Martin Mere

[SD 448 157]

Potential GCR site

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Introduction

Martin Mere is a formerly extensive freshwater lake that is currently a low-lying flat area of reclaimed peatlands and open water that sustain organic sediments ranging from lacustrine mud to terrestrial raised mire peat (Figure 8.18). Sediments from locations across the mere have yielded palaeoecological data that have contributed to an understanding of Holocene vegetation and sea-level changes in south-west Lancashire. Brodrick (1903) first studied the sediments at Martin Mere, identifying a sequence of either estuarine or lacustrine clays and silts. Gresswell (1957) regarded these silts and clays as estuarine sediments deposited in a coastal embayment during the 'Hillhouse Coastline' high sea-level event. Subsequent research has targeted the deposits at several sites across Martin Mere using field stratigraphy, plant macrofossil analysis and pollen analysis to elucidate a history of environmental change during the early Holocene (Tooley, 1977, 1985).

Description

Martin Mere is located 8 km east of Southport in south-west Lancashire. It was an extensive (690 ha) freshwater lake prior to drainage during the 17th century, with the water surface at 2.7–3.4 m OD and maximum depths of *c.* 6 m (Brodrick, 1903). The margins of Martin Mere prior to drainage in AD 1692 reveal the extent of the lake (Figure 8.18). The lake deposited an extensive sequence of unconsolidated sedi ments reaching a maximum of 7.5 m, but rarely exceeding 3 m of organic sediment (Tooley, 1985). The stratigraphy of Martin Mere has been investigated in some detail with coring across the tidal and lagoonal zone near Churchtown Moss and from the perimarine zone near Greening's Farm [SD 402 152] eastwards into the tidal and lagoonal zone (Figure 8.19) (Tooley, 1985). Recent research has also targeted sequences in the south-eastern tracts of the perimarine zone at Langley Brook [SD 410 130] and terrestrial peat sequences from Tarlscough Moss and Burscough Moss (McAllister, 2001). Pollen analysis has been applied at the following core sites: Martin Mere 1 near Greening's Farm, Mere Sands Wood, Langley Brook, Tarlscough Moss and Burscough Moss (Baxter, 1983; Tooley, 1985; Innes *et al.* 1989; McAllister, 2001). The pollen data reveal the sequence of vegetation changes in coastal south-west Lancashire during the early to middle Holocene.

Interpretation

Gresswell (1957) cored the deposits within Martin Mere and encountered sequences of silt and peat overlying either Shirdley Hill Formation sands or Kirkham Formation tills (Thomas, 1999). The silts (Downholland Silt) were interpreted as beach deposits associated within the 'Hillhouse Coastline' and Martin Mere was regarded as a marine embayment. Tooley (1976) cast considerable doubt upon the 'Hillhouse Coastline', and detailed stratigraphical evidence reveals that Martin Mere has sustained two distinct sedimentary environments. A perimarine zone east of Mere Hall [SD 404 165] has remained freshwater even though affected by relative sea-level changes, and to the west of Mere Hall there is a tidal and lagoonal zone. The perimarine zone has produced sediments ranging from organic lacustrine silts and clays within the limits of the lake to terrestrial peat on the edges of Martin Mere. Pollen and stratigraphical analyses (Figure 8.19) and (Figure 8.20) identify the widespread inception of organic sedimentation within Martin Mere at *c.* 7000 years BP, in response to a rising freshwater table, perhaps triggered by marine incursions (Tooley, 1985). Martin Mere expanded over an undulating surface, depositing a thick sequence of lacustrine sediments over either early Holocene organic materials, Shirdley Hill Formation sands or Kirkham Formation tills.

The tidal flat and lagoonal zones contain an alternating mixture of inorganic and organic sediments laid down in brackish, freshwater and terrestrial environments. The sediments north of Wyke House Farm in the tidal and lagoonal zones contain two layers of organic lagoonal sediment, which are indicative of lower sea levels and are followed by marine incursions (Tooley, 1985). The marine sediments cover the organic layers and signify higher sea levels reaching over –1 to –2 m OD after *c.* 7600 years BP and over 0.5 to 1.5 m OD in the middle of Flandrian zone Fl-II (7000–5000 years BP). There is indirect evidence for higher sea levels in the perimarine zone, where higher lake levels have been linked with sea-level oscillations (Tooley, 1985). Abundant aquatic taxa from –1.42 to –1.12 m OD at Martin Mere 1 signify higher lake levels, which correlate with a marine incursion to –1.09 to –0.23 m OD ^{14}C dated to 6870 ± 130 and 6430 ± 90 years BP at Martin Mere 14. Failure of these marine incursions to penetrate deep into Martin Mere has been explained by a combination of a till and coversand ridge and the speed at which the organic sediments accumulated, preventing marine inundation.

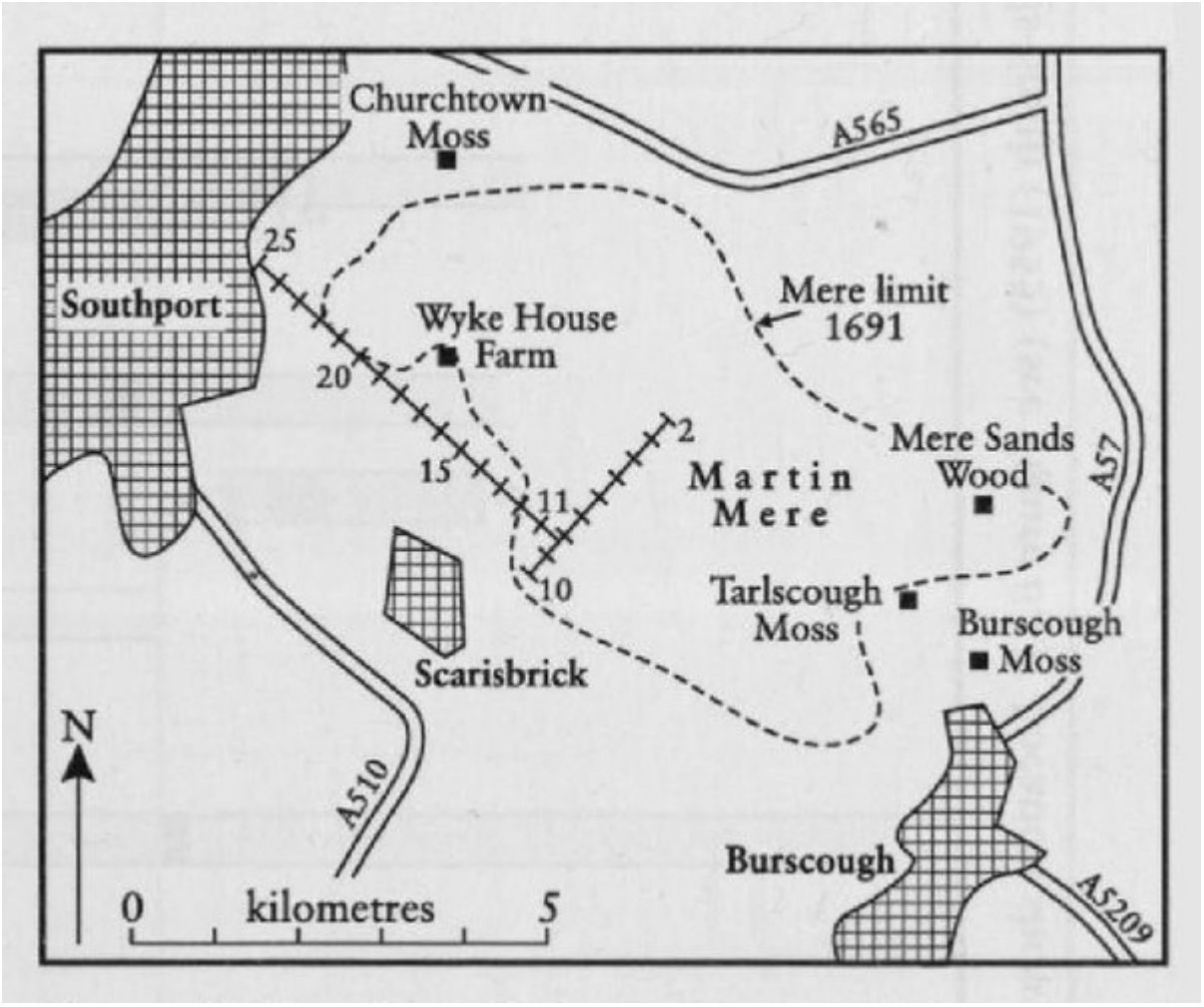
Palaeoecological analyses of sediments in Martin Mere target the perimarine zone, with Tooley (1985) and McAllister (2001) producing pollen diagrams. McAllister records a longer early Holocene sequence at Langley Brook, which pre-dates the widespread expansion of Martin Mere. The basal sediments are dominated by *Betula* and *Pinus* woodland, with the arrival of *Corylus avellana* around 9500–8500 years BP. *Quercus, Ulmus* and *Alnus* are the dominant components of the mixed deciduous forest that replaces *Pinus* and *Corylus avellana* woodland at 8080 ± 160 years BP. The sequence from Martin Mere 1 (Figure 8.20) post-dates the expansion of the lake and begins shortly after the *Alnus* rise *c.* 7000–8000 years BP (Tooley, 1985). Towards the top of Martin Mere 1 there is an undated decline in *Ulmus* frequencies and at Langley Brook a decline in *Ulmus* frequencies has yielded a PIC date equivalent to the 5010 ± 80 years BP recorded for the Elm Decline at Red Moss (Hibbert *et al.,* 1971; Tooley, 1985). The record from Martin Mere 1 stops at this point, but at Langley Brook the sequence contains charcoal remains and pollen taxa indicative of arable and pastoral activity, probably by Bronze Age communities and unfortunately the sequence terminates at this point.

The pollen data indicate organic sedimentation after 9500 years BP at certain locations within Martin Mere and widespread sedimentation after 7000 years BE Core profiles are truncated, reflecting drainage and the current agricultural land use, but organic sediments extend after the Elm Decline (5000 years BP) and in certain locations into the Bronze Age (3400 years BP). Recent pollen data from the south-eastern edge of Martin Mere using the peat deposits at Tarlscough and Burscough Mosses (Figure 8.18) have improved understanding of the vegetation history around Martin Mere. These mosses are raised above the water levels of Martin Mere and are typical of lowland mosses bordering the lake. Both Tarlscough and Burscough mosses sustain peat sequences truncated by drainage and development for agriculture, with organic sediment spanning the period 8800–7000 years BP and 8200–5000 years BP respectively. Pollen data from Tarlscough and Burscough mosses supports the vegetation history elucidated from Martin Mere (Tooley, 1985) and conforms with the sequence of changes identified elsewhere in south Lancashire (Hibbert *et al.,* 1971).

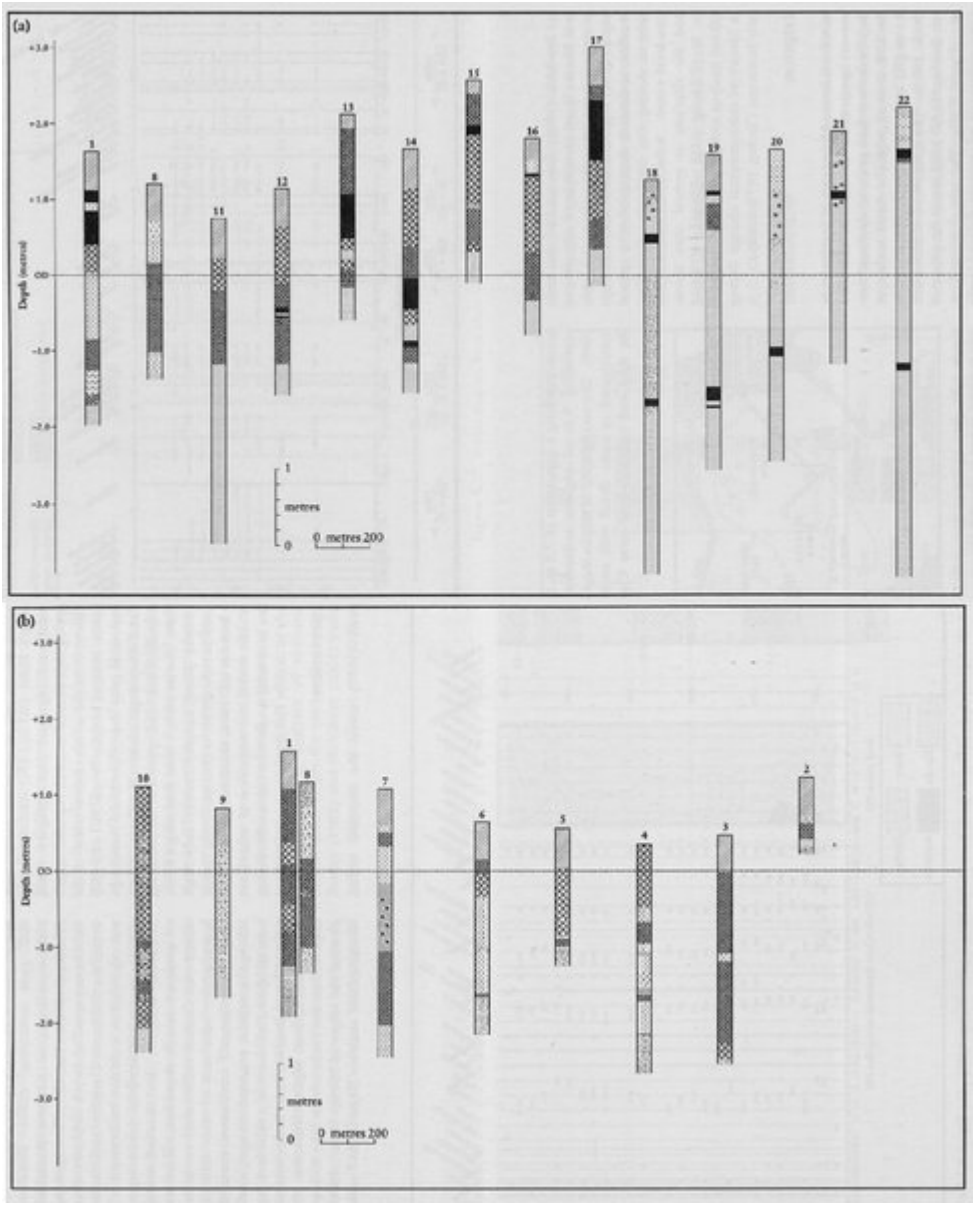
Conclusions

Martin Mere is an important site for elucidating the geomorphology and environmental history during the Holocene Epoch in south-west Lancashire. Martin Mere is a former lake drained in AD 1692, which has yielded important data on the sea-level and vegetation history of the area. The volume of stratigraphical data provides particularly detailed evidence of the evolution of adjacent tidal-flat, lagoonal and perimarine environments, making this site of crucial importance. Detailed pollen records demonstrate the sequence of woodland colonization during the early Holocene. Today Martin Mere is a shadow of it's former glory, drained and utilized for agriculture with little open water remaining and the sediments are buried beneath gley podsols with peaty or humose topsoils.

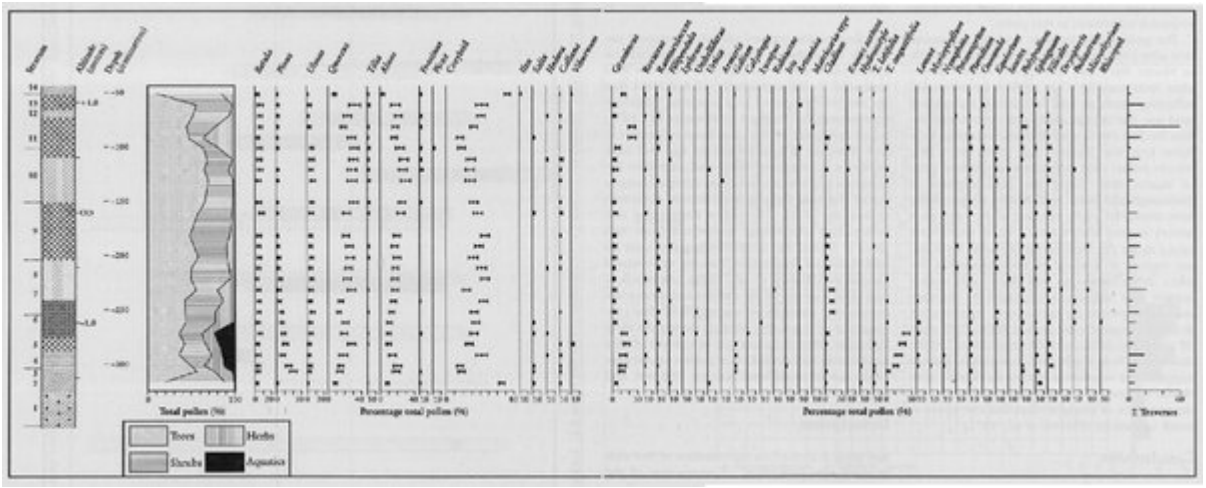
References



(Figure 8.18) Map of Martin Mere, with location of core transects shown in (Figure 8.19).



(Figure 8.19) Stratigraphical borings across Martin Mere (after Tooley, 1985). Symbols are according to Troels-Smith (1955) (see (Figure 8.1)). Location shown in (Figure 8.18).



(Figure 8.20) A percentage pollen diagram from Martin Mere 1 (after Tooley, 1985). See (Figure 8.1) for key to stratigraphical log.