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# Hamstead Ledge

[SZ 402 918]

## Introduction

Hamstead Ledge has extensive exposures of plant fossil beds in the Bembridge Marls and Hamstead Members (Bouldnor Formation), and is transitional in age between the Eocene and Oligocene epochs. It is the best site for the palaeoecological study of Tertiary floras in Britain and is of particular importance for understanding the evolution of the aquatic plant communities in this part of the world. It is also important because of its role in improving our understanding of the vegetation in Britain immediately after the global climatic cooling that took place near the end of the Eocene Epoch.

The classic site for plant fossils from the Bembridge Marls is near Thorness Bay (discussed above), but the cliffs there suffer from poor and intermittent exposure. In a search for sites better suited to palaeoecological studies, Collinson (1978a, 1983a) discovered floras from more extensive cliff and foreshore exposures of Bembridge Marls (and the lower Hamstead Member) further east along the Isle of Wight coast, at Hamstead Ledge. Although not yielding as diverse a flora as Thorness Bay, the foreshore exposures (Figure 9.30) at Hamstead Ledge, which are only available at low tide, allow the plant beds to be more easily sampled and their sedimentological context to be more easily investigated. Some of these fossils were also figured by Collinson (1978a,b; 1980b) and Collinson *et al.* (1993a). The floras formed a critical part of the studies by Collinson (1992) of vegetational change near the terminal Eocene event. Van Bergen *et al.* (1994a,b, 1995, 2000) included fossils from here in their studies of the chemistry of water-plant seed coats.

## Description

### Stratigraphy

Daley (in Daley and Batson, 1999) has described the stratigraphy of this section and its significance. The exposed sequence consists of about 21 m of mainly clays and mudstones of the Bembridge Marl and lower Hamstead Members (Bouldnor Formation). They are interpreted as mainly lagoonal or floodplain–lake deposits (Daley, 1973). (Figure 9.31) is a summary stratigraphical log showing the plant bed levels.

### Palaeobotany

The only detailed published account of the plant fossils from this site is by Collinson (1983a), who studied both macrofossils and palynology. Almost uniquely, this includes details of the exact bed from which the fossils came, and the numbers of each species found within each bed. Twenty beds were sampled by Collinson, nine of which yielded plant fossils: eight in the Bembridge Marls and one in the lowest part of the Hamstead Member. A further two beds higher in the Hamstead Member were also sampled (Collinson, 1983a, pp. 195–7). Sixteen species of vascular plant were reported: 14 angiosperms (listed in (Table 9.3)) and the floating fern *Azolla prisca* Reid and Chandler *emend.* Fowler and the leather fern *Acrostichum anglicum* Collinson ((Figure 9.32); see also Collinson, 1978b). They are nearly all aquatic plants, except for rare examples of *Sambucus*, the fruit and seeds of *Spirematospermum* (see also the account of the flora at the Hordle GCR site) and the leaves *Dicotylophyllum pinnatifidum*. Collinson (1978a) and Collinson *et al.* (1993a) described an undetermined Alismataceae fruit. In addition, there are example's of the stonewort *Harrisichara tuberculata* (Lyell) Grambast.

When the clays are split along bedding planes, leaves of *Acrostichum* and *Dicotylophyllum* are often seen. However, the most instructive fossils are the very small fruits and seeds obtained by disaggregating the clays. Despite their small size, they are extremely well preserved and yield very fine details under the Scanning Electron Microscope. It was, for instance, possible for Collinson to show that some of the seeds had germinated while others had not, an important observation for understanding the palaeoecology of this site.

The higher floras in the Hamstead Member show little difference from those lower down in the section, although *Acrostichum angicum* has not been recorded above the basal-most Hamstead Member (Bed 9 in Collinson, 1983a). This may reflect a threshold level in cooling of the climate (Collinson, in press a).

## Interpretation

This site has yielded only a fraction of the plant species that have been found at Thorness Bay. It is nevertheless the type and only known locality for several species: *Juncus vectensis*, *Alismaticarpum alatum*, *Carpolithes hamsteadensis* and *C. collumus*. It is also the type locality for the fern *Acrostichum angicum* Collinson, 1978b (Figure 9.32).

The main interest of these floras is the potential for palaeoecological study as demonstrated by Collinson (1983a). No other site has such an extensive exposure of plant-bearing deposits in the Eocene–Oligocene transition interval of Britain. It allows detailed sampling from different levels within the Bouldnor Formation, thus providing an insight into the subtle changes of vegetation taking place during this part of the Tertiary sub-Era. Most beds are dominated by the remains of the *Typha*–*Acrostichum* marshland flora that was common in Britain at this time. However, there are also occasional remains of trees such as elder (*Sambucus*), suggesting the existence of localized islands of raised ground within the marsh. The macrofloral evidence is complemented here by the palynology, fauna and sedimentology, which together make this an internationally important site for interpreting the terrestrial biotas and environment of north-western Europe during late Palaeogene times.

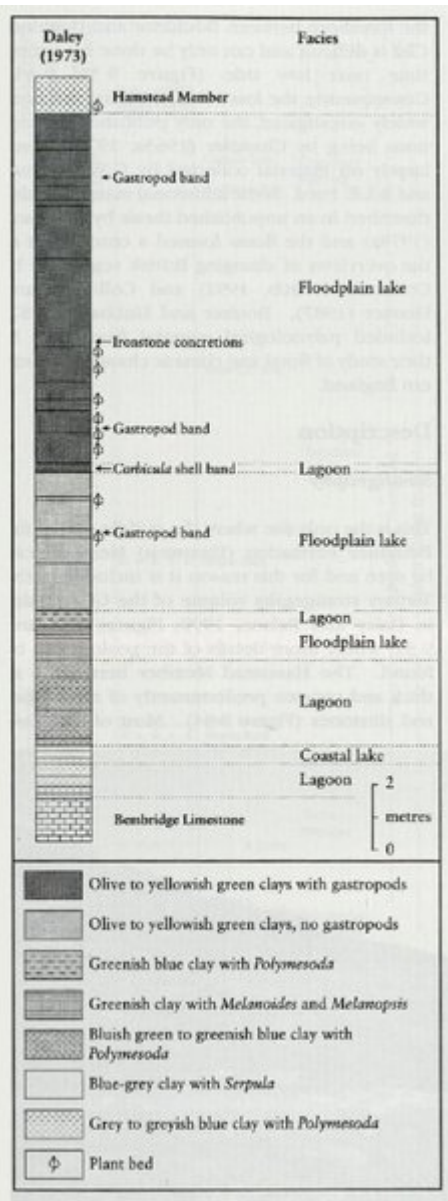
## Conclusions

Hamstead Ledge is an extensive foreshore exposure of the Eocene–Oligocene transition Bembridge Marls and lower Hamstead Members, about 34 Ma old. These offer an unrivalled opportunity to study the marsh vegetation dominated by bulrush and leather ferns, which covered large parts of southern Britain at this time.

## References



(Figure 9.30) Foreshore exposure (at low water spring tide) of the lower part of the Bembridge Marls at the eastern end of Hamstead Ledge. The Bembridge Limestone ledge is at the far right, out to sea. (Photo: M.E. Collinson.)



(Figure 9.31) Stratigraphical section through the Bembridge Marls Member, Bouldnor Formation at Hamstead Ledge, showing position of main plant beds. (After Collinson, 1983a.)

Family	Species	Thorness Bay (Insect Limestone)	Hamstead Ledge	Bouldnor Cliff
Acanthaceae	<i>Acanthaceae rugata</i> Reid and Chandler	x		
Actinidiaceae	<i>Actinidia</i> sp.	x		
Alismataceae	<i>Alismaticarpus affinis</i> Collinson		x	
Apoynaceae	<i>Apoynospermum striatum</i> Reid and Chandler <sup>1</sup>	x		
	<i>A. striatum</i> Reid and Chandler <sup>2</sup>	x		
	<i>A. rugosa</i> Reid and Chandler <sup>3</sup>	x		
	<i>A. oblongum</i> Reid and Chandler <sup>4</sup>	x		
Agrostaceae	<i>Siles</i> sp.			x
Araceae	<i>Epipremnum ornata</i> (Reid and Chandler) Grogan and Bogner (see Mai and Walther, 1991) <sup>5</sup>	x		
Araceae	<i>Poliochloa</i> sp.	x		
	<i>Sabal major</i> (Unger) Heer <sup>6</sup>	x		x
Asclepiadaceae	<i>Phyllanthus rectus</i> Reid and Chandler	x		
	<i>Typhocarpus amplexus</i> Reid and Chandler	x		
Betulaceae	<i>Asterocarpus</i> sp. <sup>7</sup>	x		
Bignoniaceae	<i>Catalpa rugosa</i> Reid and Chandler	x		
	<i>Jacarilla protensa</i> Reid and Chandler	x		
	<i>Radermachera pulchra</i> Reid and Chandler	x		
Caprifoliaceae	<i>Dipelta mangiana</i> Reid and Chandler	x		
	<i>Sambucus parvula</i> Chandler <i>emend.</i> Collinson, 1983a		x	
Cyperaceae	<i>Carex obesa</i> Chandler		x	
	<i>C. nitens</i> (Heer) Chandler <sup>8</sup>		x	
	<i>Carex gussonei</i> Reid and Chandler	x		
	<i>Carex nitens</i> (Chandler)			x
	<i>C.</i> sp.	x	x	x
	<i>Cladocarpus foeculata</i> Reid and Chandler	x		
	Genus indet. (Collinson, 1983a)		x	
Droseraceae	<i>Aldrovanda intermedia</i> Reid and Chandler	x		x
Hydrocharitaceae	<i>Ottelia britanica</i> Reid and Chandler	x		
	<i>Stratiotes aggluctus</i> Chandler	x	x	f
	<i>S. aculeatus</i> (Brongniart) Chandler			x
	<i>S. aculeatus</i> Chandler			x
	<i>S.</i> sp. (leaf margin teeth - see Collinson, 1983a)		x	
Juglandaceae	<i>Palaeocarya macroptera</i> (Brongniart) Jährichen, Friedrich and Také (see Manchester, 1987) <sup>9</sup>	x		
	<i>Euglyptaria</i> sp.	x		
	<i>Hordlyia hermsii</i> (Heer) Reid and Chandler	x		
Juncaceae	<i>Juncus rectus</i> Collinson		x	
Lamiaceae	<i>Melissa parva</i> Reid and Chandler	x		
	<i>Apogonoclea erubri</i> Reid and Chandler	x		
Lauraceae	<i>Daphnogene lanceolata</i> Unger <sup>10</sup>	x		
	<i>Nerolana</i> sp.	x		

Family	Species	Thorness Bay (Insect Limestone)	Hamstead Ledge	Bouldnor Cliff
Monocotae	<i>Ficus</i> sp.	x		
Najadaceae	<i>Najas oligocarpa</i> Reid and Chandler	x		
Nymphaeaceae	<i>Nymphaea limicola</i> Collinson <sup>11</sup>		x	
	<i>Nymphaea chandlerae</i> Collinson	x	x	x
	<i>Nymphaea boeckii</i> Hittinghausem			x
Piperaceae	<i>Piper pectinatum</i> Reid and Chandler	x		
Potamogetonaceae	<i>Potamogeton pygmaeus</i> Chandler (see Collinson, 1983a)	x		
	<i>P. tenuis</i> Reid and Reid <i>emend.</i> Collinson, 1983a		x	x
	<i>P.</i> spp.	x	x	
	<i>Limnocalyx forbesii</i> (Heer) Chandler <i>emend.</i> Collinson, 1982a	x	x	x
	<i>L. (?) spinosus</i> Reid and Chandler (see Collinson, 1982a)	x		
Ranunculaceae	<i>Chamaeactis rectus</i> Reid and Chandler	x		
	<i>Myosurus heterostylus</i> (Reid and Chandler) Mai in Mai and Walther, 1978 <sup>12</sup>	x		
	<i>Ranunculus ovaliformis</i> (Reid and Chandler) Chandler	x		
Rhamnaceae	<i>Zizyphus parviflorus</i> (Unger) Reid and Chandler	x		
Rosaceae	<i>Rubus</i> sp.			x
Rutaceae	<i>Zanthoxylum(?) costatum</i> Reid and Chandler	x		
Sparganiaceae	<i>Sparganium multilobatum</i> Reid and Chandler	x		f
	<i>S.</i> sp.			x
Typhaceae	<i>Typha latifolia</i> (Braun) Reid and Chandler (see Collinson, 1983a)	x	x	
	<i>T.</i> sp. (Collinson, 1983a)		x	x
Zingiberaceae/ Musaceae	<i>Costus</i> sp.	x		
	<i>Spizmatoglossum wetfernii</i> (Heer) Chandler <sup>13</sup>	x	x	
Incertae sedis	<i>Abelia quadrilobata</i> Reid and Chandler <sup>14</sup>	x		
	<i>A. quadrilobata</i> Reid and Chandler <sup>15</sup>	x		
	<i>A. striolata</i> Reid and Chandler <sup>16</sup>	x		
	<i>A. striolata</i> Reid and Chandler <sup>17</sup>	x		
	<i>Carpodites collinus</i> Collinson		x	
	<i>C. bantuaensis</i> Collinson		x	
	<i>C.</i> spp.	x		x
	<i>Dicostylidium pinnatifidum</i> Reid and Chandler	x	x	
	<i>Flabellifera anglica</i> Reid and Chandler	x		
	<i>Monocotylidium</i> sp.			
	<i>Rhynchospora lobatum</i> Chandler	x	x	x

<sup>1</sup> See Footnote 5 for Table 8.2, this volume.  
<sup>2</sup> Formerly *Epipremnum ornata* Reid and Chandler.  
<sup>3</sup> This may not be a true *Sabal* (Collinson, pers. obs.).  
<sup>4</sup> Described by Reid and Chandler (1926) as *Garpinus* sp. 4, and *Abelia* sp. 4, each from a single specimen. They were transferred to *Asterocarpus* by Manchester and Donoghue (1995, p. 721).  
<sup>5</sup> Includes *C. cf. major* Chandler *emend.* Chandler *sensu* Collinson, 1983a (see Mai and Walther, 1978).  
<sup>6</sup> Formerly *Euglyptaria macroptera* (Brongniart) Reid and Chandler.  
<sup>7</sup> Reid and Chandler (1926) referred to this as *Cinnamomum lanceolatum* (Unger) Heer (see Mai and Walther, 1978, 1985).  
<sup>8</sup> The generic position of this species as a *Nymphaea* has been confirmed by new, more complete material (Collinson and van Bergen, work in progress).  
<sup>9</sup> Formerly *Ranunculus heterostylus* Reid and Chandler.  
<sup>10</sup> See text for the Hoefle GCR site for discussion of *Spizmatoglossum*.  
<sup>11</sup> These are regarded as incertae sedis by Manchester and Donoghue (1995).

(Table 9.3) Angiosperm floras from the Bouldnor Formation. Species descriptions or references to them may be found in Chandler (1963a) and Collinson (1980b, 1983a) unless otherwise referenced. The family classification used here is summarized in Chapter 1 of the present volume. (Note: records of *Fagus* and *Quercus* by Reid and Chandler (1926) are here considered indeterminate.)



(Figure 9.32) Sporangium of the fern *Acrostichum anglicum*, containing a residual trilete spore, x 280 (see Collinson, in press a). From the Hamstead Ledge GCR site. (Photo: M.E. Collinson.)