Bearreraig

[NG 518 524]–[NG 518 527]

Introduction

Bearreraig Bay is on the east coast of the Trotternish Peninsula on the Isle of Skye, northwest Scotland (Figure 5.10) and (Figure 5.11). It is a recently discovered palaeobotanical site that was reported by Bateman and Morton (1994) and Dower and Bateman (1998). Well-preserved permineralized plants are found in calcitic and sideritic nodules at 14 horizons at Bearreraig spanning 100 m of Middle Jurassic sediments ranging in age from the Early Aalenian to Early Bajocian. A minimum of eight whole-plant species are known from 15 organ species: one equisetalean, four filicalean ferns, one cycad and at least one bennettite and one conifer. These represent at least two distinct plant communities: a coastal-deltaic community dominated by conifers, and an inland vegetation rich in ferns. A full account of the flora has been given by Bateman *et al.* (2000) and forms the basis of the following review.

Description

Stratigraphy

The plant fossils come from 14 horizons in a 120-m-thick central portion of the Bearreraig Sandstone Formation (Figure 5.12). The detailed stratigraphy is based upon abundant and well-preserved ammonites and bivalves in calcareous nodules. By this means, Morton (1990) dated the plant-bearing section as from the *Ludwigia murchisonae* Zone (early Aalenian) at the base of the Ollach Sandstone Member to the *Witchellia laeviuscula* Subzone (early Bajocian) in the middle of the Holm Sandstone Member.

Palaeobotany

Small fragments of well-preserved permineralized land plants are present in the calcareous nodules (Bateman *et al.,* 2000). They were prepared for detailed examination by sectioning and cellulose acetate peeling. The ferns are fusainized (charcoalified), which enabled them to be examined by SEM, thereby revealing intricate anatomical details. The plant fossils so far recorded by Bateman *et al.* (in press) are as follows:

Equisetales: *Equisetum* cf. *columnare* Brongniart (a large pyritized rhizome).

Filicales: charcoalified fragments of *Cladophlebis denticulatus* (Brongniart) Fontaine, *Coniopteris* cf. *hymenophylloides* (Brongniart) Seward, *Hausmannia buchii* (Andra) Seward, *H. dichotomy* Dunker, *Phlebopteris woodwardii* Leckenby.

Cycadales: *Nilssonia* cf. *tenuinervis* Seward.

Bennettitales: *Cycadolepis* sp., *Otozamites* cf. *penna* Harris, *Ptilophyllum* cf. *pecten* (Phillips) Harris, *P.* cf. *pectinoides* (Phillips) Morris, ovules and cone fragments.

Conifers: *Brachyphyllum* cf. *mamillare* Lindley and Hutton, female cones and isolated ovule scales of araucarian affinity, cf. *Taxodioxylon* sp. (Figure 5.13) and (Figure 5.14).

Bateman *et al.* (2000) interpret these fragments as most likely to have come from a minimum of eight and a maximum of 11 whole plant species. However, even though the assemblage is small it is diverse and encompasses eight or nine families in five orders. Plant microfossils and cuticles have also been recovered from the inorganic matrix by maceration. Riding (1991) described 17 morphospecies of dinoflagellate cysts from the section.

Interpretation

Permineralized Jurassic floras are globally rare and only one other reasonably extensive assemblage has been reported in Britain, from the Lower Jurassic succession at Eathie (Seward and Bancroft, 1913), as noted previously. The other important features of the Bearreraig plants are not only that Middle Jurassic floras in any state of preservation are uncommon but also that the assemblage immediately pre-dates and resembles the classic Yorkshire Jurassic floras described by Harris and others (see Chapter 3).

The plant fossils are clearly all allochthonous in origin, being very fragmentary and in marine deposits. The Bearreraig Sandstone Formation was deposited by tidal sand waves that migrated northwards parallel to the east. The plant debris accumulated some 25–30 km from the nearest land. Most would have decayed on the sea floor. Only those fragments that were closely associated with mollusc shells were preserved. Decay and dissolution of some of the shells led to local re-precipitation of authigenic calcite nucleating around the remaining shells and infiltrating any associated plant remains. Dower and Bateman (1998) suggested that such permineralization was most probably rapid because there appears to be little evidence of chemical or biological degradation in conditions that were unlikely to have been anoxic. Also since the ferns are fusainized, it is unlikely that degradation would have occurred anyway. Bateman and Morton (1994) suggested that the plants were carried as rafts for great distances before becoming waterlogged and sinking to the ocean floor.

Although the number of species is low there is some evidence of the communities from which they came. The single large pyritized fragment of *Equisetum* almost certainly originated from a plant growing on a riverside. The charcoalified nature of the fern fragments suggests derivation from plants that grew inland on relatively dry heaths that were subject to periodic burning. The presence of *Phlebopteris* is especially significant because Harris (1961a) had previously argued that it grew in such fire-affected situations.

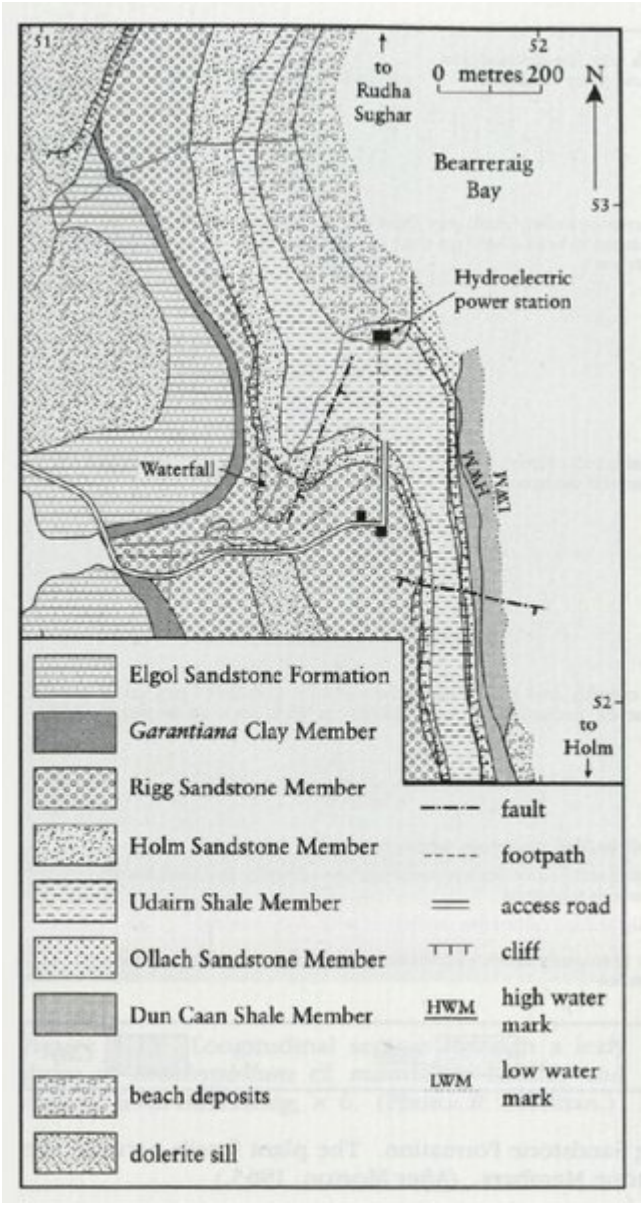
Bateman *et al.* (2000) suggest that the abundance of *Brachyphyllum* reflects seaward habitats (possibly intertidal) of the parent plants on the deltas. The domination of the araucarian *B.* cf. *mamillare* in both megafossil and microfossil assemblages suggests that it was more abundant and closer to the watercourses than the cheirolepidiacean *B.* cf. *crucis.* The few cycadophytes suggests that they were either rarer components of the delta community or that they lived in drier habitats further away from the watercourses.

Nearly all the species had thick fleshy leaves with thick cuticles and sunken stomata suggesting xeromorphy. However, Bateman *et al*. (2000) quite rightly point out that such leaves might have been selectively preserved, therefore biasing our views on both species and morphological make-up of the living communities.

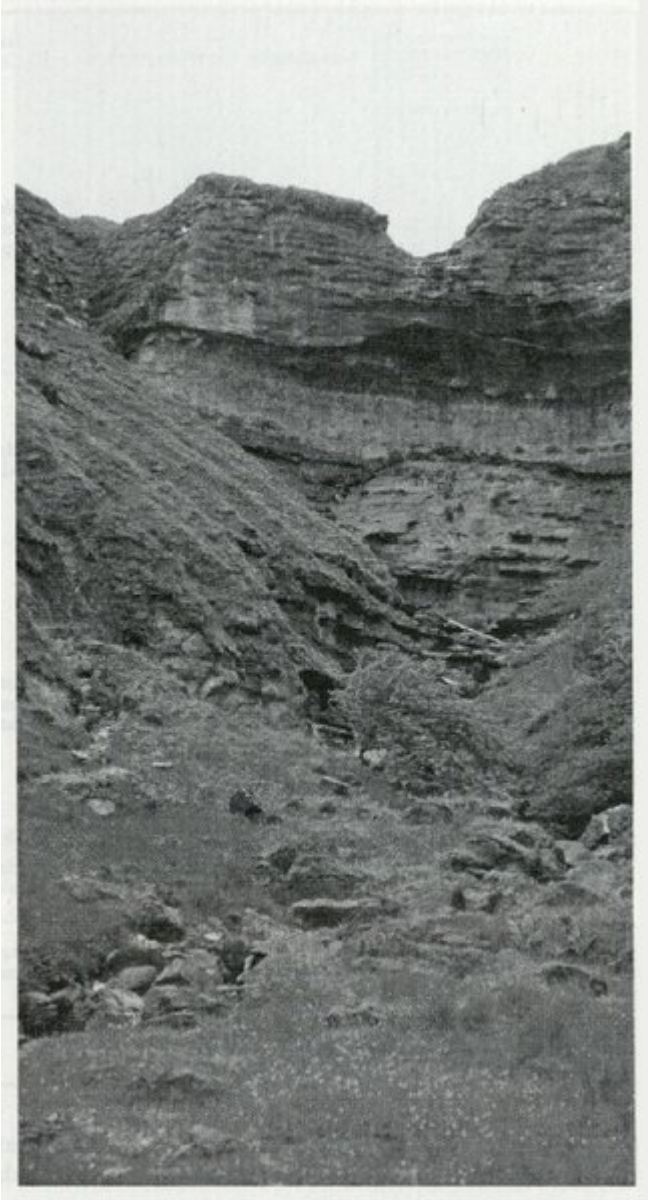
Conclusion

The Bearreraig assemblage is a rare Middle Jurassic flora immediately pre-dating the classic compression floras described from Yorkshire. It provides a rare opportunity for studying the anatomy of Middle Jurassic plants and thus significantly improve our understanding of the vegetation of this period.

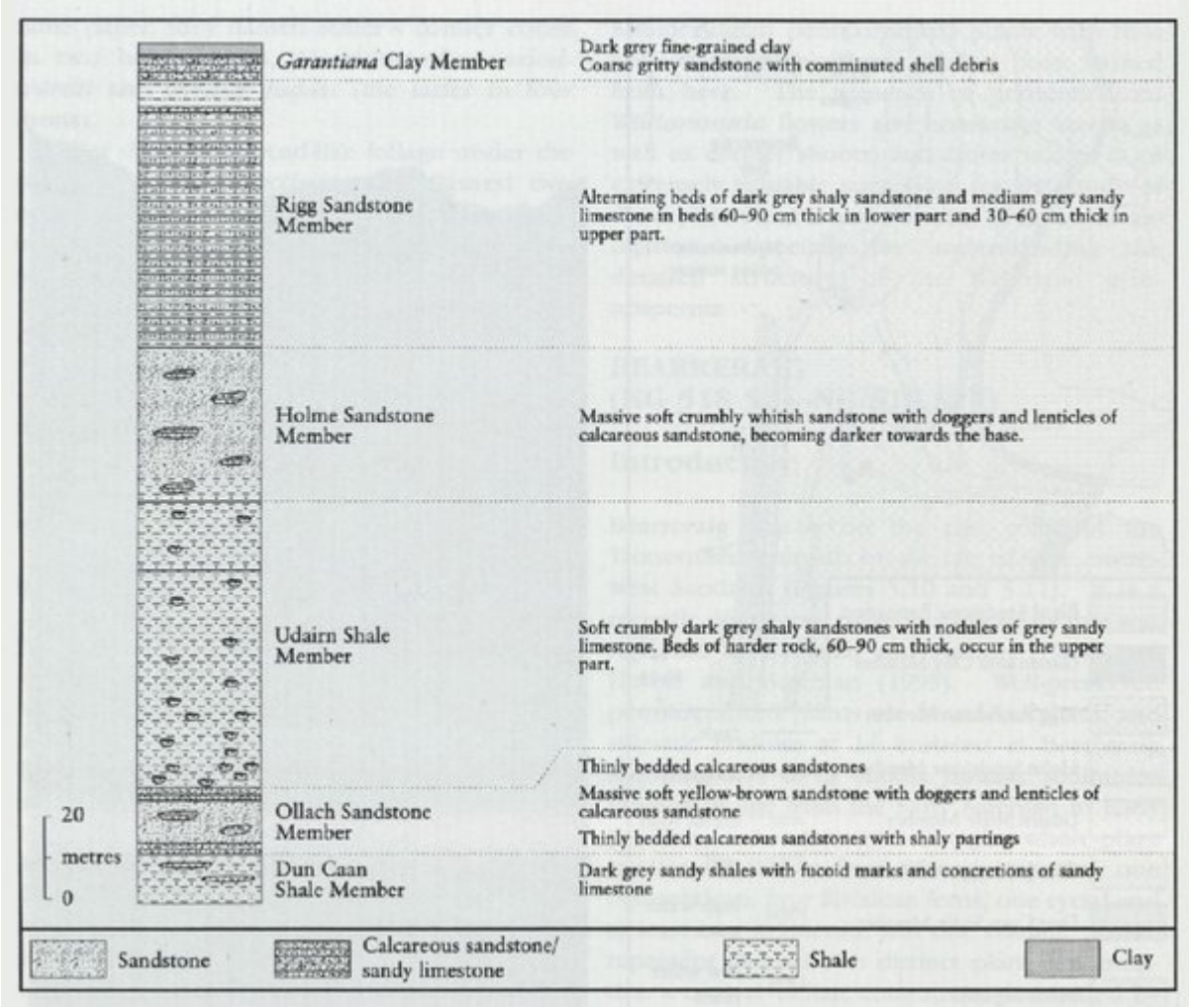
References



(Figure 5.10) The geology of Bearreraig Bay. (After Morton and Hudson, 1995.)



(Figure 5.11) View of the upper part of the Middle Jurassic plant beds at Bearreraig Bay, Skye. (Photo: R. M. Bateman.)



(Figure 5.12) Generalized section through the Bearreraig Sandstone Formation. The plant fossils occur in the 011ach Sandstone, Udairn Shale and lower Holme Sandstone Members. (After Morton, 1965.)

(Figure 5.13) Longitudinal section through a leafy shoot of Brachyphllum cf. mamillare Lindley and Hutton, from Bearreraig, × 6. (Photo: R. Bateman.)

(Figure 5.14) Transverse section through a leafy shoot of Brachyphyllum cf. mamillare Lindley and Hutton, from Bearreraig, × 12. The section shows the stem surrounded by fleshy leaves. (Photo: R. Bateman.)