Roseberry Topping

[NZ 579 126]

Introduction

This is a locality famous for its Middle Jurassic plant bed, which has yielded a prolific flora of some 70 species. It is particularly important for well-preserved specimens of *Pachypteris papillosa,* which show the plant to have had xeromorphic characters and to be probably adapted to salt marsh conditions, in contrast to the majority of species in the flora, which were either freshwater marsh plants or inhabitants of dry land.

Plant fossils were first described from Roseberry Topping by Thomas (1913, 1915) when mining operations caused part of the massive sandstone cap to slip downhill, carrying with it the underlying beds to form a scree (see also Thomas and Bose, 1955). However, it was Tom Harris who made a major impact on the study of the site, especially with his work on the bennettites, cycads and corystosperms (Harris, 1946b, 1949a, 1951, 1964, 1983; Thomas and Harris, 1960). Van Konijnenburg-van Cittert (1975b, 1989) has also studied the ferns found here.

Description

Stratigraphy

This isolated hill (Figure 3.19) has a cap of massive sandstone underlain by shales. On the north side of the hill, Thomas (1913, 1915) described the fossiliferous beds as '8–10 feet' (c. 2.7–3.3 m) of black and yellow shales immediately beneath the sandstone. Here they were said to be conformable with those below but thinning out northwards. The fossiliferous bed is part of the Saltwick Formation and therefore of early Aalenian age.

Palaeobotany

About 70 species have been recorded from Roseberry Topping although most are very limited in their distribution both horizontally and vertically. Working along the section can, therefore, give new plant species. The exception to this is the abundant *Equisetum beani,* which occurs throughout the section. A full list of the known species found here is given in (Table 3.1) (see also (Figure 3.20)).

Many of the plants are beautifully preserved and can easily be removed from the surface of the rock without chemical treatment. Thomas (1913) stated that cuticles of *Zamites, Anomozamites, Ctenozamites* and *Ctenis* are preserved in this way. Then in 1915, Thomas described the compound leaves of what is now called *Pachypteris papillosa* from a thin bed almost entirely composed of this species. Large numbers were extracted from this bed without any treatment and from the main escarpment at Little Roseberry where the bulk of the bed was exposed.

In contrast to *Pachypteris papillosa,* good hand specimens of *P. lanceolata* (Figure 3.21) are very rare. However, small fragments are common, chiefly occurring in sandstones along with driftwood and other tough leaves such as *Pagiophyllum.* At Roseberry Topping several leaves have been found together, in contrast to the coastal sections where it is only ever found as fragments.

The bennettite *Otozamites penna* is locally abundant in the basal black coaly clay. The cycad *Pseudoctenis lanei* is also locally abundant. Other species found here that are worth mentioning are the very rare *Dicksonia kendalliae* (two specimens known to date), which has this as its type locality, abundant *Nilssonia kendalliae,* which also has this as it type locality, abundant *Ctenis kanehanai,* and locally frequent *Cladophlebis aktashensis* and *Pseudoctenis oleaosa.*

Van Konijnenburg-van Cittert (1975b, 1989) used specimens of *Dicksonia kendalliae, Eboracia lobifolia* and *Marattia anglica* from here in her studies of in-situ fern spores.

Interpretation

This flora shows large variation in content both vertically and laterally. This suggests that the lagoon in which the sediments were deposited received the remains of plants that were growing in different communities at different times.

The distribution and sometimes great abundance of *Pachypteris papillosa* is of outstanding importance. It is characteristic of the Aalenian strata above the Dogger and is often associated with *Brachyphyllum expansum,* suggesting that both species required the same ecological conditions. *P. papillosa* leaves have very thick cuticles and Harris (1964) suggested that they were thick and succulent, with tough skins and soft interiors. The stems were also fleshy and rotted easily, having only thin layers of xylem and firm tissues in the phloem and outer cortex. Harris (1983) used specimens from here in his interpretation of *P. papillosa* as a large shrub that formed mangrove-like thickets along tidal rivers or on salt marshes, probably growing between high and low tide marks. This is supported by their association with the marine microfossils *Tasmanites* and dinoflagellate cysts.

P. papillosa is associated here with the pollen-organ *Pteroma thomasii,* which Harris (1964) thought belonged to the same plant.

This plant is now thought to belong to the Corystospermaceae, a peltasperm family that is better known from the southern high latitudes such as in South Africa (e.g. Anderson and Anderson, 1983).

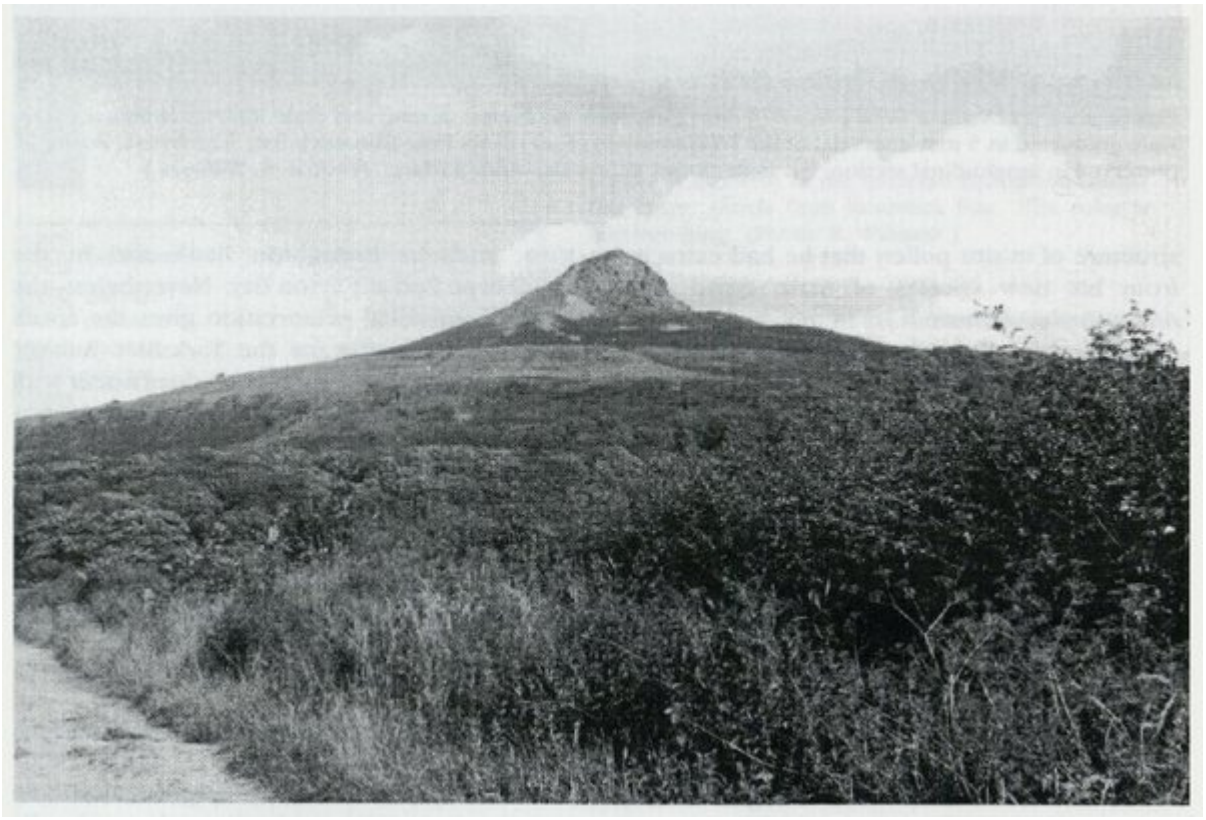
Pachypteris lanceolata (Figure 3.21) was probably an abundant plant inland that sometimes grew close to water bodies where its intact leaves could become incorporated into sediment. The rest of the common or abundant species either grew in fresh water or were brought down from the river banks.

The Roseberry Topping floras have also been important for improving the understanding of Mesozoic cycad biology. As at Broughton Bank and Marske Quarry, the cycad fronds *Pseudoctenis lanei* are associated here with fragments of the massive and more compact pollen-producing cone *Androstrobus prisma* (Thomas and Harris, 1960). This constant association, together with a similarity in epidermal structure between the leaf and the exposed part of the microsporophyll, suggests that they were both borne by the same parent plant species. Both organs are very like the corresponding organs of such recent cycads as *Zamia* and *Encephalartos,* so it is possible that the whole plant was closely similar to these genera. The cones are quite different from those that Harris (1961b) thought were attached to his *Beania* tree (*Androstrobus manis* Harris), which were stalked and more slender (Harris described the latter as being more like catkins). Roseberry Topping has also yielded the best and in some cases only known examples of *Nilssonia kendalliae, Ctenozamites cycadea, Ctenis kaneharii* and *Pseudoctenis oleosa.*

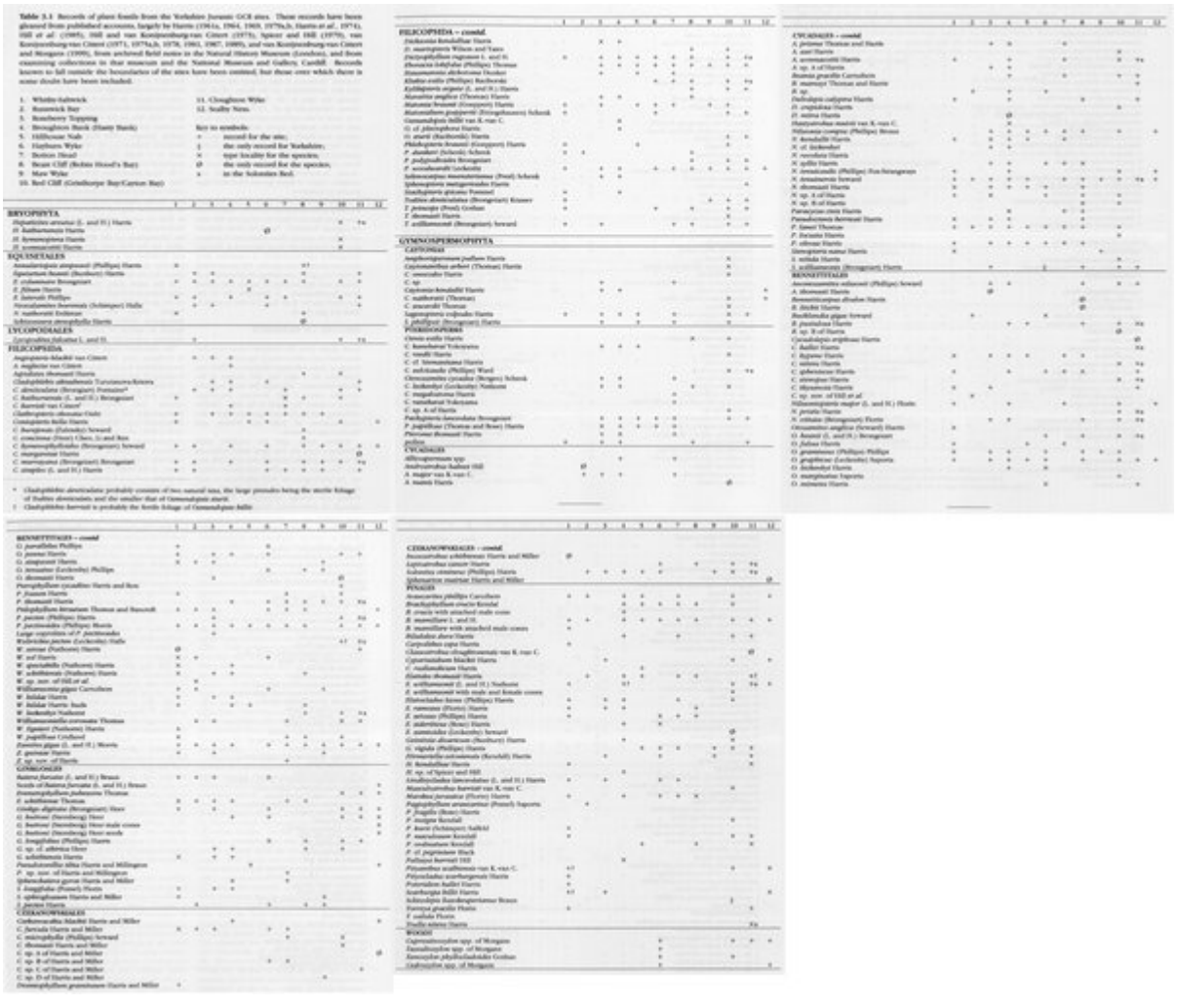
Conclusion

Roseberry Topping is a nationally important locality for well-preserved plant remains that help us to interpret the early Middle Jurassic floral ecology of this part of Yorkshire. It has proved particularly important for studies on fossil cycads and corystosperms, which were important groups of plants growing in Britain 170 Ma ago. It has great potential for future research.

References



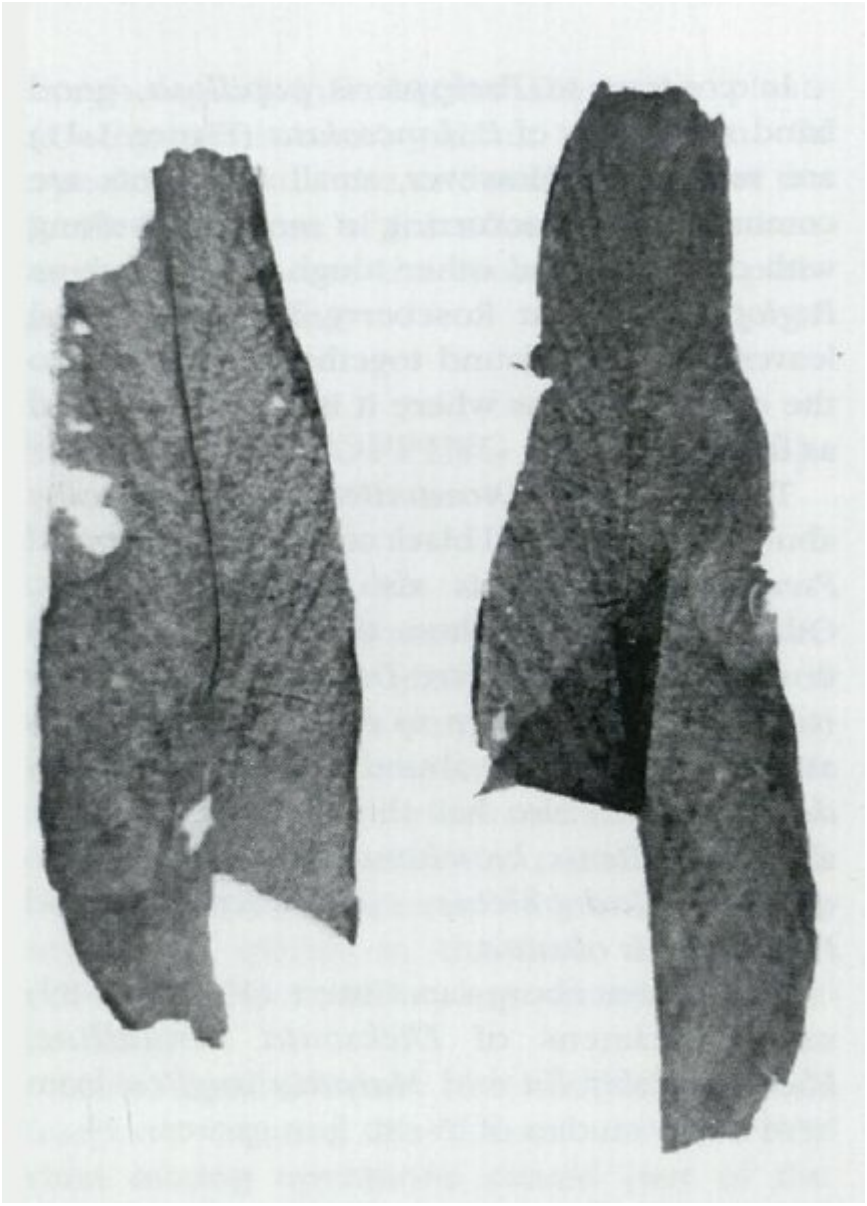
(Figure 3.19) Roseberry Topping. View towards the characteristically cone shaped outlier of Middle Jurassic rocks. The plant-bearing beds are exposed in the face on the north-west side. (Photo: D.J. Batten.)



(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 3.20) Ginkgo whitbiensis Harris. A characteristically small leaf with blunt apices to its lobes. Its veins are obscure. Laboratory of Palaeobotany and Palynology, Utrecht, specimen S.1468, Saltwick Formation, Roseberry Topping, × 2. (From van Konijnenburg-van Cittert and Morgans, 1999; photo: J.H.A. van Konijnenburg-van Cittert.)



(Figure 3.21) Pachypteris lanceolata Brongniart. These are upper and lower cuticles of a pinnule of this corystosperm leaf Large numbers of leaf and stem fragments come from a thick (up to 3 m) band of dark shale, within which there are bands of almost pure leaves with comparatively little sediment between them. National Museums and Galleries of Wales, Cardiff, specimen 98.24.G6, Saltwick Formation, Roseberry Topping, × 3. (From Cleal and Thomas, 1999; photo: B.A. Thomas.)