Runswick Bay

[NZ 809 170]

Introduction

Three-dimensionally preserved plant fossils have been known from the Yorkshire Jurassic succession since Young and Bird (1822) described them from the ironstone seams (sideritic sandstone beds) in the cliff at Runswick Bay (Figure 3.15). Others were later labelled as coming from 'Saltwick' and 'Hawsker'. Interestingly, Chapman (1973) suggested that these plant fossils were found on stones collected from the beach for the Tyne Iron Company. This parallels the much earlier discovery and collecting of the Tertiary pyritized fruits and seeds on the beach at Sheppey (see Chapter 5). Other specimens were collected by Yates (1855), Williamson (1870) and Halle in 1910 (Hill *et al.,* 1985). Thomas (1915) described some of Yates's specimens in the Paris Museum as male flowers of *Williamsonia gigas,* later transferred by Harris (1969) to his new species *Weltrichia sol.* In this work Harris also stated that the beds from which the ironstone casts were collected are no longer known. The discovery in 1980 of an in-situ sideritic sandstone bed at Runswick Bay yielding three-dimensionally preserved plants was followed up by extensive collecting and subsequent publication of the flora by Hill *et al.* (1985) and Hill (1990).

There are over 30 species described from the site, of which about five are new, and many show previously unknown anatomical details. The most important of these are a new species of the cycad male cone *Androstrobus (A. balmez)*, the bennetite 'flower' *Williamsonia gigas* and the male cone of the conifer *Elatides thomasii.*

Description

Stratigraphy

The stratigraphy at this site is summarized in (Figure 3.16). The main plant bed (the Wrack Hills plant bed) is within the Saltwick Formation (Aalenian). Hill *et al.* (1985) based their dating on the occurrence of abundant, relatively unfragmented, plant remains and fossils of the freshwater mussel *Unio.* They showed that the Saltwick Formation here overlies the Dogger Formation, which itself rests upon Lower Jurassic Alum Shale. Their excavations also led them to deduce that the fossil-bearing undercliff region had slipped from the main cliff some distance behind it.

Palaeobotany

There are two kinds of preservation of plant fossils at the Runswick locality. The more commonly found compressions are present in the basal claystones, but of far more importance are the three-dimensionally preserved organs in the sideritic sandstone. The uncompressed state of the plants must be due to early diagenetic carbonate precipitation.

Hill *et al.* (1985) described 31 species of plant fossils, representing what they thought to be 23 whole plant species in the sideritic sandstone (a more complete list of the 34 species that have been found at this site is given in (Table 3.1); see also (Figure 3.17) and (Figure 3.18). Cycad remains include leaves that have been tentatively referred to *Nilssonia tenuinervis,* male cones to *Androstrobus* and a fragment of the female cone *Beania.* The reproductive organs retain not only their original form, but also considerable amounts of structural and microscopic detail. Hill (1990) subsequently described the ultra-structure of in-situ pollen that he had extracted from his new species of male cycad cone *Androstrobus balmei.*

Hill *et al.* collected about 30 specimens of *Williamsonia gigas* (Figure 3.18) out of the 200 they saw. They appear to represent a developmental sequence from relatively small, immature specimens to larger, presumably more mature, specimens in which the gynoecium reaches up to 8 cm long and the base of the corona is up to 26 mm wide. This collection prompted a new restoration of a relatively mature 'flower' or 'fruit' in which the surface of the corona and mamilla is composed of modified interseminal scales that lie adpressed to the surface.

Interpretation

The species diversity at Runswick Bay is much less than at many of the other Yorkshire Jurassic sites, such as Broughton Bank and in the Gristhorpe Bed at Cayton Bay. Nevertheless, the three-dimensional preservation gives the specimens unique value for the Yorkshire Jurassic fossil material. This new locality does not fit with the site location described by Yates, nor is it certain whether it is the ironstone bed from where Williamson (1870) described *Williamsonia* and *Zamites gigas.* It may be that there is more than one ironstone band or that such plant fossil lenses were distributed throughout the area. In time, other localities might well be discovered, but for now the potential value of this site is immense.

Conclusion

Runswick Bay is the most important Middle Jurassic site in Britain for three-dimensionally preserved plant fossils. These give much needed morphological information about the plants growing in this country about 170 Ma ago. Of especial interest is the evidence provided of the detailed structure of fructifications of the bennettitaleans, one of the most important plant groups of that time.

References

(Figure 3.15) Cliffs at Runswick Bay. The fossiliferous ironstone occurs in the undercliff, which appears to have slipped from the main cliff behind it. The photograph was taken in 1980 just prior to the excavations that were made there. (Photo: C.J. Cleal.)
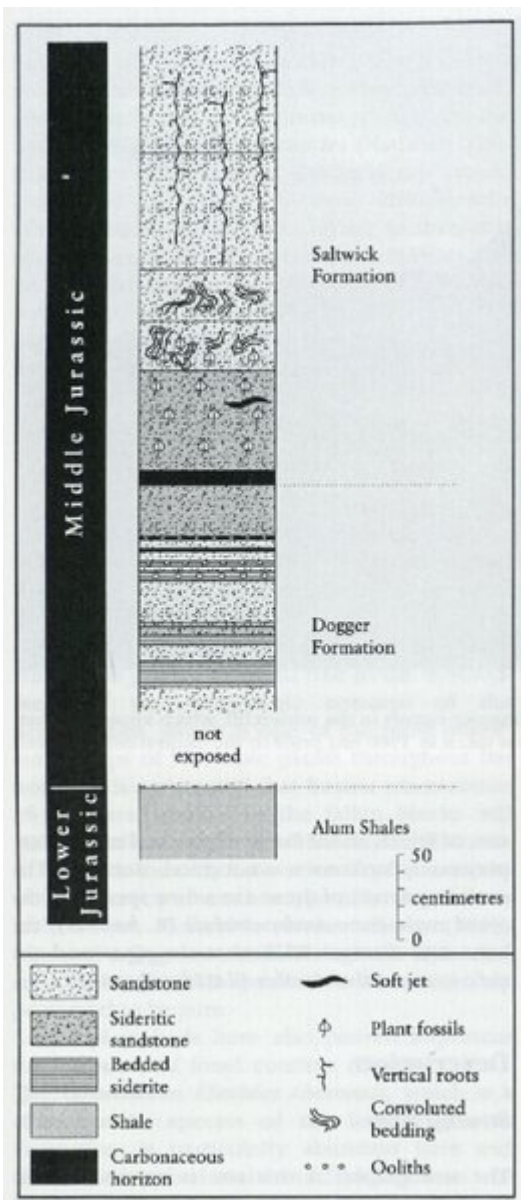
(Figure 3.16) The succession through the Dogger and Saltwick Formations at Runswick Bay, showing the position of the main plant beds. (After Hill et al., 1985.)

(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.
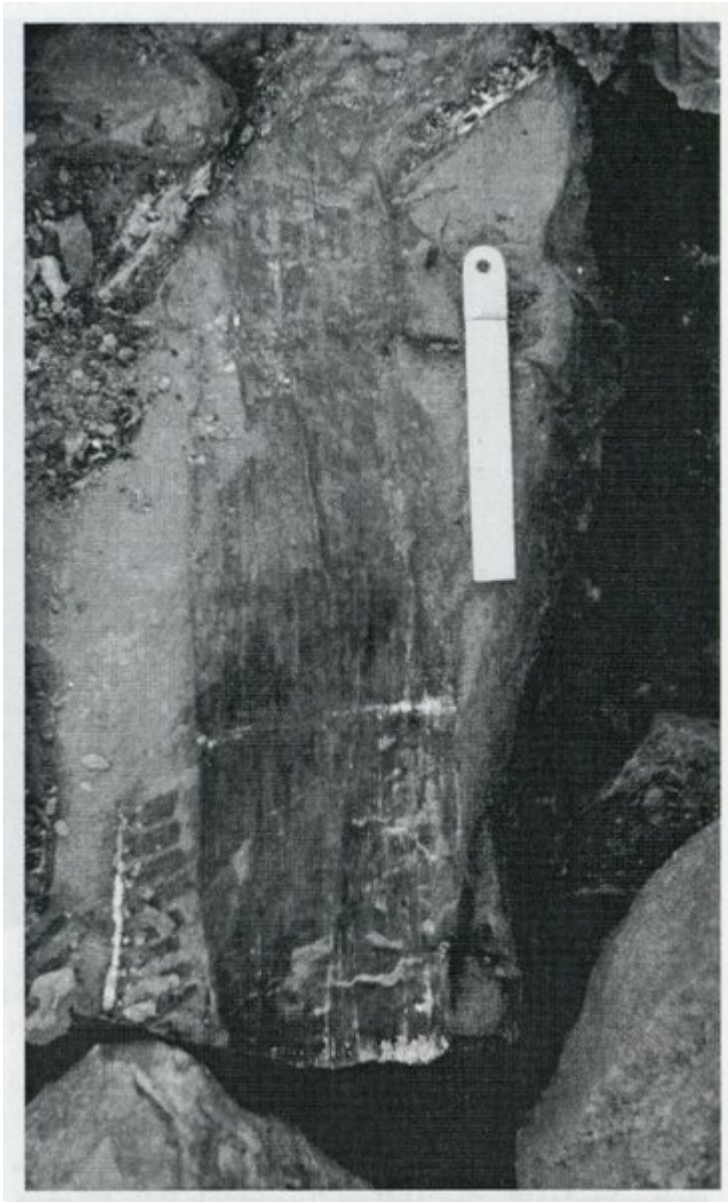
(Figure 3.17) Stem of the horsetail *Equisetum beanii* (Sunbury) Harris from Runswick Bay. The ruler is 130 mm long. (Photo: R. Williams.)
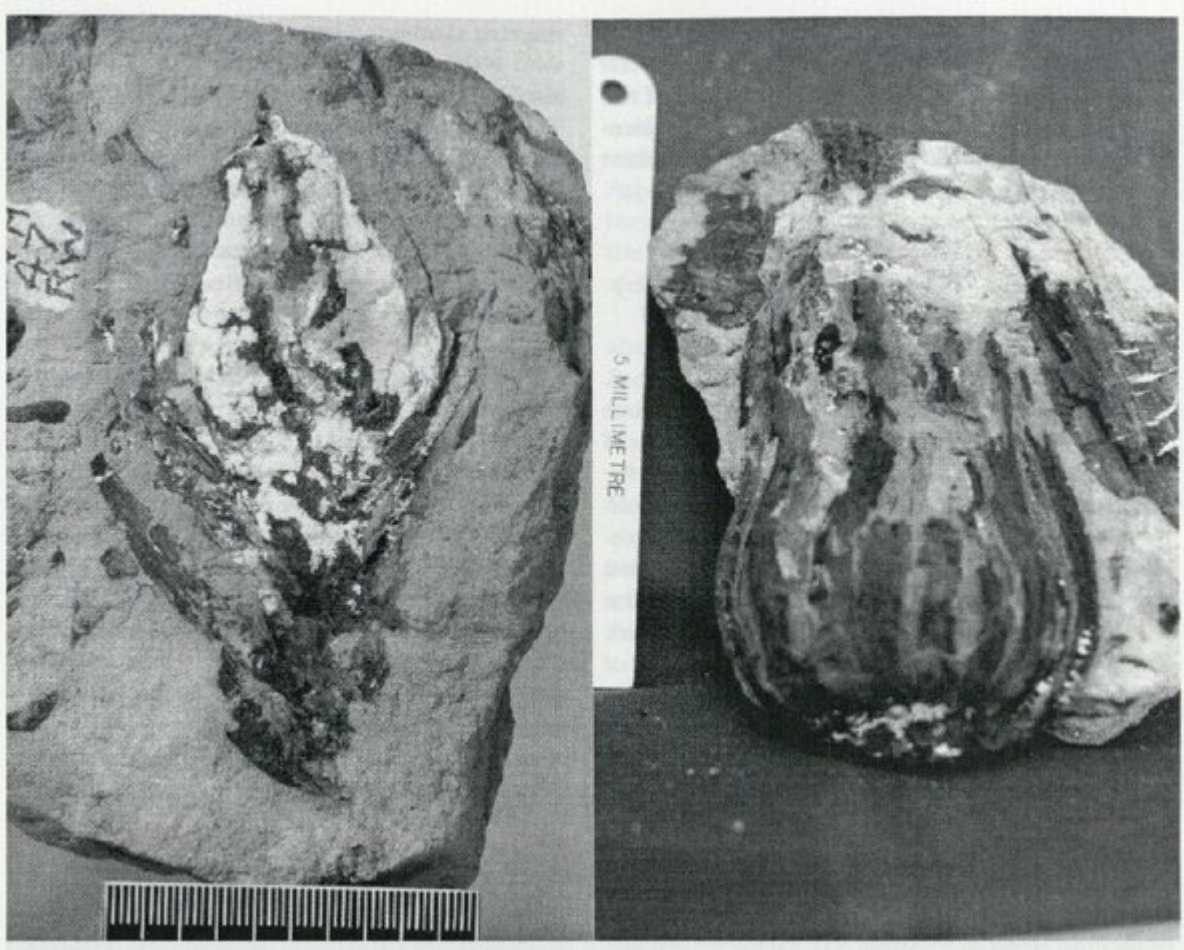
(Figure 3.18) The female Williamsonia flower (left, scale graduated in mm) and male Weltrichia flower (right, scale graduated in 5 mm intervals) of the Williamsonia gigas plants from Runswick Bay. The female flower is preserved in longitudinal section, the male flower shows the outer surface. (Photos: R. Williams.)