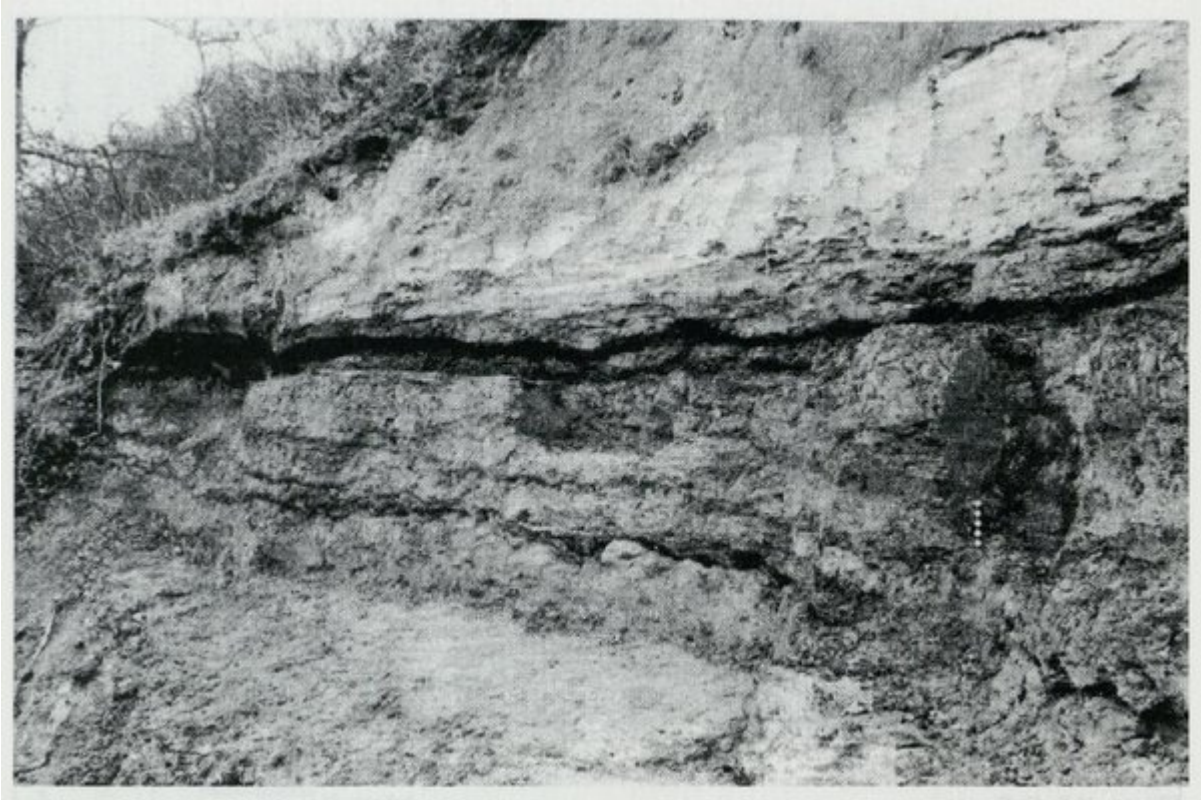
Family	Species	Lake	Arne	Studland
Pteridaceae	*Acrostichum lanzaeanum* (Visiani) Chandler		×	×
Schizaeaceae	*Lygodium kaulfussii* Heer *emend.* Gardner and Ettingshausen			×
	L. poolensis Chandler	×		
	Anemia poolensis Chandler	×	×	
	Ruffordia subcretacea (Saporta) Barthel, 1976[1]		×	
Taxodiaceae	*Taxodium 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



(Figure 9.19) The seeds of the water plant Stratiotes from the Bembridge Limestone Formation of Headon Hill show severe degradation both in morphology and chemistry (bottom), compared to their equivalents at Gurnard, Thorness Bay (top). This suggests oxidative decomposition prior to or following fossilization. The Scanning Electron Microscope images of the seeds show outer (left) and inner (right) views, × 7.5. See Hooker et al., 1995. (Photos: M.E. Collinson.)



(Figure 9.15) Section of Bembridge Limestone Formation on the north-east face of Headon Hill, where the multidisciplinary study of Hooker et al. (1995) was undertaken. (Photo: M.E. Collinson.)