Cnap Twt

[SS 911 753]

Introduction

A number of Mesozoic fissure deposits in the Carboniferous outcrop of the Bristol channel have yielded animal and plant remains (Figure 2.5). Owen (1871) and then Simpson (1928) first described the vertebrate remains. Detailed work recommenced in the 1940s and has continued up to the present day. Robinson (1957) described the geology and reviewed previous work on all the fissures and their vertebrate faunas in South Wales and Somerset. Much of the work has been on the vertebrate remains. Kühne (1949) and Kermack *et al.* (1968) described early mammals from South Wales fissures, and Benton and Spencer (1995) included details of all the fissure faunas in their GCR volume on fossil reptiles.

Plant fossils were first described from deposits in the Vale of Glamorgan by two students of Harris (Lewarne and Pallot, 1957) and then by Harris himself (1957). Since then no further work has been published on the plants, except for Harris' (1958) use of the fusainized (charcoalified) preservation state of the plant remains as evidence of forest fire. There is clearly great potential for additional palaeobotanical studies of these deposits.

The most productive fissures for plant remains are at Cnap Twt (Figure 2.6). Harris described two of these in the year the quarry closed, as follows:

'Here there are two fissures which changed their appearance greatly as the section was cut back. When I saw them, the south fissure was an oblique crack up to 50 cm wide, running obliquely up the limestone face from the quarry entrance to the hillside 50 ft [15 m] above. There was another fissure, looking like a cave, but narrowing above and partly occupied by great blocks of limestone. The north fissure was poorly exposed.'

The face has since weathered and deteriorated although fissures can still be identified.

Description

Stratigraphy

The Lower Carboniferous Limestone of the Mendip Hills and parts of South Wales formed an archipelago of low islands in the early Mesozoic sea. The dating of the fissures is difficult with few palynological data to enable detailed comparisons with other deposits to be made (e.g. Marshall and Whiteside, 1980). The infillings are generally considered to be Triassic in age on the evidence of the animal and plant remains. Robinson (1957, 1971) suggested that there are two groups of fissures. One, having yielded reptile remains and sporadic *Euestheria,* is considered to be late Norian. The second, containing the remains of plants, early reptile-like mammals as well as reptiles, is thought to post-date the Westbury Formation transgression (formerly called 'the Rhaetian transgression'). More recently, Simms (1990) reviewed the geology of the caves and the nature of the palaeokarst. He concluded that the evidence suggests a Late Triassic, late Carnian to Rhaetian, age for some fissures, and an Early Jurassic, Hettangian–Sinemurian, age for others.

The plant remains from the Vale of Glamorgan fissures can be compared with those in the basal Lias of Germany and the Rhaetian deposits of Greenland (Harris, 1957). Marshall and Whiteside (1980) established a Hettangian–Sinemurian age for the nearby Duchy [SS 906 757], Pont Alun [SS 899 767] and Pant [SS 896 760] quarries, based on the occurrence of *Hirmeriella (Cheirolepis*) spores.

Palaeobotany

By far the commonest plant fossils are carbonized fragments, which Harris described as resembling charcoal. These were sieved out on a 1 mm mesh after disaggregration of the fissure clay with hydrochloric acid (Figure 2.7).

Carbonized bark and wood, now referable to the conifer *Hirmeriella airelensis* Muir and van Konijnenburg-van Cittert, 1970, made up over three-quarters of the material Harris recovered from Cnap Twt. In contrast, he found wood to comprise 98% of the plant material recovered from a fissure in the nearby working Ewenny Quarry. Microsporophylls and seeds referred to the conifer were also recovered from Cnap Twt. Harris interpreted all of these carbonized remains as true charcoal, based on comparisons with modern conifer charcoal. He thought this charcoal material was a result of forest fires and remarked on other similar charcoal that he had found in the Rhaeto-Liassic rocks of Greenland and the Middle Jurassic strata of Yorkshire. He drew heavily on the results of his Cnap Twt studies in his publication on forest fires (Harris, 1958) in which he also mentioned finding the remains of beetles.

Identical conifer leaves were found by Chaloner (1962) in Rhaetian deposits from the Henfield borehole, in fissure fillings in northern France by Briche *et al.* (1963) and Levet-Carette (1964), and in lacustrine deposits at Airel, also in northern France, by Muir and van Konijnenburg-van Cittert (1970). The last of these authors referred their fragments of male cones and those from Cnap Twt to *Hirmeriella airelensis* on the basis of association and their consistent structure (two pollen sacs on each microsporophyll). Harris had originally referred the Cnap Twt conifer to *Cheirolepis (= Hirmeriella) muensteri* but Muir and van Konijnenburg-van Cittert (1970) distinguished it from this species, which has up to 12 pollen sacs on each microsporophyll.

Harris recovered numerous pollen grains of *Cheirolepis.* The age range of such grains, called *Classopollis,* extends from the Late Triassic Epoch through the remainder of the Mesozoic Era. Those from Cnap Twt and identical forms from Airel were named *Classopollis harrisii* by Muir and van Konijnenburg-van Cittert (1970).

Harris also recovered small cuticle fragments of *Dolerophyllum, Ctenis, Pterophyllum,* an unidentified conifer, *Cycadolepis,* and two forms of small seed. Lycophyte microspores were referred to *Heliosporites reissingeri* (Harris, 1957) by Chaloner (1969), and Harris referred other miospores to *Pityosporites* type, *Leiotriletes* spp., *Entylissa* spp. and about eight other unidentified species. Lewarne and Pallot (1957) described some megaspores, now known as *Bacutriletes tylotus* (Harris, 1935) Potonié, 1956, which were identical to those previously recorded from Greenland (Harris, 1935) and northern France (Muir and van Konijnenburg-van Cittert, 1970).

Interpretation

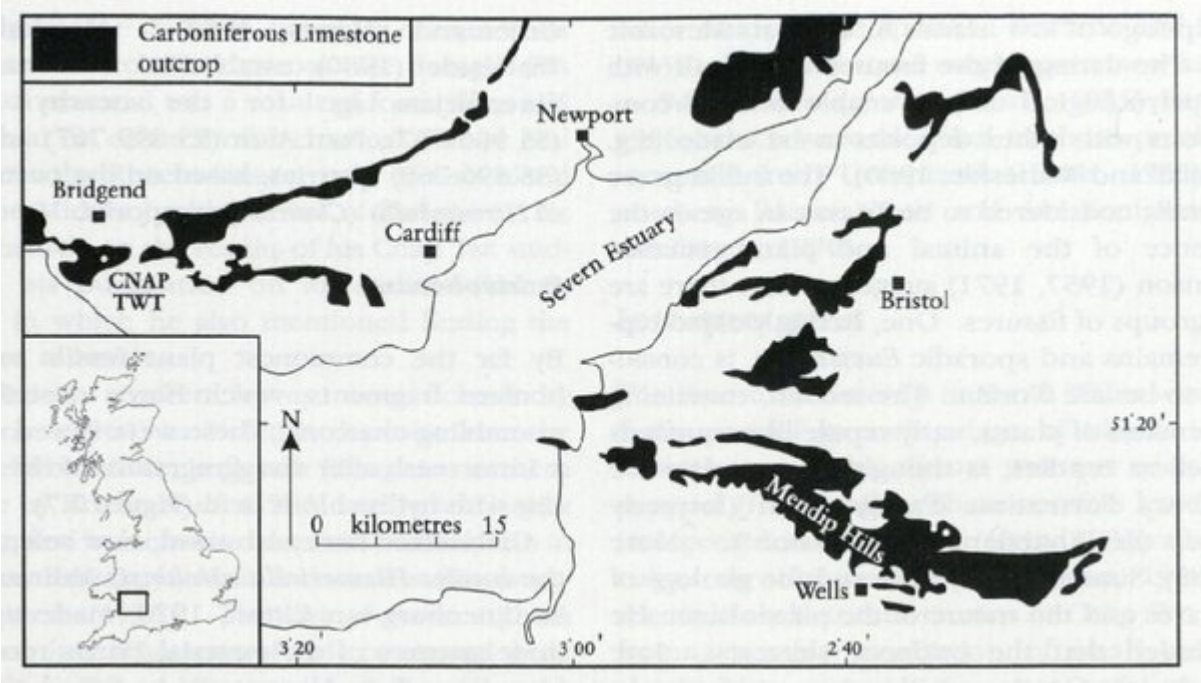
The limestone outcrop in South Wales was originally part of an archipelago of islands in the Rhaetian sea. The climate was wet enough to support *Hirmeriella.* These conifers have been interpreted as both trees (Alvin, 1983) and succulent shrubby xerophytes (Watson, 1988). It seems likely that the remains at Cnap Twt came from a scrubby vegetation of small trees or shrubs that grew in the poor soils of these islands.

Fires, presumably started by lightning strikes that swept through the scrub, burnt and charcoalified the twigs and their reproductive organs. Subsequent storms would have washed these remains, together with mud and sand, into the drainage fissures that ran through the limestone. Anaerobic conditions in these waterlogged sediments preserved them in exquisite detail, with the best twigs and male cones showing every cell equally well preserved.

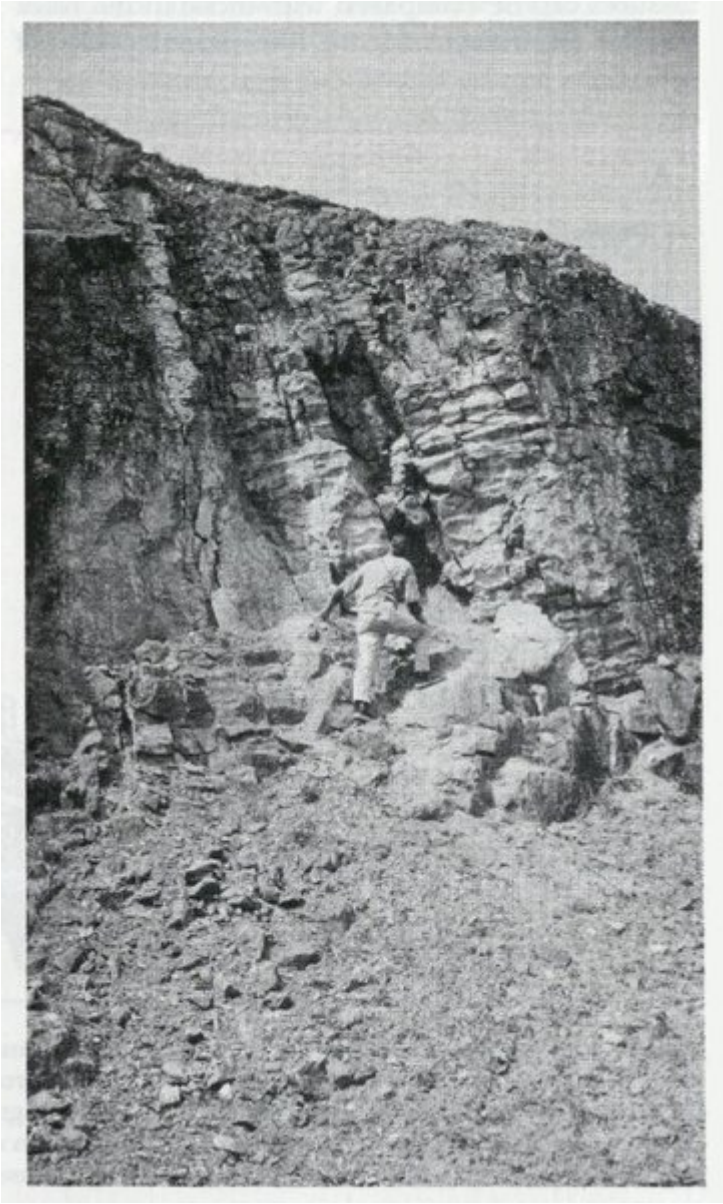
Conclusion

Cnap Twt is the best Rhaetian fissure-fill deposit in Britain to yield a good plant fossil assemblage. The charcoalified remains give a unique insight into the plants that lived in southern Britain at this time. It is a site of outstanding palaeobotanical significance and an exceptional locality for Rhaetian plant fossils, most notably those of primitive conifers.

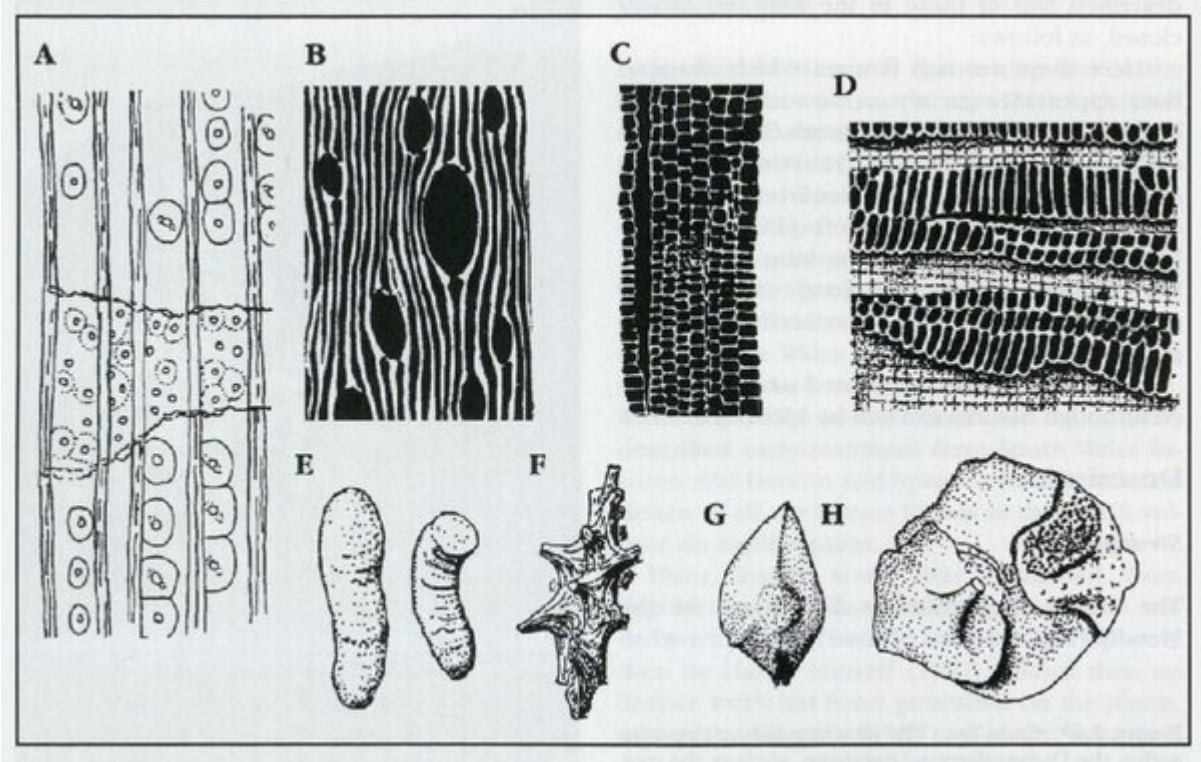
References



(Figure 2.5) Distribution of Carboniferous Limestone deposits with fissure fills in eastern South Wales and southwest England, showing the position of the Cnap Twt GCR site. (From the Fossil Mammals and Birds of Great Britain GCR Volume, in preparation.)



(Figure 2.6) Cnap Twt. The Rhaetian fissure deposits within the Carboniferous Limestone, such as the one visible here, have yielded charcoalified remains and pollen of cheirolepidiacean conifers, which are believed to be the precursors of all living conifers. Fragments of bennettites and other conifers have also been reported from here. (Photo: B.A. Thomas.)



(Figure 2.7) Examples of some of the types of fossil found in the Rhaetian fissure-fill deposits at Cnap Twt. (A–D) Cheirolepis wood. (A) Macerated tracheids close to protoxylem, × 500. (B) Charcoal fragment, tangential surface showing distorted rays, × 500. (C) Charcoal fragment, showing growth rings, × 200. (D) Charcoal fragment, in oblique radial section, × 100. (E) Two pollen masses, × 10. (F) Male cone axis, × 10. (G) Seed showing hilum, × 8. (H) Base of male cone showing a mass of pollen grains, × 10. (After Harris, 1957.)