Covehurst

[TQ 846 101]–[TQ 867 110]

Introduction

This is the best-known and most productive site for the lower Wealden flora, and is the most important of all the palaeobotanical sites in the English Wealden strata. It contains a range of algae and mosses, and more common and varied pteridophytes and gymnosperms. The fossils are well preserved and include more or less whole cycad and bennettite fronds. Cuticles are often present and their study has proved vital in species distinctions. In Britain, it is unique for the abundance and diversity of the plants it has yielded. It is without doubt our most important Cretaceous fossil plant site.

Much of our knowledge of the English Wealden flora is based on fossils obtained during the 19th century by collectors such as Beckles, Dawson and Gideon Mantell. This material mainly came from inland exposures, especially in the Tilgate Forest, which are no longer accessible. Philip Rufford collected most of the fossils referred to by Seward (1894) in his classic account of the flora. He gave little in the way of locality details other than to indicate that they were from coastal exposures of 'Fairlight Clays' near Hastings, an argillaceous facies of the Ashdown Formation. According to Watson and Sincock (1992) and others before them (e.g. Batten, 1975; Hughes 1975; Allen, 1976), however, they probably mainly originated from rocks in the vicinity of Ecciesbourne and Fairlight glens, the latter falling within the boundaries of the present site. In 1913, Seward described another collection made by two Jesuit priests, P. Teilhard de Chardin (who later became well known for his own evolutionary theories and palaeoanthropolgical work) and Felix Pelletier in about 1910. Their collection was also mainly from near Fairlight Glen.

Nothing further was published on this flora until the first part of Watson's revision appeared in 1969. Hughes (1975) discussed the plant succession in the English Wealden and gave a table of the plants known for six areas, including this one. Batten (1969, 1973) reported on dispersed spores from the Ashdown Formation, and Oldham (1976) described dispersed cuticles from plant debris beds. More recently monographs on the Wealden horsetails and bennettites by Watson and Batten (1990) and Watson and Sincock (1992), respectively, include material from the Covehurst succession. Watson and Alvin (1996) have given the most up-to-date list of English Wealden plants, many of which were originally described from here.

Description

Stratigraphy

Lake and Shephard-Thorn (1987) described the geology of this area. The plant fossils occur in lenses of sandstone and ironstone within locally red-mottled clays of the Fairlight Clays facies (lower Ashdown Formation) (Figure 6.7), (Figure 6.8), (Figure 6.9). The Ashdown Formation, which rests conformably on the underlying Purbeck Beds, consists mainly of fine-grained, silty sandstones and siltstones, with small amounts of shale and mudstone (Gallois, 1965). The Fairlight Clays Facies is thickest on the south-east Sussex coast, and gradually thins northwards until, in the Ashdown Forest, it is represented only by pebble beds overlain by thin siltstones.

Palaeobotany

As mentioned above, the localities and productive horizons from which most of the old collections of the Wealden flora were made are not accurately known. However, the following species most probably come from the cliffs that extend from Ecclesbourne Glen through Fairlight Glen to Warren Glen in Covehurst Bay.

Nitellaceae (Charophyta)

Circonitella knowltonii (Seward) Watson

Hepaticae (thalloid liverworts)

Thallites valdensis (Seward) Watson

T. catenelloides (Seward) Watson

Hepaticites zeilleri (Seward) Watson

H. ruffordii Watson

Selaginellaceae

Selaginella dawsonii (Seward) Dijkstra

Isoetaceae

Isoetes sp.

Equisetaceae

Equisetum burchardtii Dunker

Equisetites yokoyamae Seward

?**Osmundaceae**

Cladophlebis albertsii (Dunker) Seward

C. browniana (Dunker) Seward

C. dunkeri (Schimper) Seward

C. longipennis Seward

Schizaeaceae

Ruffordia goeppertii (Dunker) Seward

Pelletixia valdensis (Seward) Watson and Hill

Gleicheniaceae

Gleichenites nordenskioldii (Neer) Seward

Matoniaceae

Matonidium goeppertii (Ettingshausen) Schenk

Phlebopteris dunkeri Schenk

Dipteridaceae

Hausmannia dichotoma Dunker

Dicksoniaceae

Onychiopsis psilotoides (Stokes and Webb) Ward

?Coniopteris sp.

Cyatheaceae

Protopteris sp.

Weichseliaceae

Weichselia reticulata (Stokes and Webb) Ward

Tempskyaceae

Tempskya schimperi Corda

Polypodiaceae

Aspidistes sewardii Watson

Caytoniaceae

Sagenopteris mantellii (Dunker) Schenk

Corystospermaceae

Pachypteris lanceolata Brongniart

Cycadales

Becklesia anomala Seward

B. sulcata Watson

Nilssonia schaumburgensis (Dunker) Schenk

Paracycas sp.

?Ctenis sp.

?Pseudoctenis sp.

?Almargemia sp.

Bennettitales [leaves]

Otozamites titaniae Watson and Sincock

Pseudocycas lesleyae Watson and Sincock

P. roemeri (Schenk) Holden

P. saportae (Seward) Holden

Pterophyllum brongniartii (Mantell) Morris

P. fontarianum Watson and Sincock

P. lyellianum Dunker

Ptilophyllum ashleyi Watson and Sincock

P. marksilveri Watson and Sincock

P. sibleyae Watson and Sincock

P. sirfredii Watson and Sincock

P. sirkennethii Watson and Sincock

Zamites carruthersii Seward

Z. corderi Watson and Sincock

Z. dowellii Watson and Sincock

Z. manoniae Watson and Sincock

Z. nicolae Watson and Sincock

Z. notokenensis Watson and Sincock

Z. tatianae Watson and Sincock

Z. wendyellisae Watson and Sincock

Williamsoniaceae [female flowers]

Bennetticarpus anatoinetteae Watson and Sincock

B. madamae Watson and Sincock

B. nataliae Watson and Sincock

Williamsonia bryonyae Watson and Sincock

W. *carruthersii* Seward

W. *cynthiae* Watson and Sincock

W. margotiana Watson and Sincock

Williamsoniaceae [male flowers]

Bennettistemon valdensis (Edwards) Watson and Sincock

Williamsoniaceae [scale leaves]

Cycadolepis cedricii Watson and Sincock

C. crawleyana Watson and Sincock

C. cromwellensis Watson and Sincock

C. markii Watson and Sincock

C. shuteana Watson and Sincock

Williamsoniaceae [shoots]

Bucklandia anomala (Stokes and Webb) Presl

B. florovia Watson and Sincock

Bennettitaceae

Cycadeoidea saxbyana (Brown) Morris Czekanowskiaceae

Phoenicopsis sp.

Ginkgoales

?Baiera sp.

?Ginkgoites sp.

Ginkgoales/Coniferales *incertae sedis*[?araucariaceous affinity]

Pseudotorellia linkii (Romer) Watson and Harrison

Pseudotorellia sp.

Sciadopityoides sp.

Cheirolepidiaceae

Hirmeriella sp. [female cone]

Pseudofrenelopsis parceramosa

(Fontaine) Watson

Araucariaceae

Conites elegans (Carruthers) Seward

Taxodiceae

Elatides sp.

Sciadopitytes sp.

Sphenolepis kurriana (Dunker) Schenk

Pinaceae

Pityites solmsii (Seward) Seward

Taxaceae

Torreya sp.

Conifers *incertae sedis*

Brachyphyllum obesum Heer

B. punctatum Seward

B. spinosum Seward

Conites berryi Seward [probable female cone of *B. punctatum*]

Pagiophyllum spp.

?**Chloranthaceae**

Bevhalstia pebja Hill

Incertae sedis

Withamia saportae Seward

Interpretation

This is the most studied floral assemblage in the English Wealden strata and is represented by a wide range of plant groups. No other site has yielded anything like the diversity of plant remains. About 90 species have been identified, and for most of these it is the type and only known locality. The site therefore offers a unique opportunity to study the Early Cretaceous vegetation in Britain.

The flora is particularly important for studies on the Bennettitales. Some of the best examples of Early Cretaceous bennettitalean fronds with cuticles have been found here, providing an important insight into the group at the height of its diversity. Many of the bennettite flowers described by Watson and Sincock (1992) apparently came from Ecclesbourne Glen, a little to the west of the present site. However, the sedimentary facies there are similar to those seen in Fairlight and Warren glens; hence, similar fossils can be expected at the latter localities.

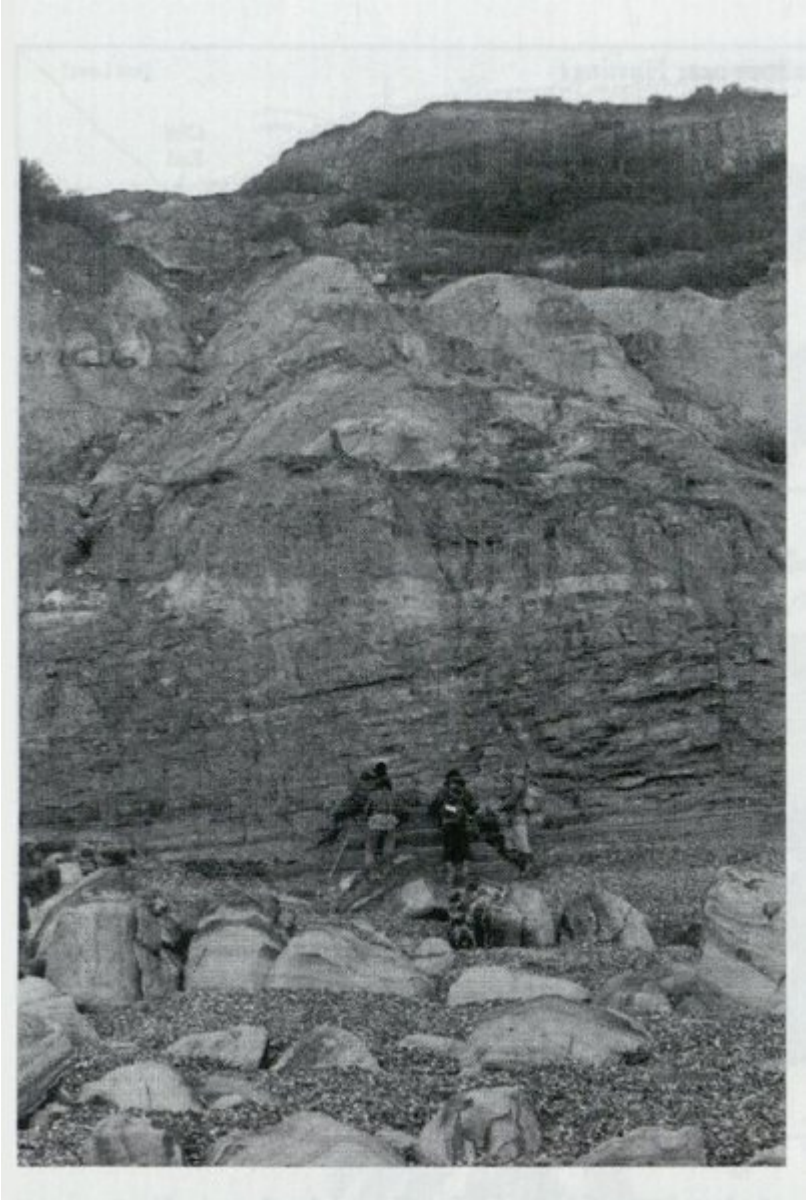
Comparable 'Wealden'-type floras are also known from elsewhere in Europe, notably in north-west Germany (Dunker, 1846; Daber, 1960, 1968), Belgium (Seward, 1900b; Alvin, 1968, 1971; van Amerom *et al.,* 1976), and northern France (Carpentier, 1927). However, much of the material from continental Europe came from temporary exposures and boreholes, which can no longer be accessed. Furthermore, with the possible exception of one or two of the German sections, none of the sites has yielded the diversity of plant remains found in the English Wealden. The comparison also tends to be weak at the rank of species. For instance, Watson and Sincock (1992) have shown that among the bennettites, only 11 of the 46 species in the British Wealden floras also occur in Germany. This combination of good exposure and high floristic diversity makes Covehurst in effect the standard locality for the pre-Aptian Europe Palaeoprovince of Vakhrameev (1991).

Allen (1976) interpreted the environment of deposition in which the plant remains occur as a mudplain with lagoons and sandy watercourses sometimes with coalescent alluvial fans. He suggested that large expanses of the plains probably supported rich growths of ferns. Watson and Alvin (1996), however, interpreted the situation rather differently. Accepting that the lowland vegetation was complex in structure, they suggested that many gymnosperms (Bennettitales, Cycadales and perhaps some conifers) were also constituents of the vegetation. This view was based on the fact that ferns are seldom preserved alone in the Hastings Beds. On the basis of his palynological studies, Batten (1973, 1975, 1982) also came to the conclusion that the lowlands were inhabited by a mixed flora of pteridophytes and gymnosperms.

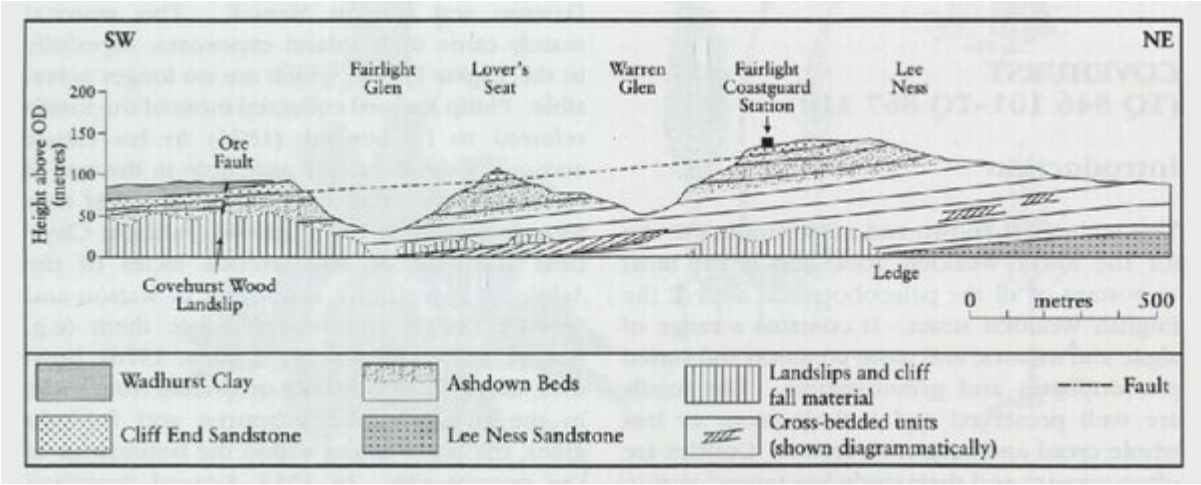
Conclusion

This is the most important locality for Early Cretaceous plants in Europe. It has yielded about 90 species, many of which are known only from here. The flora, which is dominated by horsetails, bennettites and conifers, gives a unique insight into the plant life living in this region about 140 Ma ago.

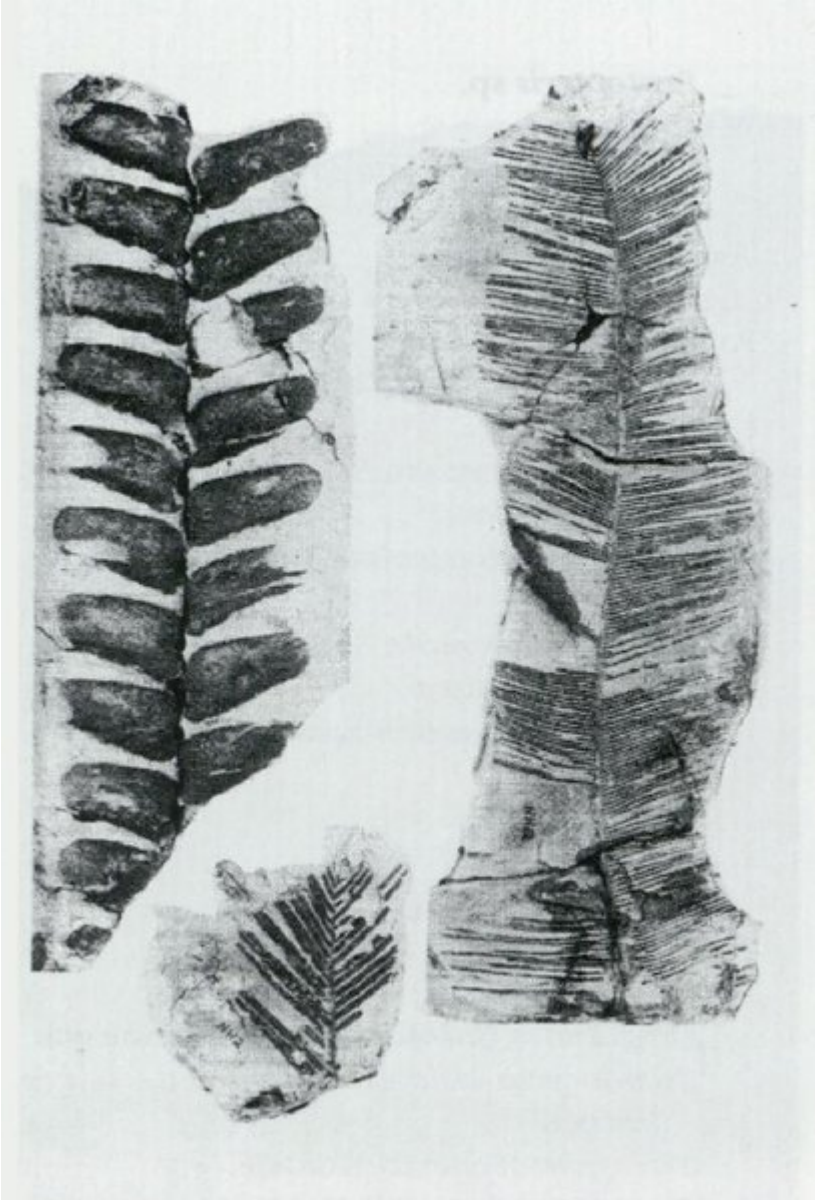
References



(Figure 6.7) The Ashdown Formation, here at Covehurst Bay, is generally accepted to be the horizon from where such people as Rufford, Teilhard de Chardin and others collected fossils that are so characteristic of the lower Wealden flora. (Photo: D.J. Batten.)



(Figure 6.8) Cliff section at Covehurst Bay showing the outcrop of the plant-bearing Ashdown Formation. (After Lake and Shephard-Thorn, 1987.)



(Figure 6.9) Plant fossil specimens collected from the Fairlight Clay of Covehurst Bay in the middle of the 20th century and figured by Hughes (1975); the names he used are in brackets where they have been subsequently changed. (A) Zamites carruthersii Seward emend. Watson and Sincock 1992 [Otozamites klipsteinii (Dunker) var. angustifolia Heer] x0.25; (B) Pseudocycas saportae (Seward) Holden, × 0.25; (C) Zamites dowelli Watson and Sincock 1992 [Zamites buchianus (Ettingshausen) Seward] × 0.17.