Scalby Ness

[TA 037 911]

Introduction

The plant beds of the Scalby Formation contain an important flora, well known for its outstanding examples of ginkgoalean remains. The most significant is *Ginkgo buttonii,* here at its type locality. It is a good example of a 'living fossil', being closely similar to the only extant species, *Ginkgo biloba,* the maidenhair tree. The Scalby Ness site is also the type locality for six other species of plant fossils.

Fossil plants have been collected, studied and described from this locality from the earliest days of investigations on the Yorkshire Jurassic flora. W.C. Williamson collected specimens of *Ginkgo* from here and these were illustrated in Lindley and Hutton's *Fossil Flora of Great Britain* (1831–1837). Subsequent studies have been carried out by Phillips (1875), Black (1929), Harris (1946b, 1948, 1961a, 1964, 1969, 1979a; Harris *et al.,* 1974) and Morgans (1999).

Description

Stratigraphy

The Scalby plant beds are part of the Scalby Formation (Bathonian), which overlies the thick marine Scarborough Formation (Figure 3.50). The exact age of the Scalby Formation has been debated for many years although Hogg (1993) recently dated it as late Bathonian, *discus* Zone on the basis of a sparse dinoflagellate cyst assemblage. It is fluvio-deltaic in origin although the actual type of depositional environment has been the subject of much discussion and disagreement. The lower division, the Moor Grit Member, consists of foreset deposits of a pro-grading delta front, channel fills of a braided river system and a deltaic distributary system. The upper division, the Long Nab Member, comprises delta-top deposits, a meander belt complex crossing an alluvial plain, and a saline-influenced delta plain system with smaller sinuous channels, some of which may have been tidal (Nami and Leeder, 1978; Leeder and Nami, 1979).

The plant fossils are found just above the base of the Long Nab Member at a number of places in the immediate vicinity of Scalby Ness where the gentle seaward dip brings these silty shales to the base of the cliff (Table 3.7). They constitute the Scalby Plant Bed. Nearby at Scalby Wyke the plant bed is a few metres from the base of the Long Nab Member and exposed on the shore under flat sandstone reefs. It is full of waterworn fragments suggesting that it is a drifted plant bed in a channel infllll. In contrast, the Plant Bed at Scalby Ness is full of plants at various levels in what is interpreted as a river channel. The fragmentary nature of the plant remains and the fact that they are spread along the bedding planes indicate that they have drifted (Black, 1929). However, the fact that most of the fossils are well preserved indicates that they were not carried very far before becoming trapped in the river sediments.

Palaeobotany

Fifteen species are known from Scalby Ness

(Table 3.7) The locations of the plant beds identified by T.M. Harris (in manuscript) at Scalby Ness.

			[GR added 2023]
Scalby Ness Plant Bed	54°18'14"	0°24'18"	[TA 03885 90982]
Scalby Ness *Ginkgo* Bed in beach	54°18'20"	0°24'17"	[TA 03899 91168]
Scalby Ness Brown *Ginkgo* Bed	54°18'21"	0°24'30"	[TA 03663 91194]

Scalby Wyke Black's Bed E	54°19'2"	0°24'50"	[TA 03273 92453]
Scalby Wyke Drifted Bed	54°19'0"	0°25'0"	[TA 03094 92387]
Scalby Wyke Black's Bed G	54°18'57"	0°25'0"	[TA 03096 92294]
Scalby Wyke *Otozamites* Bed	54°18'21"	0°24'36"	[TA 03555 91191]
Scalby Beck, sand above black clay	54°18'13"	0°24'36"	[TA 03561 90944]
Scalby Beck, black clay Scalbv Beck sandy laver	54°18'14"	0°24'35"	[TA 03578 90975]

(Table 3.1); (Figure 3.51), (Figure 3.52), (Figure 3.53), (Figure 3.54). Although this is poor in comparison to the floras from the Cloughton Formation, it is particularly interesting and important because of the abundance of ginkgoalean remains. There are well-preserved leaves with cuticles of *Ginkgo* and *Baiera,* together with cuticle fragments of *Pseudotorellia. Ginkgo huttonii* (here in its type locality; (Figure 3.51)) has a fairly thick cuticle with well-developed papillae surrounding the stomata, which together suggest a xerophytic habitat for the plants. There are also the very occasional seeds, bud scales and male cones, which have been attributed to *G. huttonii.*

Other species that are relatively common are *Coniopteris bella* (Figure 3.52), *Zamia gigas, Otozamites graphicus* and *Czekanowskia blackii* (here at its type locality; (Figure 3.53)). There are also the interesting conifers *Cyparissidium blackii* (foliage), *Pityanthus scalbiensis* (male cone) and *Scarburgia hillii* (female cone), this being the type locality for the last two.

Morgans (1999) has recently described charcoalified fragments of conifer wood from meandering channel sandstones comprising the overlying Long Nab Member as *Cedroxylon* spp. and *Cupressinoxylon* spp..

Interpretation

This is one of the classic sites for Mesozoic ginkgophytes. The well-preserved leaves here, referred to *G. huttonii,* bear a striking similarity to those of the living *G. biloba.* More significant, however, are the closely associated seeds and pollen organs that compare well with those of the living tree. Not all fossil ginkgoaleans are quite so similar to the modern form (Hori *et al.,* 1997). It is clear that there was a considerable diversity in this group in the Mesozoic Era. Nevertheless, the fossils from the Scalby Ness *Ginkgo* Bed strongly support the idea of *Ginkgo biloba* being a 'living fossil'.

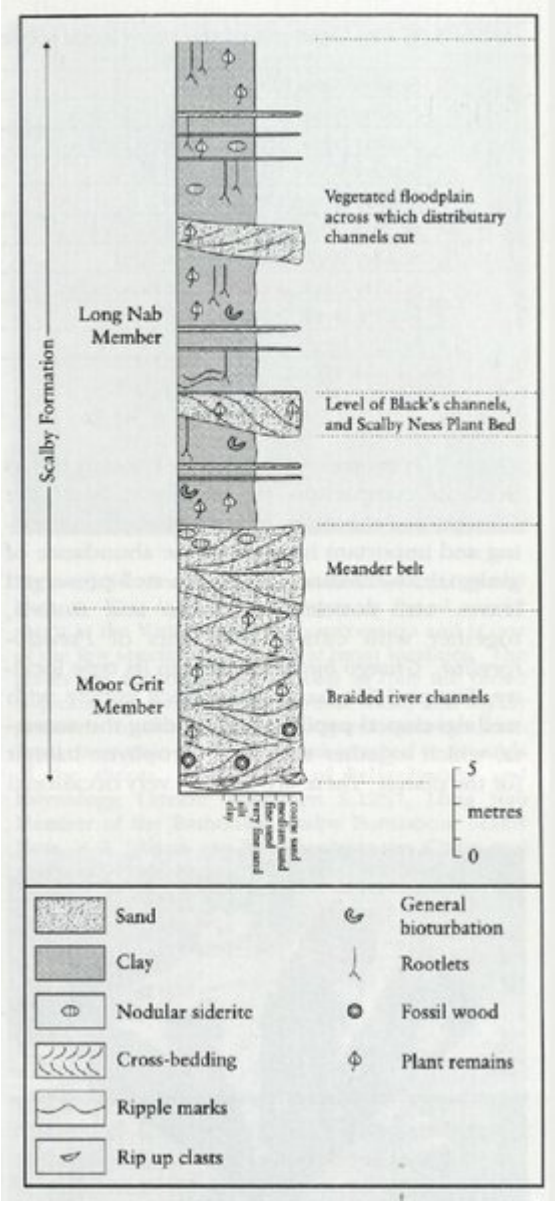
Harris (1979a) took *Cyparissidium blackii, Pityanthus scalbiensis* and *Scarburgia hillii* to be parts of one plant species, which he assigned to the extant Southern Hemisphere family Podocarpaceae. This suggests a cosmopolitan history for the family, as also inferred from the widespread distribution of podocarp-like pollen grains in Mesozoic and Tertiary deposits of the Northern Hemisphere, particularly in Russia. The cone is much larger and more developed than those of living podocarps, which suggests that the modern cones, which often comprise just one or two cone scales, are probably reduced.

The presence of well-preserved plant organs shows that they were not carried far, if at all, before becoming trapped in the sediment. Consistent with this interpretation are the associations of *Ginkgo* leaves with what are probably the seeds and pollen organs of the plant, and the conifer *Cyparrisidium blackii* with its male fructification *Pityanthus scalbiensis* and its female cone *Scarburgia hillii.* These characters of the assemblage are consistent with the idea that a delta marsh flora is represented, as suggested by Hemingway (1974). In contrast, the water-worn fragments that dominate the nearby Scalby Wyke plant bed suggest that it is a bed of drifted plants that settled with fine clastic sediments in an abandoned channel.

Conclusions

The main significance of the plant bed lies in the abundance of ginkgoalean remains. It is the type locality for *Ginkgo huttonii* and the seeds, scales and male cones referable to this species. Although some 170 Ma old, these fossils are very similar to the living maidenhair tree, *Ginkgo biloba.* Much has also been learned about the evolutionary history of the Podocarpaceae from the shoots and cones collected here.

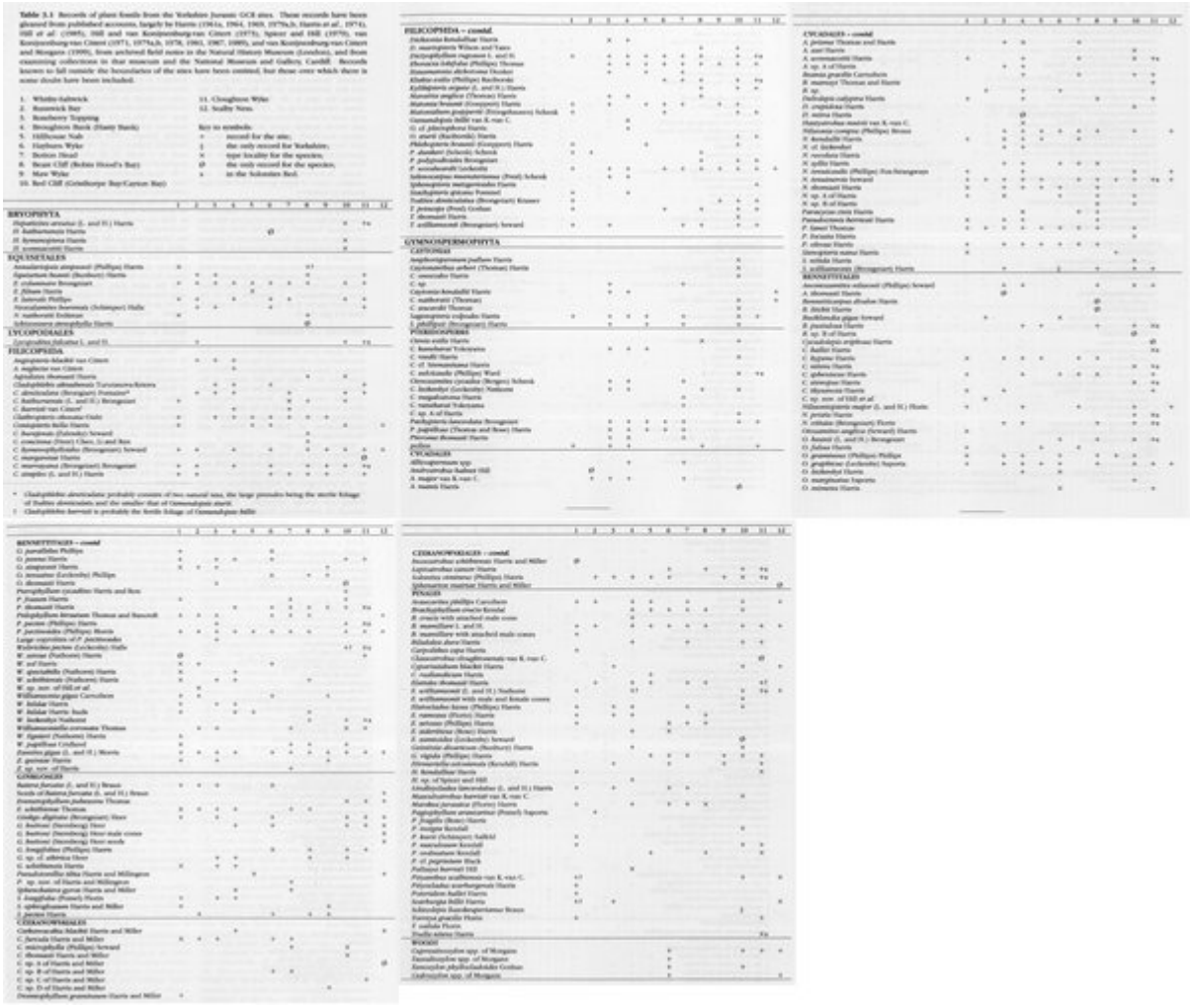
References



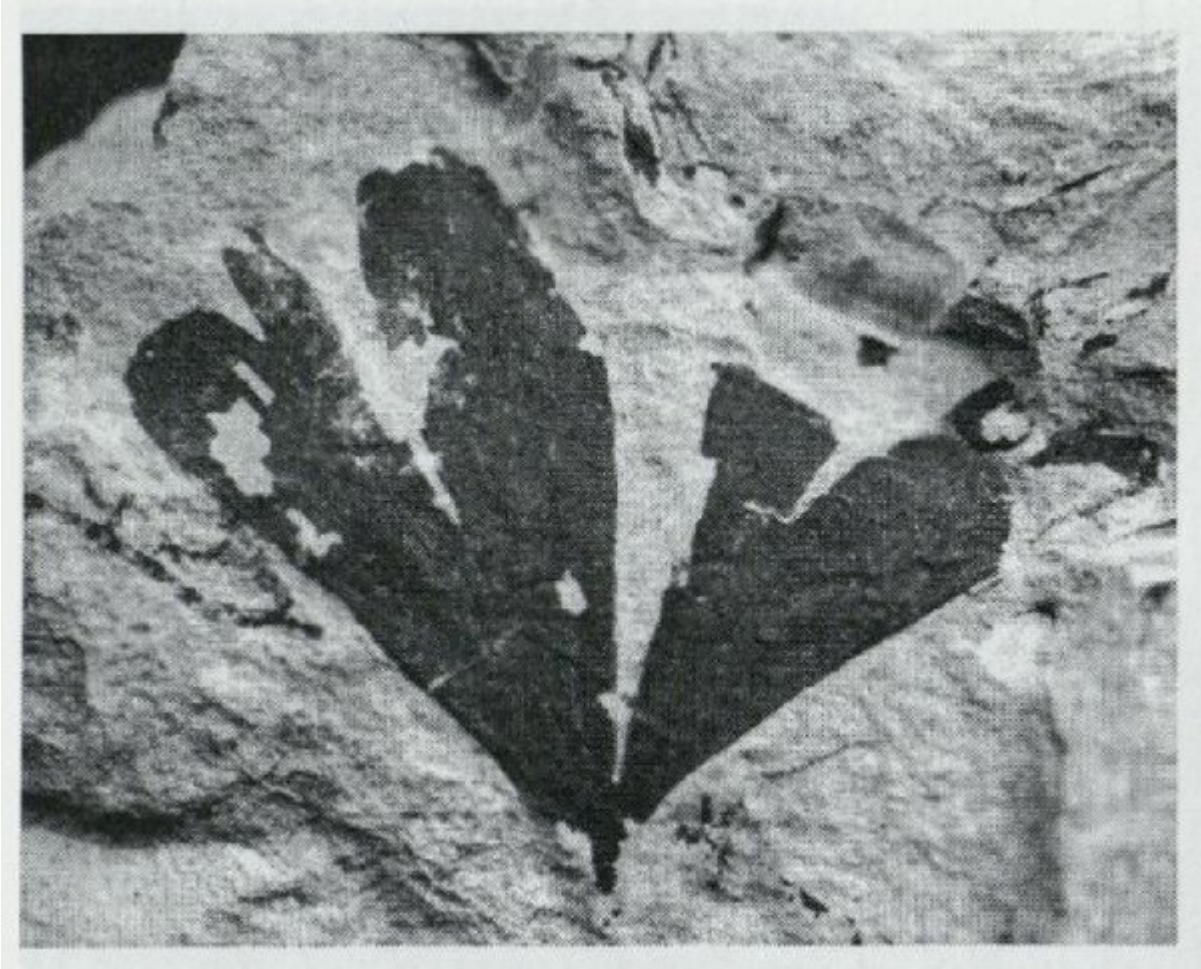
(Figure 3.50) Stratigraphical section through the Scalby Formation, Scalby Ness GCR site. (After Van Konijnenburg-van Cittert and Morgans, 1999.)

Scalby Ness Plant Bed	54° 18' 14", 0° 24' 18"
Scalby Ness *Ginkgo* Bed in beach	54° 18' 20", 0° 24' 17"
Scalby Ness Brown *Ginkgo* Bed	54° 18' 21", 0° 24' 30"
Scalby Wyke Black's Bed E	54° 19' 2", 0° 24' 50"
Scalby Wyke Drifted Bed	54° 19' 0", 0° 25' 0"
Scalby Wyke Black's Bed G	54° 18' 57", 0° 25' 0"
Scalby Wyke *Otozamites* Bed	54° 18' 21", 0° 24' 36"
Scalby Beck, sand above black clay	54° 18' 13", 0° 24' 36"
Scalby Beck, black clay	
Scalby Beck sandy layer	54° 18' 14", 0° 24' 35"

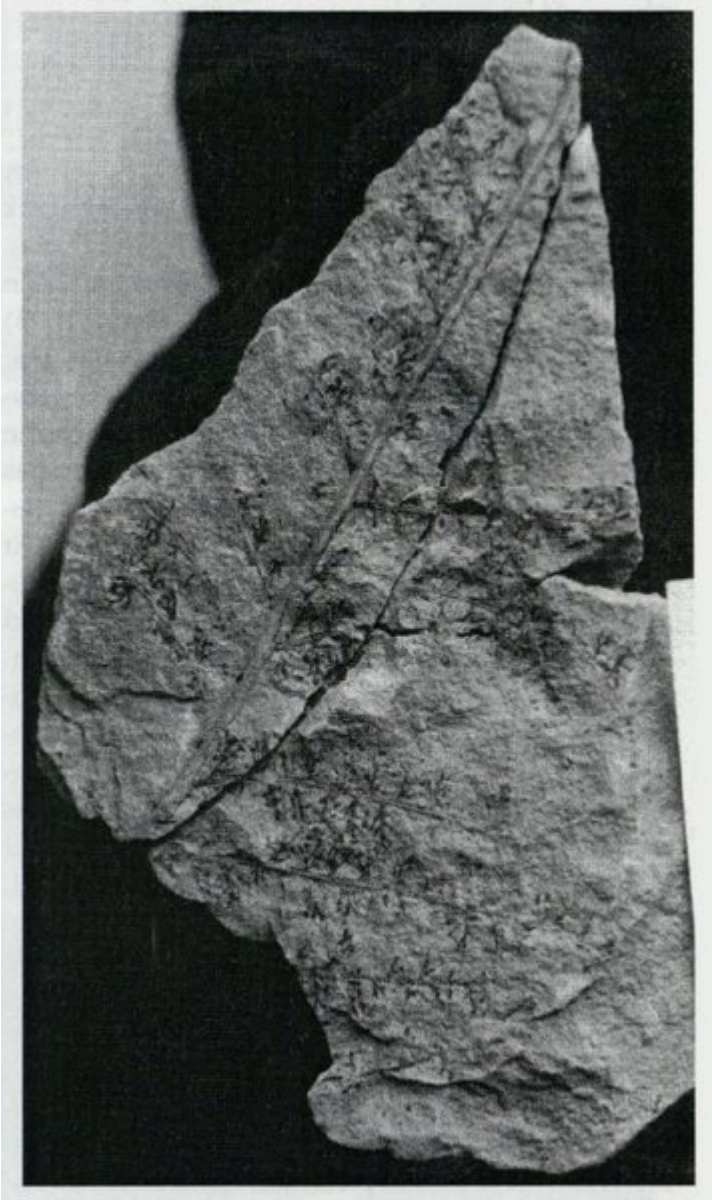
(Table 3.7) The locations of the plant beds identified by T.M. Harris (in manuscript) at Scalby Ness.



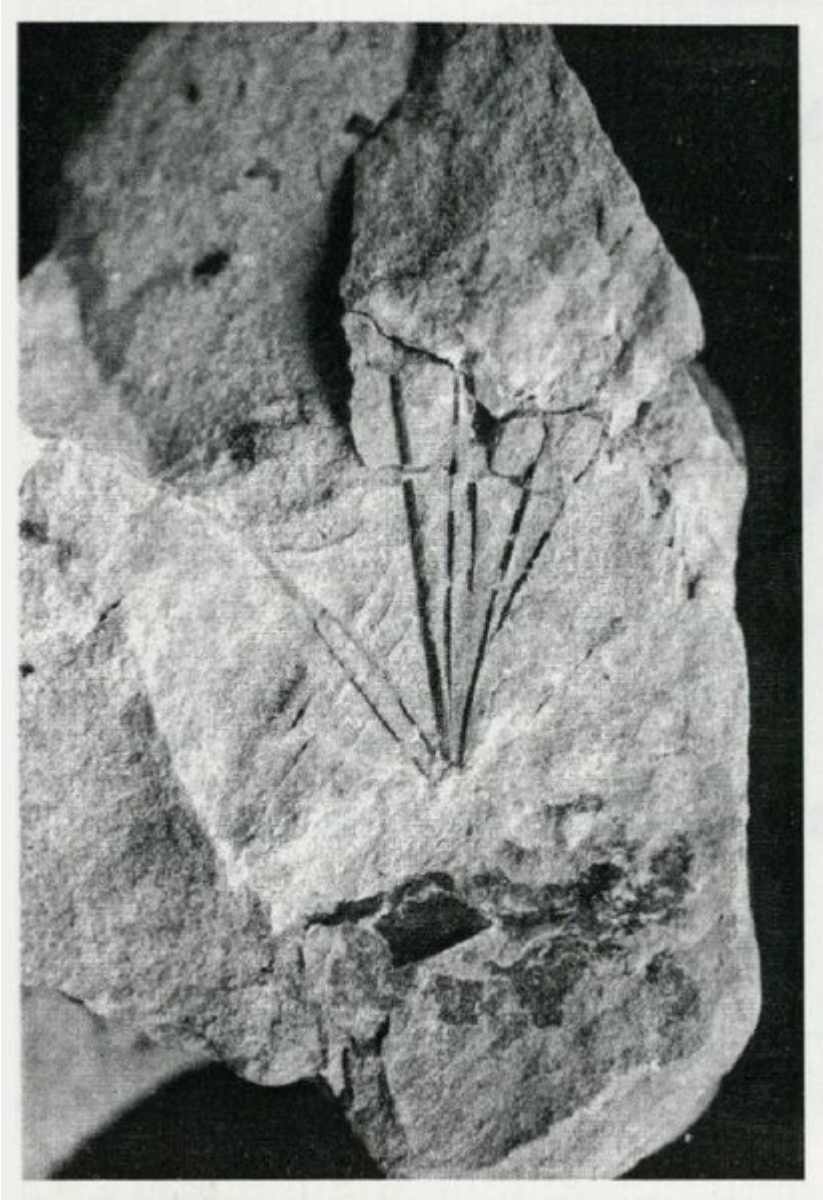
(Table 3.1) Records of plant fossils from the Yorkshire Jurassic GCR sites. These records have been gleaned from published accounts, largely by Harris (1961a, 1964, 1969, 1979a,b; Harris et al., 1974), Hill et al. (1985), Hill and van Konijnenburg-van Cittert (1973), Spicer and Hill (1979), van Konijnenburg-van Cittert (1971, 1975a,b, 1978, 1981, 1987, 1989), and van Konijnenburg-van Cittert and Morgans (1999), from archived field notes in the Natural History Museum (London), and from examining collections in that museum and the National Museum and Gallery Cardiff. Records known to fall outside the boundaries of the sites have been omitted, but those over which there is some doubt have been included.



(Figure 3.51) Ginkgo huttonii (Sternberg) Heer. This ginkgoalean leaf is the most common plant fossil at Scalby Ness, which is also its type locality. The leaf is characteristically deeply divided into six segments with rounded apices. Associated seeds found at Scalby Ness are attributed to the same plant that bore these leaves. Laboratory of Palaeobotany and Palynology, Utrecht, specimen S.3037, Long Nab Member of the Bathonian Scalby Formation, Scalby Ness, × 1.2. (From van Konijnenburg-van Cittert and Morgans, 1999; Photo: J.H.A. van Konijnenburg-van Cittert.)



(Figure 3.52) Coniopteris bella Harris. This fern, belonging to the extant family Dicksoniaceae, is characterized by its rounded leaf segments. It is relatively common at Scalby Ness but less so in the Gristhorpe Plant Bed at Cayton Bay (Red Cliff). Laboratory of Palaeobotany and Palynology, Utrecht, specimen S.3031, Long Nab Member of the Bathonian Scalby Formation, Scalby Ness, natural size. (From van Konijnenburg-van Cittert and Morgans, 1999; photo: J.H.A. van Konijnenburg-van Cittert.)



(Figure 3.53) Czekanowskia blackii Harris. This species, which is locally common at Scalby Ness, is characterized by having five to eight leaves attached to each short shoot. Each leaf can be up to 150 mm long and normally forks twice. Laboratory of Palaeobotany and Palynology, Utrecht, specimen S.1292, Long Nab Member of the Bathonian Scalby Formation, Scalby Ness, × 2. (From van Konijnenburg-van Cittert and Morgans, 1999; photo: J.H.A. van Konijnenburg-van Cittert.)

(Figure 3.54) Brachyphyllum mamillare Lindley and Hutton. This is the most commonly found conifer shoot in the Yorkshire Jurassic succession and is one of the few species that occurs at most localities. The leaves are approximately as long as they are broad (typically 1.5 mm long and 2 mm wide) and tightly pressed to the stem in a spiral arrangement. Sometimes male cones are found attached to the ends of the shoots. Laboratory of Palaeobotany and Palynology, Utrecht, specimen S.1257, Long Nab Member of the Bathonian Scalby Formation, Scalby Ness, × 2. (From van Konijnenburg-van Cittert and Morgans, 1999; photo: J.H.A. van Konijnenburg-van Cittert.)