Tregaron Bog (Cors Tregaron)

Highlights

This locality is one of the largest raised bogs in Britain. Its peats yield pollen making it possible to elucidate vegetational change through the Holocene. This, with close interval radiocarbon dating, has allowed the reconstruction of an accurate history of environmental change and later land use.

Introduction

Tregaron Bog is important for reconstructing Holocene environmental conditions in western Mid Wales. The stratigraphy and development of the raised bog at Tregaron were first studied in detail by Godwin and Mitchell (1938), and its ecology by Godwin and Conway (1939). The effect of human activity in the development of vegetation at the site, including forest clearance, was discussed by Turner (1964, 1965). Radiocarbon dates were given by Godwin and Willis (1960, 1962), Switsur and West (1972) and Hibbert and Switsur (1976). More general accounts of the Holocene history were given by Moore (1977) and Turner (1977), and the site has been widely discussed (for example, Turner 1962; Moore and Chater 1969b; Smith and Taylor 1969; George 1970; Moore 1972b; Deacon 1974; Taylor 1980; Walker 1980, 1982a, 1982b; Ince 1983).

Description

The site consists of three bogs known locally as Cors Goch Glan Teifi, developed upstream of a broad arcuate moraine near Tregaron. The moraine was regarded as the southern limit of Late Devensian ice in the Teifi Valley (Charlesworth 1929). The largest bog, usually referred to as the west bog (*c.*[SN 680 630]), lies on the west bank of the Teifi and is roughly oval in shape, measuring some 2,400m by 1,200m.

The other bogs lie to the east of the Teifi and are separated by a ridge of higher ground which runs towards the river from the valley side at Maes Ll■n. These bogs are referred to as the north-east and south-east bogs. Details of bog morphology and present vegetation are given by Godwin and Conway (1939). All three show marked raised profiles. The north-east bog has been extensively altered by drainage, but the west and south-east bogs are relatively intact, despite cutting at the margins.

The stratigraphy of the bogs at Tregaron was determined by Godwin and Mitchell (1938) and Hibbert and Switsur (1976), and consists over most of the valley centre of:

7 Fresh, light-coloured *Sphagnum* peat with remains of *Calluna* and *Eriophorum*

6 Thin (0.07–0.5m) highly humified peat, termed a retardation layer — see text

5 Light-coloured *Sphagnum* peat with remains of *Calluna* and *Eriophorum*

4 Highly humified *Sphagnum* peat with fibres and roots of *Eriophorum* and twigs of *Calluna*

3 *Phragmites* peat with scattered wood fragments, remains of *Cladium mariscus* (L.) Pohl and numerous seeds of *Menyanthes* and *Nuphar luta* (L.)

2 Pale brown mud with seeds of open-water plants and scattered fragments of wood

1 Stiff blue-grey (lacustrine) clay

Borings from the bog margins, however, show peats with a higher wood and silt content, overlying angular gravelly hillwash (Godwin and Mitchell 1938; Turner 1977).

The pollen biostratigraphy at Tregaron was first studied by Erdtman (1928), although a full pollen diagram was not published. Subsequently, the stratigraphy of the bogs was investigated by Godwin and Mitchell (1938) who described up to 5m of bog peat overlying *Phragmites* peat, mud peats and clays (beds 1–3). The bog peat was divided into a lower highly humified dark *Sphagnum* peat (bed 4) and an upper, light-coloured *Sphagnum* peat (beds 5 and 7). In all three bogs there is a well marked contact between the lower highly humified peat (bed 4) and the upper fresh peat (bed 5) termed the *Grenzhohzont* by Godwin and Mitchell (1938). A thin layer of highly humified peat (bed 6) occurs approximately mid-way between the *Grenzhorizont* and the upper surface of the fresh *Sphagnum* peat in bed 7; this was termed a 'retardation' layer (Godwin and Mitchell 1938).

In 1960, Godwin and Willis published radiocarbon dates from the south-east bog. These included dates of 760 ± 70 BP (Q-75) and 1,477 ± 90 BP (Q391), between which the 'retardation' layer (bed 6) was believed to have formed. Dates of 2,954 ± 78 (Q-389) and 2,647 ± 78 BP (Q-388) were presented to show that the contact between beds 4 and 5 (the *Grenzhorizont)* represented a hiatus in deposition of about 300 years.

Interpretation

Godwin and Mitchell (1938) charted the course of vegetation development at Tregaron from the pre-Boreal to the sub-Atlantic using pollen analysis. Their interpretations were confirmed by Hibbert and Switsur (1976) who presented a detailed analysis of the pollen biostratigraphy with radiocarbon dates — see (Figure 26). They showed that deposition began in the Holocene at Tregaron at 10,200 ± 200 BP (Q-930), marked by an abrupt lithological change from blue-grey clay (bed 1) to organic mud (bed 2). The first pollen assemblage zone (bed 2) shows *Betula* to be the dominant tree pollen, with pollen of *Juniperus* and *Salix. Pinus* pollen is also present in relatively low, yet constant, frequencies. The start of the succeeding pollen zone (bed 3), dominated by *Betula, Pinus* and *Corylus,* was dated to 9,750 ± 220 BP (Q-931). This zone shows the first continuous representation of *Corylus* in the profile.

The following pollen zone (also in bed 3) began at 9,300 ± 190 BP (Q-933), and is dominated by *Corylus* and *Pinus. Corylus* increased sharply at the start of this zone and maintained high values — see (Figure 26). At this time, *Juniperus* declined, probably indicating shading-out by other woodland taxa such as *Ulmus* and *Quercus,* which first become continuously represented (Hibbert and Switsur 1976). The following *Pinus-Corylus-Quercus* pollen zone (bed 3) begins at 8,150 ± 150 BP (0–935) and is marked by a rise in *Pinus* frequencies. In this biozone, *Ulmus* reaches its acme, yet it is exceeded by values of *Quercus* pollen. The representation of shrub pollen was at its lowest during this period — see (Figure 26); (Hibbert and Switsur 1976).

The *Quercus–Ulmus–Alnus* pollen zone (bed 4 and top of bed 3) opens at 6,990 ± 180 BP (Q-937). *Alnus* values rise markedly, and Ericaceae pollen and spores of *Sphagnum* are present for the first time. The following *Quercus–Alnus* pollen zone (in beds 4–7) begins at 4,990 ± 70 BP (Q-942) and is marked by a fall in *Ulmus, Tilia* and *Fraxinus* values at the beginning of the zone.

Although *Quercus* and *Alnus* dominate this later pollen zone, which encompasses beds 4 to 7, several significant events occur. These have been discussed both by Hibbert and Switsur (1976) and Turner (1964). First, the 'elm decline', widely documented at other British sites, is clearly seen at Tregaron within bed 4, although it is not as pronounced as in other Welsh Holocene profiles (Moore 1977); it has been radiocarbon dated at Tregaron to 4,890 ± 70 BP (Q-943). Second, the *Grenzhorizont,* or contact between beds 4 and 5, has been shown by radiocarbon dating to represent a break in sedimentation of some 300 years. It has been proposed that this hiatus represents a drier period; its ending marks the opening of Pollen Zone VIII (the Atlantic). Third, the highly humified peat layer (bed 6) within the *Sphagnum* peat sequence would also appear to mark a change in conditions during which peat grew only very slowly (Godwin and Mitchell 1938; Turner 1977).

Finally, Turner (1964, 1965, 1977) studied the pollen biostratigraphy of the upper 2m of Holocene deposits at Tregaron (beds 5–7 and the top of bed 4), and inferred human influences in the later Holocene vegetational history of the site. She concluded that the area was well wooded with only small clearings during the Bronze Age. At about 400 BC, most of the woodland was replaced by grassland, perhaps as part of the pastoral economy of the Iron Age peoples who built a fort to the northeast end of the bog near Pontrhydfendigaid. This economy appears to have continued until the twelfth century

when Cistercian monks founded an abbey at nearby Strata Florida (Ystrad Fflur) and established arable farming on their granges (Turner 1964, 1965, 1977).

Tregaron, therefore, provides an exceptionally detailed record of Holocene vegetational changes. Open-water conditions existed at the site until early Holocene times. The course of vegetation development can then be traced as open-ground conditions were replaced by woodland of increasing diversity. At Tregaron, the early Holocene is marked by a rise in *Juniperus* pollen followed closely by a rapid expansion of *Corylus.* A date of 9,750 ± 220 BP (Q-931) for the rise in *Corylus* is significant in being one of the earliest for the arrival of the genus in Britain (Deacon 1974; Taylor 1980; Walker 1982b). The relationship between the expansion of *Corylus* and *Juniperus* in western Britain is not straightforward, however, and varies with both altitude and latitude (Moore 1972b, 1977). The evidence from Tregaron suggests that *Corylus* may have expanded earlier in the west as the result of more favourable maritime conditions. Thus, the low lying area of Cardigan Bay may have acted as an area of early invasion for the genus *Corylus,* or may even have been a refugium for it during the Devensian late-glacial (Moore 1977).

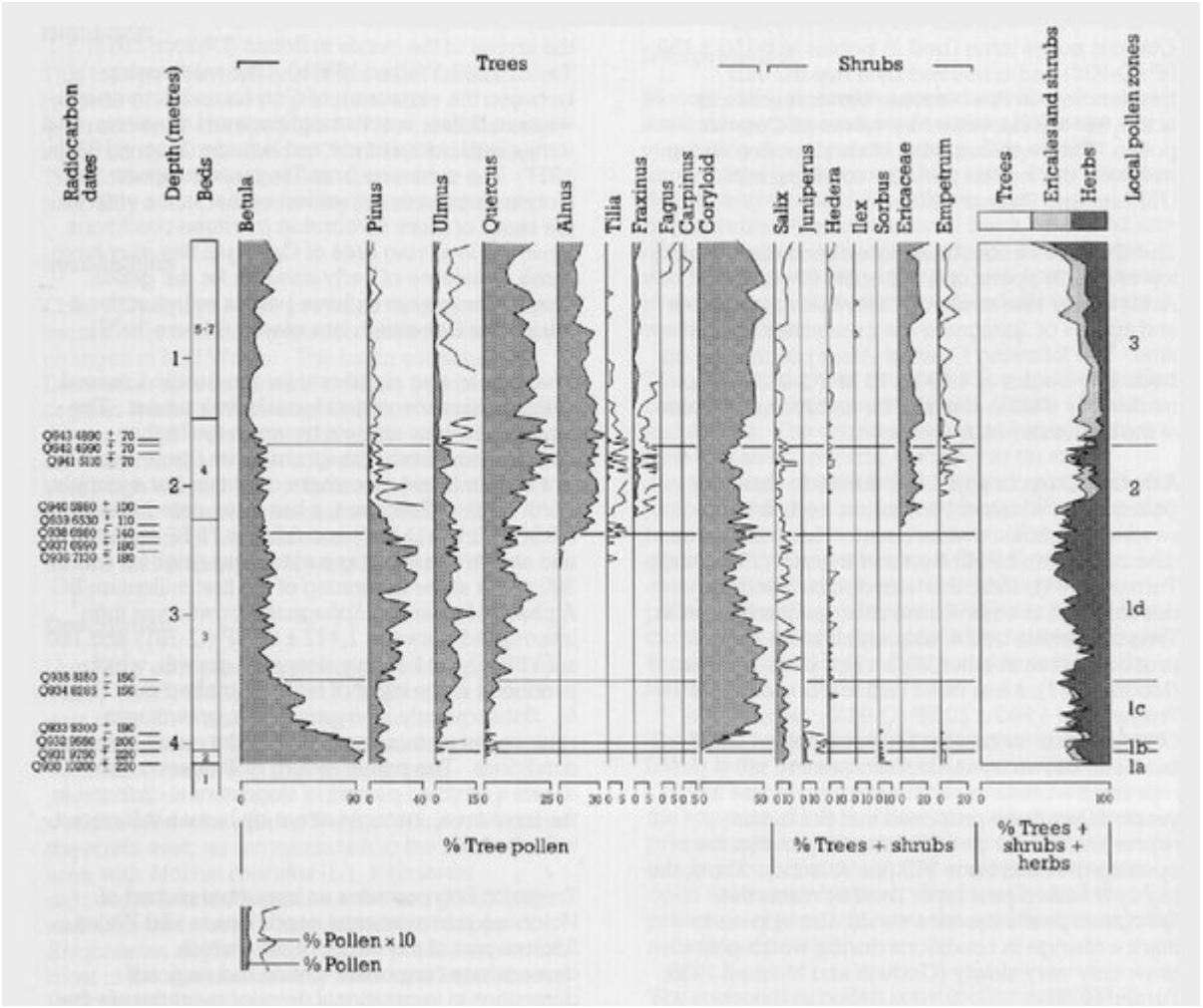
Tregaron is also significant for the detailed record of later Holocene vegetational development. The *Grenzhorizont* or contact between the highly humified and fresh *Sphagnum* peats (beds 4 and 5) is a feature found elsewhere in Britain (for example, Borth Bog); at Tregaron, it has been dated between 2,954 ± 78 BP (Q-389) and 2,647 ± 78 BP (Q-388) and shows that the bog surface was drier for some 300 years at the beginning of the first millenium BC. A phase of renewed *Sphagnum* growth was then interrupted between 1,477 ± 90 BP (Q-391) and 760 ± 70 BP (Q-75) by very slow peat growth, which produced a thin layer of highly humified peat (bed 6). Subsequently, *Sphagnum* peat growth was renewed at an increased rate as the result of wetter conditions. The pollen record at Tregaron also allows a detailed pattern of vegetational changes in the local area, brought about by human influences, to be traced.

Tregaron Bog provides an important record of Holocene environmental conditions in Mid Wales. It forms part of a network of sites which demonstrates important trends and regional diversities in vegetational development during the Holocene. Its close interval radiocarbon timescale, together with pollen analysis and historical records have enabled a continuous pattern of changing environmental and land-use conditions to be reconstructed, from the early Holocene up to and beyond the establishment of the Forestry Commission in 1919.

Conclusions

Tregaron Bog is historically important because it was one of the earliest sites where pollen analysis was applied in the British Isles. It has yielded an important record of vegetational and environmental change over the past 10,000 years. These changes have been dated by radiocarbon methods and the detailed pollen evidence is sufficiently accurate to demonstrate the cereal growing activities of the Cistercian monks in the Middle Ages as well as the beginning of Forestry Commission activities in 1919. As such it is an exceptional example of the power of pollen analysis and radiocarbon dating in showing detailed climatic and other changes.

References



(Figure 26) Tregaron Bog: a summary of pollen, lithological and radiocarbon evidence (from Hibbert and Switsur 1976)