

Recently Discovered Trackways in Swansea Bay

ANDY SHERMAN
Glamorgan-Gwent Archaeological Trust

Over the last seventeen years, fieldwork in the western half of Swansea Bay (in this case taken to be the area between the River Tawe and Mumbles Head) has identified four discreet peat shelves (see Figures 1 and 2). In 1993, a series of archaeological features were noted eroding out of the Brynmill upper peat shelf, including a brushwood trackway of late Iron Age or early Roman date and a tangential plank (see Figures 3 and 4). A second trackway was reported eroding out of the lower peat shelf at Brynmill in 2009. This trackway was dated to the middle Bronze Age (see Figure 5).

In 2009, an undated trackway was identified as eroding out of the Oystermouth peat shelf and a second trackway dating to the late Bronze Age was identified early in 2010 eroding out of the same peat shelf (see Figure 6).

This report discusses the peat topography of Swansea Bay, giving a brief overview of the historic observations of peat shelves and submerged forests in the bay before describing the seven probable trackways recorded from the Brynmill and Oystermouth peat shelves. This is the first time that all of these discoveries have been discussed in detail, drawing together over a century's worth of archaeological investigation into the prehistory of Swansea Bay.

The peat topography of Swansea Bay: historic observations

In a description of Oystermouth given by Isaac Hamon to Edward Lhuyd in 1697, during the latter's compilation of his geographical dictionary of Wales, Hamon wrote:

‘The sea hath encroached upon a great part of the low grounds of this parish, as appears by the roots of trees, and whole trees that lyes in the sands’ (Gabb 1986: 23). Whilst this observation is given in relation to local legends of major flooding of former farmland in Swansea Bay in the early seventeenth century, it undoubtedly represents an early observation of an exposed prehistoric submerged forest (Nayling 1998). With the creation or expansion of the dock facilities at Swansea (Moggridge 1856) and Port Talbot (Strahan 1907), deeply buried peats were recorded systematically for the first time (Nayling 1998). For the Swansea south dock peats, Moggridge records that the ‘sections exposed varied greatly in different parts of the cuttings’ (p. 169); the succession that he chose to publish in detail was at the north-eastern end of the main basin. This he recorded as:

1. Made ground, sand and loose gravel of variable thickness from 20 feet to 6 feet
2. Peat, with leaves, trees etc., 2 feet

3. Blue marine clay, 8 feet 6 inches
4. Peat of rather greater density than no. 2, 10 inches
5. Blue marine clay, 4 feet 1 inch
6. Peat with trees, 3 feet 1 inch
7. Brown clay and gravel, not penetrated

Elsewhere he noted four layers of peat and four layers of clay (Evans and Marvell 2000: 5).

The growth of the town of Swansea also provided opportunities to observe peat horizons that had accumulated over glacial drift along the edge of the hard geology of Swansea's hilly hinterland. In 1892–3, 'Trunks of oak and other trees, hazel wood and nuts, Fern roots and seeds, found at Swansea Gas works in peat 25 feet (7.62m) under the surface' were presented to the museum of the Royal Institute of South Wales (RISW 1893: 38). Stevens (1930) outlined a sequence of deposits including 1ft 6in (0.49m) of peat overlying clay and underlying 5ft (1.52m) of made ground near the west end of the London Midland and Scottish Railway goods shed at Victoria Station (Nayling 1998), located at approximately NGR SS 6565 9270. Intertidal exposures of the uppermost of these peat horizons were briefly described in the late 1920s. Cundall and Landman (1925: 20) noted exposures of 'submerged tree stools rooted in deep black soil' particularly at Blackpill and West Cross but also extending throughout the area of Swansea Bay exposed at low tide. Rider and Trueman (1929: 16) described a submerged forest in Swansea Bay exposed just below the high water mark, with roots and stumps of trees in the position of growth. George (1930) summarized the overall sequence of the 'Submerged Forest' in Swansea Bay as an introduction to an early description of exposures in Gower. Drawing on evidence from the foreshore where the 'Forest Bed' was described as extending 'but a short way towards the sea', usually only 6–8 yards (5.49–7.32m). A recurrent feature of this horizon was the quantity of wood, with George giving identifications of alder, birch, elder and hazel. Von Post (1933) carried out the first pollen studies of these deposits from foreshore boreholes at Blackpill (Nayling 1998).

During the construction of a new main trunk sewer, two observers recorded peat exposures between Mumbles in the south-west and Clydach in the north-east between 1932 and 1935. Cole (1934) described peat exposed in excavations in the north-east corner of the Recreation Ground, near Brynmill Lane as a 5ft (1.52m) thickness of peat and tree trunks overlying clay and underlying 7ft 6in (2.32m) of sand and loam. George (1936) recorded the exposed geology in open excavations and manholes between tunnelled sections, and described boreholes taken along the route. His descriptions, for the first time, began to provide sufficient detail to allow the reconstruction of the extent and distribution of these peat beds in the western part of the bay between Mumbles and the River Tawe (Nayling 1998). The estimated landward extent of these peats as given by George and plotted by Nayling can be seen in Figures 1 and 2.

George (1936) suggests that the peats of Swansea Bay form a nearly horizontal bed that thins and disappears against even very gentle rises of drift, with the landward extent of the peat being close to his line of excavation, and that absences or thinning of the peat may in places be explained by the former action of the Clyne River at Blackpill, along the line of the Vivian Stream (e.g. BH10; see Figure 1), and localized rises in the underlying glacial drift (e.g. BH06). He argues for a former landscape comprised of a hinterland of rising ground, the shore a considerable distance seaward of the present, probably made

of dunes of blown sand which restricted free drainage, thus encouraging peat growth. Penniman believed that, on the basis of finds he had excavated, this dune system was formed sometime between the Bronze Age and the Roman occupation of Wales (Penniman 1938).

Godwin (1940) carried out analysis of samples from an exceptionally deep peat bed at Crymlyn Bog and a run of boreholes taken in 1931 adjacent to the east end of King's Dock, Swansea. He linked these findings to the peat beds analysed by von Post (1933) at Blackpill, George's earlier work (George 1936; George and Griffiths 1938) and early observations at North Dock, Swansea (Moggridge 1856) and Port Talbot (Strahan 1907). Godwin concluded that these horizons could be correlated with beds at similar depths, indicating eight or nine levels dating from the pre-Boreal onwards reflecting periods of standstill or slight inversion of a general marine transgression (Nayling 1998). He especially notes the tendency for there to be one peat bed located around +8ft to +10ft (2.47m to 3.05m) OD and another just below ordnance datum.

Pringle and George (1948: 96; Figure 29) described post-glacial deposits in Swansea Bay as the Submerged Forest Series and illustrated seven vertical sections within the study area from West Cross, St Helens, the mouth of the Tawe, Swansea's North Dock, Crymlyn Bog, Port Talbot Dock and Aberavon (Nayling 1998). Culver (1976) used foraminiferal analysis of samples (from onshore and offshore drilling and offshore gravity coring) to further interpretation of the post-glacial development of the Swansea Bay area, identifying for the first time deeply buried peats lying between two deep rock basins, now located underwater, off Mumbles Head. Pollen analysis of peat samples from these cores (Culver and Bull 1979), along with the analyses carried out by previous workers form the main dating framework through zonation of the Flandrian sequence of sea level rise and alluvial accretion within Swansea Bay (see Table 1), supplemented by a group of radiocarbon dates from the Port Talbot sequence (Godwin and Willis 1964). The Port Talbot peat bed was found 60–65ft (18.29–19.81m) below ordnance datum, with the bottom of the bed dated to 10,000BC (Churchill 1965).

Table 1. Selected peat samples taken from Swansea Bay between 1940 and 1979

Pollen zone	Crymlyn Bog (Godwin 1940)	Boreholes (Godwin 1940)	Crymlyn Bog (James 1971)	Blackpill (von Post 1933)	Sub-tidal core G71 (Culver and Bull 1979)	Sub-tidal core G88 Culver and Bull 1979)	Port Talbot borehole (Godwin and Willis 1964)
VIII							
VIIIb							
VIIa							
VIc							
VIb							
VIa							
V							
IV							
III							
II							

In 1998, four boreholes were excavated across the site of the National Waterfront Museum to the north of the South Dock Basin, with peat identified in each. This peat took the form of (a) discreet layers between deposits of different character, (b) 'bands' within clay deposits and (c) 'traces of peat' within clay deposits. From a sedimentological point of view, there is no difference between types (a) and (b): they both represent the accumulation of vegetable material within a waterlogged environment. Type (c) suggests that peats accumulated in this way were eroded by water action and then redeposited in silts (Evans and Marvell 2000: 5; Thyssen Geotechnical 1998).

The intertidal survey

The 1998 intertidal survey of Swansea Bay identified six areas of exposed peat shelf in the bay area (see Figures 1 and 2). The number of the peat shelves follows that of Nayling (1998).

P1: Oystermouth (Figure 2)

A thin exposure of peat was observed running for *c.*150m as a shallow curving crescent with the seaward face of the peat most noticeable as a slight nick point with a drop in the height of the foreshore of approximately 0.2m. The peat was exposed for no more than 0.5m, often less, with the landward edge covered by coarse sediment. The depth of peat seen along the seaward edge did not exceed 0.2m (Nayling 1998: 8).

The outcrop mirrors a deposit of peat observed by George (1936) north of Mumbles, apparently occupying the mouth of the depression in which Oystermouth lies where an outcrop of relatively soft millstone grit has been eroded below the level of the flanking, harder, Carboniferous limestone. The surface level of this peat lay between 1ft (0.30m) and 8ft (2.44m) above OD, up to 3ft (0.9m) thick and was overlain by alluvium (Nayling 1998: 8).

During an assessment of the south-east Wales waterfront, Dunning and Howell (2005) identified a small area of peat (PRN 05801w; see Figure 2) that measured 1m by 0.60m, located a short distance to the south of Nayling's peat bed.

P: Blackpill (Figure 2)*

An exposed submerged forest was reported at Blackpill by Morris in 1964 and George recorded extensive peat deposits just landward of the present coastline in 1936. Dark zones on this part of the foreshore were observed on a number of aerial photographs that could have been peat exposures. No such exposures were observed during fieldwork even though repeated visits were made to the area throughout the duration of the survey. It may be that shifting sand had temporarily obscured these deposits but it seems more probable that recent beach management had led to their partial or total destruction (Nayling 1998: 8).

P2: Brynmill (Figure 1)

The outcrop was clearly visible on aerial photographs as a thin, irregular line of peat, its dark hue in stark contrast to the surrounding sand, close to the high water mark. Overall, the outcrop extends to a maximum of 1.3km with a maximum width of some 30m (Nayling 1998: 9).

Williams (1993a, 1993b) gives a height of 0.68m OD for the surface of this peat exposure. George (1936: 342) recorded an upper peat in one of two boreholes on the site

of the Brynmill outfall with a base height of 8ft above OD (2.4m OD). He correlates this with peat seen in excavations between the Clyne River and Brynmill with a surface height of between 5ft and 15ft above OD (1.5–4.6m OD). A lower peat was also noted in the outfall boreholes with a base height of 4.5–6ft below OD (-1.4m to -1.8m OD) and a thickness of approximately 3ft (0.91m). It seems reasonable to equate the features recorded by Williams in 1993 with the upper peat recorded by George in 1936, although the heights OD are not directly comparable (Nayling 1998: 9).

P3: Brynmill 2 (Figure 1)

During field visits a sheet of peat (covered to the west by sand, to the east by shingle and, landward, to the north by clay) was observed with a thin covering of fine mobile clay. This sheet formed an irregular area of approximately 0.01km² that had not been identified on aerial photographs. The depth of peat appeared thin at approximately 0.1m. Without absolute OD heights, it is not possible to correlate this peat with great confidence with either the 'Upper' or 'Lower' peat observed by George. It is certainly at a lower level than the peat exposed close to the high water mark (Nayling 1998: 9).

P4: Margam (not illustrated)

The most extensive exposure of peat and associated Flandrian deposits on the foreshore of Swansea Bay occurs at Margam on Morfa Beach. This has been the apparent source of a number of stray prehistoric finds. The peat was most clearly defined on a 1991 Geonex sortie that was used to map the exposure extending over 1.3km along the beach (Nayling 1998: 10). At its widest, this peat shelf measures up to 150m in width and has a maximum depth of over 0.50m.

P5: Kenfig (not illustrated)

A less well-defined peat exposure occurs between Sker Point and the Gwely'r Misgyl (Mussel Rock). This suffers from even more severe erosion than the Margam exposure due to the close proximity of mobile, coarse beach sediment concentrated by longitudinal drift and erosion of Sker Point and the Gwely'r Misgyl. The exposure was observed on aerial photographs as a narrow dark band running for a distance of some 150m (Nayling 1998: 11). In 2007, a series of animal hoof prints, probably of cattle, were recorded eroding out of this peat shelf (Evans and Higgins 2008: 7, 11).

The submerged forest

Three substantial areas of submerged forest have been identified in the western half of Swansea Bay, one a short distance to the south-east of the Brynmill peat shelf was identified by Evans in 1993, a second was identified to the south of County Hall in 2008 (Hughes 2008) and a third was identified to the west of the Oystermouth peat shelf in 2010 (Sherman 2010). Samples taken from these tree stools have suggested that this wood included oak, hazel and birch, indicating that for at least part of the time this area was relatively dry (Evans 2003). George (1930) recorded evidence for this submerged forest between Oystermouth station square (NGR SS 61586 88281) to the Vivian or Singleton stream, but estimated that it once extended between Southend (SS 62750 87736) and Swansea docks (SS 65871 92360) and to stretch inland at Sandfields and Oystermouth (Gabb 2006).

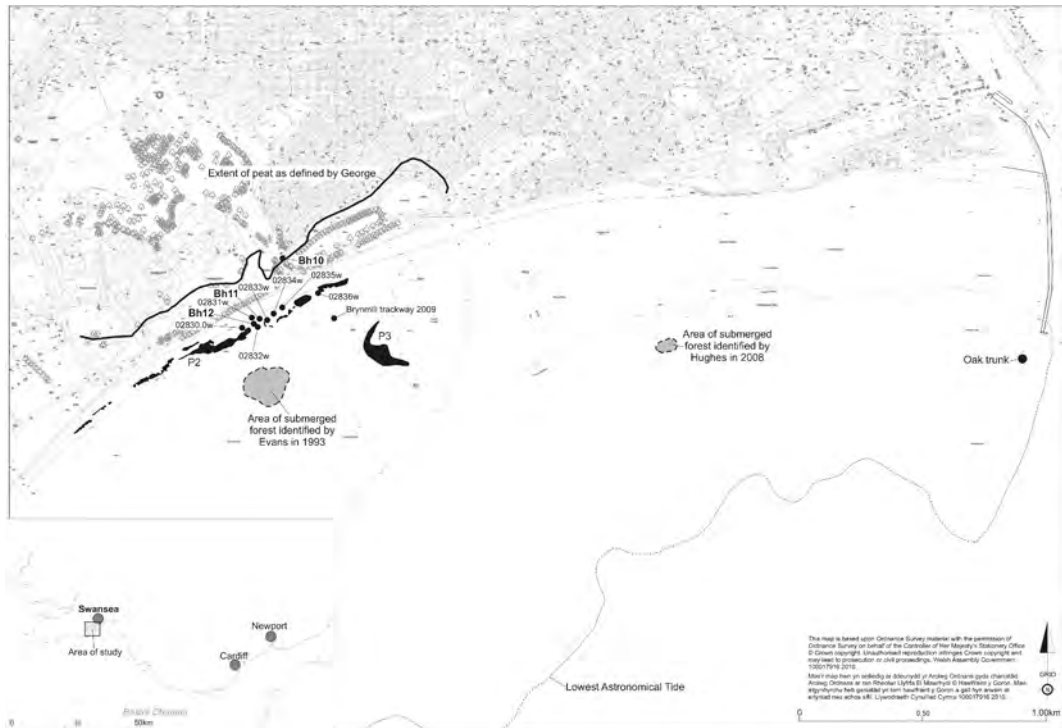


Figure 1.

The timber structures

Brynmill peat shelf

In 1993, Williams conducted an evaluation of the Brynmill upper peat shelf, which identified seven sites of archaeological interest, four of which relate to possible trackways (identified as sites A–D below). In 2008, Brian Price of the Swansea Metal Detecting Club reported the discovery of a wooden structure in the Brynmill lower peat shelf. In 2009, the structure was identified and recorded as a probable hurdle trackway (Sherman 2009).

Site A – Brushwood trackway, PRN 02830.0w (Figures 1 and 3)

A short section of brushwood trackway was located at NGR SS 63308 91722 that measured 2.30m in length and 2.10m wide. It was made up of over eighty pieces of roundwood (wood numbers W01–W65), of which fifteen were not recorded because they were too small or fragmentary. The largest timber W60 measured 1060mm x 35mm, while the smallest timber W63 measured 64mm x 25mm. A total of six pieces (W36, W40, W42, W43, W45 and W60) showed signs of woodworking, and two (W38, W39) showed possible signs of working. Cut marks, or apparent cut marks, on four pieces, appear to be the result of single blows. Timber W39 displayed woodworking in the form of several cuts on its upper surface, but this would appear to represent modern activity. This conclusion

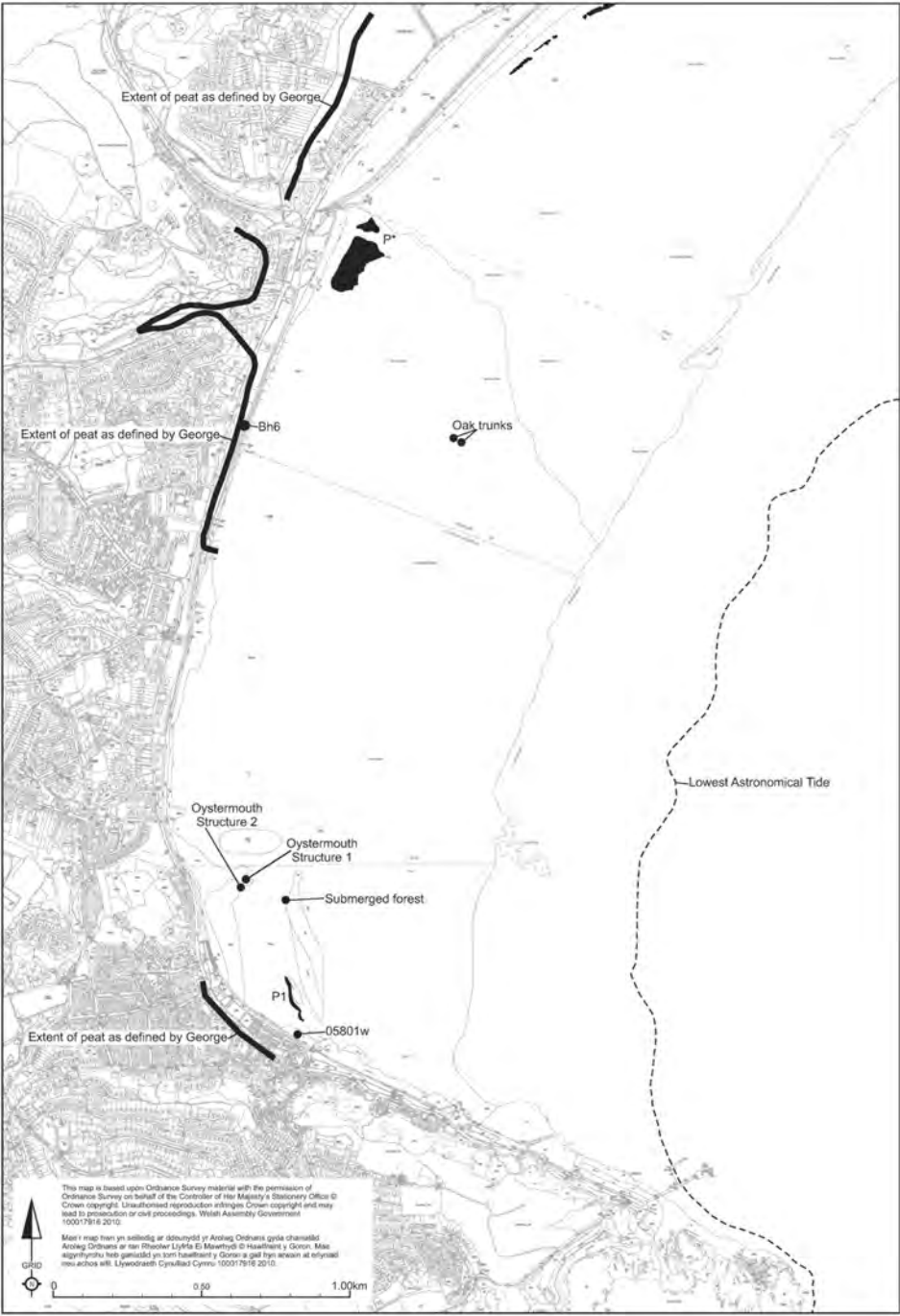


Figure 2.

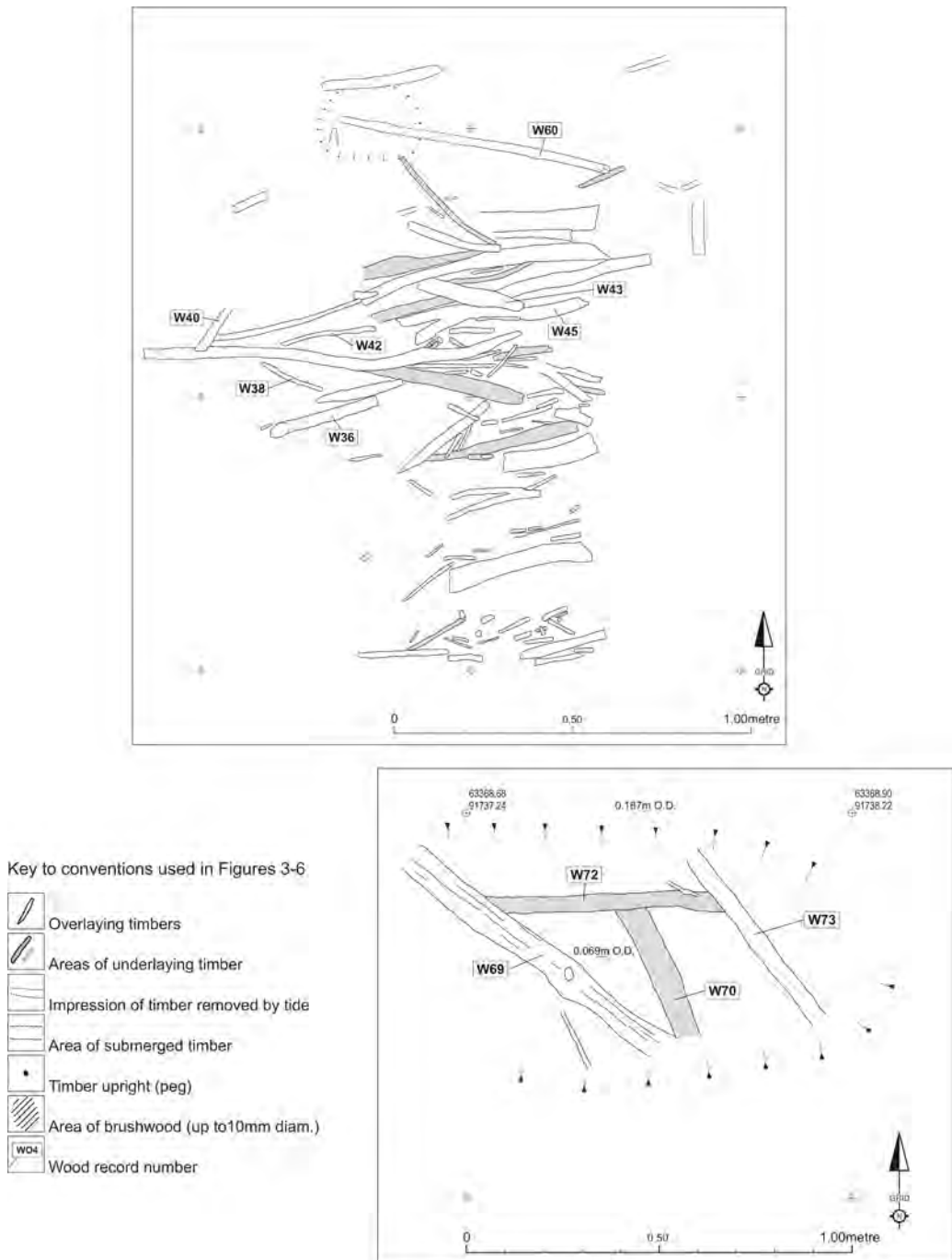


Figure 3.

is reached because the lines of the cut marks on W39 are visible on W40 and W42, suggesting that the marks were made with the trackway *in situ*. Timber W60 showed signs of having been worked in prehistory, with its western end worked into a pencil point, possibly to help peg the trackway down (Williams 1993a: 14).

This section of brushwood produced a radiocarbon determination of 1980 +/- 50 BP (Beta 67930). Calibration using Oxcal version 2.12 and the most recent calibration curve (Stuiver and Kra 1986) gave a probability range of 95 per cent confidence of 103 BC to AD 118 (Nayling 1998: 9).

Site B – PRN 02831w (Figures 1 and 3)

This area consisted of four pieces of roundwood (W69, W70, W72, W73) and was located at NGR SS 6337 9174. The wood was not fully exposed, but one piece (W69) is possibly a half-split piece of roundwood, and has had a side branch removed (Williams 1993a: 14). These timbers were possibly interwoven (*ibid.*: 9).

Site C – PRN 02832w (Figure 1)

Three pieces of timber were recovered from this area: W68, W75 and W76 (not illustrated). Timber W76 was a tangentially converted plank 0.607m in length, 0.133m in width and 0.075m thick. It was aligned east–west, and the western end had been cut into a two-sided point, at an angle of 85°. The second piece, W75 was a roundwood, 0.31m in length, 0.06m in width and 0.04m thick, which had several cut marks. W68 was a small fragment measuring 0.175m x 0.045m x 0.025m that appeared to be a scrap of woodworking debris. The one end had been partially eroded by the sea, while the other end had possibly been axed (Williams 1993a: 14).

Site D – Tangential plank W66, PRN 02833w (Figures 1 and 4)

To the east of the Brynmill outfall, a tangentially converted plank (W66) was found lying on a north-south alignment at NGR SS 63414 91758. It was 1.70m in length, had a maximum width of 0.27m and a maximum thickness of 0.05m. The plank had two possible mortise holes cut into it: the southern mortise was sub-circular, measured 0.046m x 0.052m and showed no signs of working (Williams 1993b). The potential northern mortise was extremely worn and again showed no signs of working.

At the southern end of the plank was a cross-cut, cut 0.06m into the plank, on its western side. No tool marks were visible but the regularity of the cross-cut suggested the possible use of a pull saw, a type of saw used in the later Iron Age. No usage could be assigned to this artefact due to its degraded nature (Williams 1993a: 15).

The 2009 Brynmill Trackway (Figures 1 and 5)

The trackway was orientated north-west–south-east, with an exposed length of 2.18m and could be traced for a further 0.14m under the marine clay. The structure had a maximum exposed diameter of 1.72m and narrowed towards its north-eastern end to a projected width of 0.63m. The sub-structure of the trackway was constructed from parallel roundwood laterals, all of which had small side branches removed. The north-eastern lateral consisted of a single roundwood (W04) that measured 849mm in length and 25mm in diameter; whilst the south-eastern lateral consisted of a roundwood (W02) with an exposed length of 923mm and a maximum diameter of 31mm. Timber W02 was traced for a further 140mm to the north-east under the marine clay. The traces of a

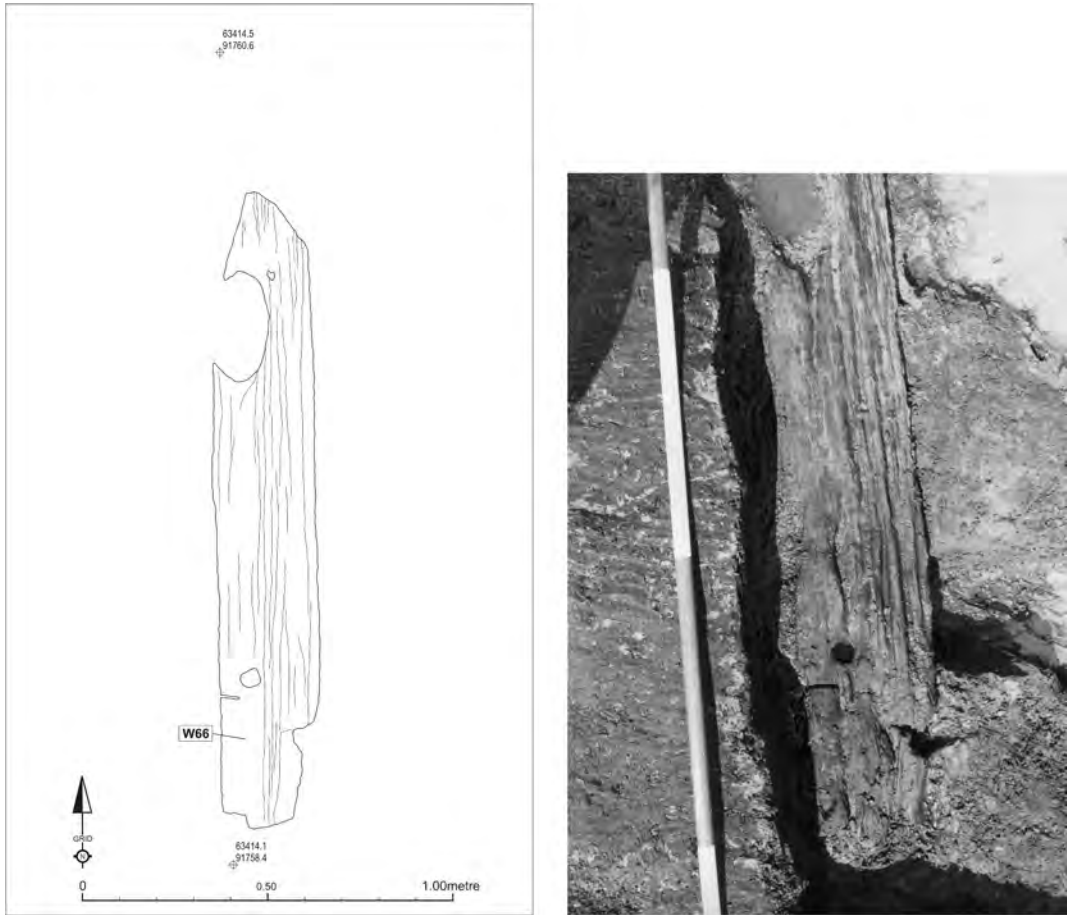


Figure 4.

second roundwood with a maximum diameter of 40mm, forming part of the south-eastern lateral, could be followed in the marine clay for a distance of 0.37m.

Running parallel to timbers W02 and W04, down the centre of the structure was a possible third lateral (W03). Timber W03 measured 283mm in length and 29mm in diameter; unfortunately, as this timber was broken at both ends, it is not possible to tell if it ran the entire length of the trackway.

A single large roundwood (W01) was orientated at 90° to these laterals, overlying timber W02. Roundwood W01 measured 89mm in diameter at the south-eastern end, with an overall length of 1070mm, and tapered to an un-worked point with a width of 39mm. A 6mm deep, V-shaped notch with a gently sloping southern edge and a vertical northern edge had been cut into the roundwood, 345mm from the south-eastern end.

Partially underlying the north-eastern lateral W04 was a roundwood timber (W06) that extended 0.35m to the north-west of the structure, under the surface of the marine clay. Roundwood W06 had been worked to a wedge point and measured 466mm in length and 21mm in diameter.

Overlying the north-western end of the structure was a deposit of brushwood, orientated at right angles to the lateral roundwoods. The brushwood within this deposit measured between 1mm and 44mm in diameter and between 51mm and 310mm in length. Unfortunately, none of the surviving brushwood overlay both the north-eastern and south-western laterals; however a number of the brushwood elements appeared to be interwoven around one or other of the laterals. There was no evidence for any of the brushwood being fully wrapped around the laterals as seen in some upright hurdle panels. Located 0.56m from the north-western end of the brushwood deposit was a roundwood (W07) that measured 305mm in length and 25mm in diameter, which had been worked to a chisel point on one side. This roundwood appeared to have been inserted vertically through the brushwood into the underlying marine clay.

Two samples of brushwood (B01 and B14, not illustrated) and three of the larger timbers (W01, W04 and W07) were examined for species identification, seasonality, growth pattern and the number of growth rings at the Palaeoenvironmental Research Centre, University of Wales, Trinity Saint David. The three rods (W01, B01 and B14) and peg (W07) proved to be oak (*Quercus sp*) and the sail (W04) was alder (*Alnus glutinosa*). Two of the rods (B01 and B14), the peg and the sail were fast grown, while the other rod (W01) had a more variable growth pattern. Bark was present and all the wood displayed a narrow final annual growth ring. In the oak the large early vessels, which are formed at the start of the growing season, were present and the small late vessels were absent, apart from in B01 where the beginning of late vessel formation was visible. Although the narrow final growth rings could indicate less favourable growth conditions and little or no growth later in the season, generally the presence of earlywood and absence of latewood in oak suggests summer cutting. Alder is a diffuse porous wood and there is not the same clear division between earlywood and latewood. Identification of the cutting season must therefore be treated with more caution. However, in the case of the alder and three of the oak (B01, B14 and W07), the narrow final ring followed a wide penultimate ring (which indicates fast growth). This tends to support the view that the wood was cut in the summer before the whole annual ring had formed, rather than the winter. Interpretation of the final oak rod (W01) was less certain because the last two growth rings were both narrow. The appearance of the final ring suggested summer cutting but the narrow penultimate ring and other narrow rings indicated that the tree had been subject to periods of slow growth. The age of this rod, thirteen years as opposed to six to seven years (the rod (B14) that was slightly less than a half-split was probably also around this age), was also greater than that for the other pieces of wood. It is therefore possible that W01 came from a slightly different area of woodland. The results must, however, be treated with a degree of caution because of the small sample size (Caseldine and Griffiths 2009). A sample from timber W04 was sent to the Beta Analytic Radiocarbon Dating Laboratory in Florida. This sample was dated to Cal BC 2140 to 1930 (Cal BP 4090 to 3880) with a 2 Sigma Calibration (Beta: 257022), see Appendix 1.

Oystermouth structures

In the later summer of 2009, John Player of the Swansea Metal Detecting Club reported the discovery of a wooden structure (Structure 1) eroding from a previously unidentified area of the Oystermouth peat shelf, some 360m to the north-west of the area identified by

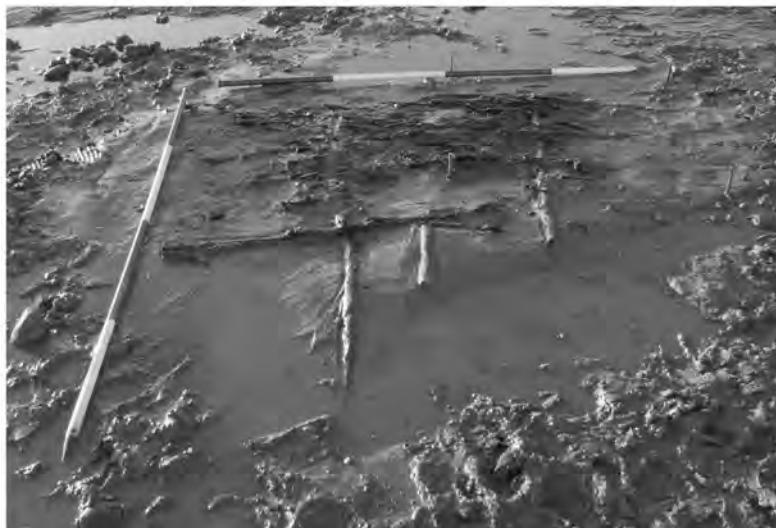
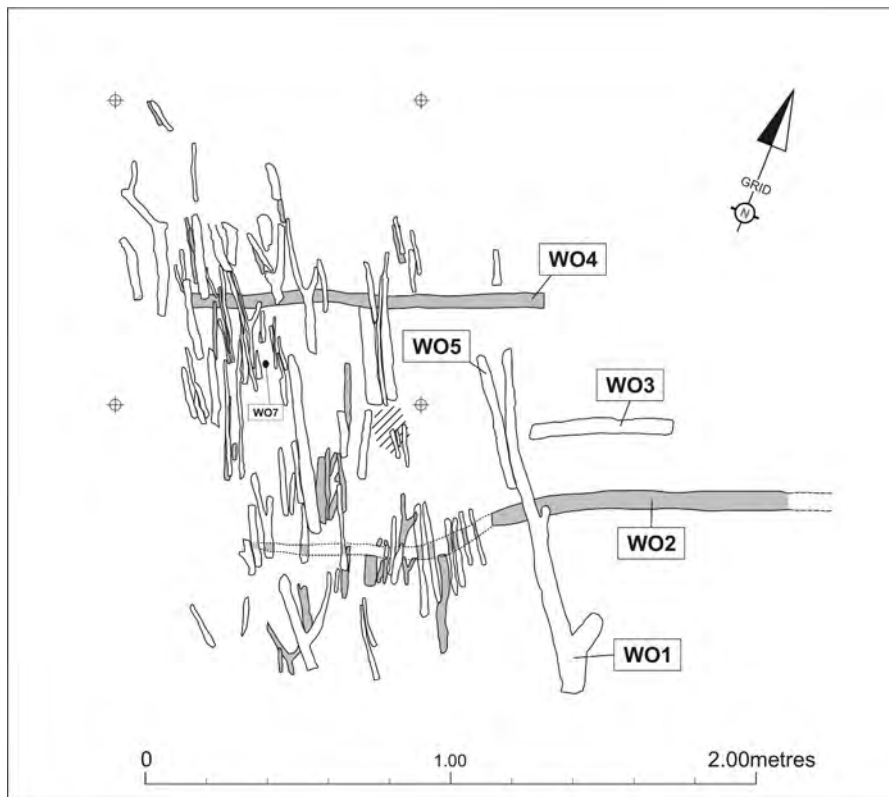


Figure 5.

Nayling (1998). A series of site visits were conducted to the area and in October 2009 some basic recording of this feature was conducted. In January 2010, fieldwork was organized to record this structure in more detail; however, it was discovered that the feature had been covered by sand during winter storms. A search of the surrounding area revealed a second timber feature (Structure 2) that may have formed part of the original feature.

Structure 1 (Figures 2 and 6)

Structure 1 consisted of a series of roundwoods and apparently quarter-split timbers, orientated east-west. The largest exposed timber measured 2.40m in length and 0.08m in diameter. Overlying these timbers was a possible plank, orientated in a north-south direction. The exposed structure measures approximately 3m in an east-west direction and 5m in a north-south direction. This feature was photographed but was not planned. Noted in close proximity to this structure were a series of vertical, roundwood timbers with a maximum diameter of 0.08m. One of these timbers still had intact bark. It was not possible to say whether these timbers were related to the structure or formed part of a submarine forest. (See Figure 6.)

Structure 2 (Figures 2 and 6)

The exposed area of the second structure consisted of five roundwoods (W200 – W203 and W205) aligned north-south and a radial split timber (W204).

Table 2. Roundwood dimensions in Oystermouth peat shelf Structure 2

Wood number	Length	Width	Depth	Grain ¹
W200	0.36m	0.06m	Unknown	1
W201	1.46m	0.10m	Unknown	3
W202	1.54m	0.17m	0.09m	4
W203	0.17m	0.03m	Unknown	1
W205	0.25m	0.04m	Unknown	2

¹ A subjective rating was used to assess the straightness of grain ranging from 1–4 (straight–knotty)

Timbers W201 and W202 were half-split roundwoods that had been laid with their split-faces uppermost. There was no other evidence for woodworking on these timbers. Small samples from timbers W202 and W203 were sent to the University of Wales, Trinity Saint David for species identification, and both were identified as alder (*Alnus glutinosa*) (Caseldine, p. 16 below).

The triangular-shaped, radial-split timber (W204) had a length of 0.08m, a maximum width of 0.06m and a minimum width of 0.03m. The structure as a whole measured 1.63m in a north-south direction and 0.67m in an east-west direction. Partially overlying timbers W200 and W203 was a dark brown fibrous peat, which was sampled for biological analysis (see Figure 6).

A single sample from timber W202 was sent to the Beta Analytic. This sample was dated to Cal BC 1040 to 910 (Cal BP 2990 to 2860) with a 2 Sigma Calibration (Beta: 294872), see Appendix 1.

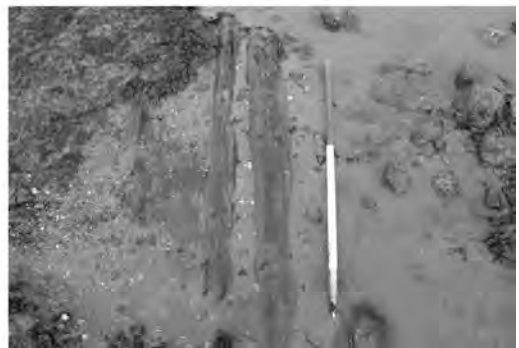
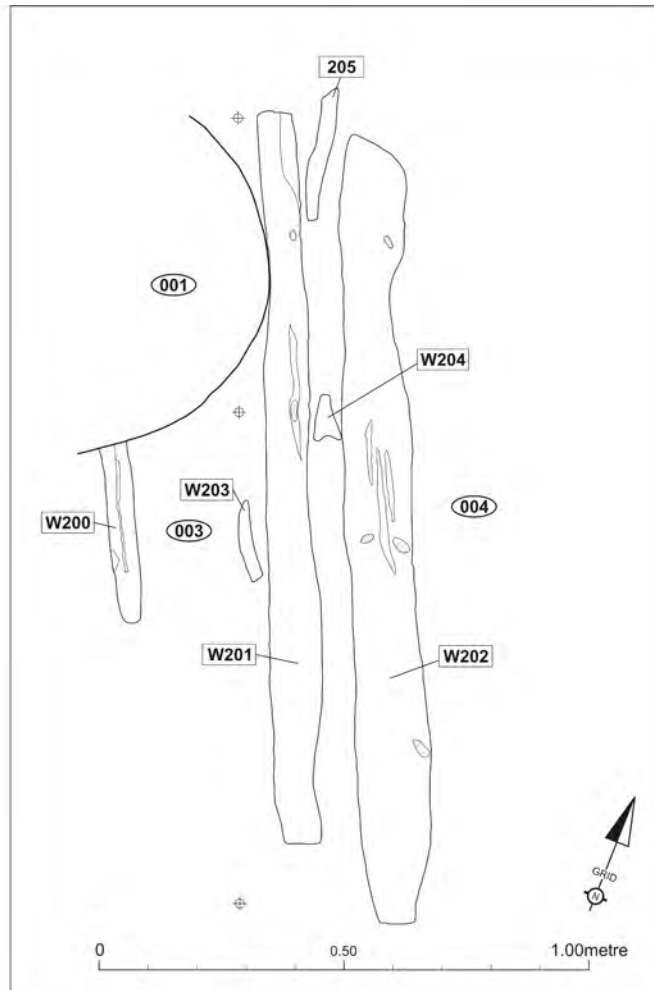


Figure 6.

Environmental analysis by Astrid Caseldine

The main purpose of this investigation was to determine the nature of the local environment post-dating the use of the trackway at Oystermouth. Two peat samples were received for analysis. Sample *101 was from directly over the trackway and sample *102 was from the peat shelf, which was *c.* 10cm deep, 10m to the south of the trackway. A blue-grey alluvial clay underlay the trackway. In addition, two wood samples from the trackway were received for identification.

*Methods**Plant macrofossil analysis*

The samples were sub-sampled and 500ml samples were sieved using a stack of sieves. The finest mesh used was 250 μ m. All fractions greater than 500 μ m were fully sorted and *c.* 5 per cent of the 250 μ m fractions were sorted. The samples were sorted using a Wild M5 stereomicroscope and identification was by reference to modern type material and identification texts (e.g. Berggren 1969, 1981; Schoch et al. 1988; Anderberg 1994; Cappiers et al. 2006). The results are presented in Table 4. Nomenclature is based on Stace (2010). Stace (2010) was also used for ecological information along with other texts, including volumes by Rodwell (1994, 2000).

Wood identification

Thin sections (transverse, transverse longitudinal and radial longitudinal) were cut from the two wood samples to allow examination of the wood anatomy. A Leica DMR microscope with transmitted light source was used to identify the wood. Identification was by reference to Schweingruber (1978) and Schoch et al. (2004). Ring counts were also made using a stereomicroscope. The results are given in Table 5.

*Results and discussion**Plant macrofossil analysis*

The assemblages from the two samples are very similar. Many of the taxa, including duckweed (*Lemna* spp), water-starworts (*Callitriche* sp), celery-leaved buttercup (*Ranunculus sceleratus*), crowfoots (*Ranunculus* Subgenus *Batrachium*), water-pepper (*Persicaria hydropiper*), water-cress (*Nasturtium officinale*), water-plantains (*Alisma* sp), common spike-rush/slender spike-rush (*Eleocharis palustris*/ *E. uniglumis*), grey club-rush (*Schoenoplectus tabernaemontani*) and bulrushes (*Typha* sp) suggest the presence of shallow water. This view is further supported by the occurrence of stonewort (*Chara*) and ephippium (egg pouch) of water flea (*Daphnia* sp). Other species such as blue water-speedwell (*Veronica anagallis-aquatica*) also occur near water or in marshes while species such as bristle club-rush (*Isolepis setacea*) and sedges (*Carex* spp) are typical of marshes and fens. Docks (*Rumex* spp) can be found in a range of habitats, including damp habitats, as can species such as ragged robin (*Lychnis flos-cuculi*). Although species like tormentil (*Potentilla erecta*) commonly occur in bogs and heaths, and brambles (*Rubus* Subgenus *Rubus*) occupy habitats such as heaths, woods and rough ground, they are also found in fen and swamp.

Common nettle (*Urtica dioica*) may also be found in fen and swamp, although it can occur in a range of other habitats, including cultivated and disturbed ground and is commonly

found where there is nitrogen enrichment as a result of animals defecating. Several other taxa can be associated with cultivated ground, including redshank (*Persicaria maculosa*), fat-hen (*Chenopodium album*) and mints (*Mentha arvensis*/*M. aquatica*), but again these can be found in habitats such as swamp and water-margins. There are, however, a few taxa that are generally not found in wet or damp habitats. Fig-leaved goosefoot (*Chenopodium ficifolium*) is typical of waste and arable ground, while parsley-piert (*Aphanes arvensis*) is usually associated with well-drained cultivated ground. Wood sage (*Teucrium scorodonia*) also likes well-drained ground and is found in woods and dunes. Another species, selfheal (*Prunella vulgaris*), occurs in woodland clearings as well as grassland and rough ground.

Together with the occurrence of reed (*Phragmites australis*) rhizomes, the assemblages suggest the presence of swamp with shallow water and possibly areas of drier fen in the area of the trackway. Several of the taxa, for example celery-leaved crowfoot, wild celery (*Apium graveolens*) and toad rush (*Juncus bufonius*), can tolerate brackish water conditions and, along with others, can be found in saltmarsh but overall the evidence suggests predominantly fresh-water conditions. The presence of taxa indicative of cultivation and other dry-land habitats probably represents material washed in from vegetation communities growing inland.

Wood identification

The wood identified from the trackway was alder (*Alnus glutinosa*), suggesting the exploitation of wet woodland rather than timber brought from dry land woods. The presence of a cone-scale of alder provides further evidence for alder woodland in the area. Unfortunately, the outer edges of the timbers were too poorly preserved to say anything about the season it was cut. One of the timbers (W201) contained *c.*17 growth rings, although the last 10mm were very hard to see, while the other timber (W202) had *c.*23 growth rings. The average ring width of the timbers suggests relatively fast growth.

The trackway is dated to 1040–910 cal BC, somewhat later than the Brynmill hurdle trackway, also in Swansea Bay, dated to 2140–1930 cal BC. At Brynmill there was, once again, evidence that alder woodland was being exploited but oak was also used in its construction (Caseldine and Griffiths 2009). Further east, the boat plank structure at Goldcliff, which was either a trackway made up of reused boat planks or a landing place, dates to *c.*1170 BC (Bell 2000), slightly earlier than the trackway at Oystermouth. The structure lay in a minor palaeochannel within the clay and the analysis of plant remains indicated an environment of mudflats, saltmarsh and reed swamp (Caseldine 2000), perhaps not dissimilar to that when the trackway at Oystermouth was constructed, although no samples have been analysed to confirm this.

Discussion

Throughout the Bronze and Iron Ages the wetland fringes of Swansea Bay would have been exploited for a wide range of resources. In a western European context for example, wetlands, such as reed swamps, can have a projected primary productivity of up to four times the amounts for temperate oak woodland, boreal forests and temperate grasslands (Van de Noort and Fletcher 2000). Although it should be noted that the primary productivity of different wetlands will vary depending on the amount of nutrients entering into them.

The number of structures recovered from Swansea Bay, especially on the Brynmill Peat shelf, suggests that these resources were routinely exploited. However, given the heavily eroded nature of some of the features and the limited areas of excavation, it is difficult to state conclusively how these resources were exploited.

The short section of brushwood trackway recorded from the Brynmill peat shelf in 1993 is similar to those excavated in the Somerset Levels, such as the Honeygore and Tinney's Ground trackways (Coles and Hibbert 1975; Coles and Orme 1978), and Ireland, such as Corlea 8 and 9 (Raftery 1996) dating to the Neolithic and Bronze Age. Whilst the Goldcliff Trackways 1 and 8 do date to the Iron Age, with a radiocarbon date of 2260 $\pm$ 60BP being produced for Trackway 1 (Bell 1992). However, all of these trackways were constructed in a more robust fashion than the Brynmill trackway, with longitudinal roundwoods underlying the brushwood for extra stability and vertical pegs to hold them in place. The Brynmill trackway appears to have been constructed by bundles of brushwood simply being placed on the ground surface, perhaps suggesting a more temporary structure. While little remains of sites B and C from the Brynmill peat shelf they too could be the remains of brushwood trackways.

It is not possible to provide a conclusive use for the tangential plank W66 (Site D, PRN 02833w), however, given the possible presence of a tool mark from an Iron Age pull saw and the date of the brushwood trackway, it may form part of an Iron Age road. In these trackways, planks were placed on longitudinal runners, with these planks secured by pegs hammered through mortises cut into their ends (Raftery 1996).

The small hurdle panel recorded from the Brynmill peat shelf in 2009 was constructed from brushwood with a wide range of diameters and included two half-split timbers and a number of Y-shaped elements within its construction. This would appear to suggest that the timber used to create the hurdle came from what was close to hand, rather than coming from a managed environment or pre-prepared stock of timber. The species analysis of the timber within the hurdle panel was identified as oak and alder. Although the analysis of the timbers' growth rings has to be treated with a degree of caution due to the small sample size, the five timbers would appear to have been cut during the summer. The variation in the age of the timbers at felling (three timbers were aged between six and seven years, with two probably being aged around thirteen), and species within the sample group seem to support the theory that the structure was constructed from suitable material in the local vicinity rather than a pre-prepared source. As the panel was pegged down, it suggests that it was designed to stay in place for some time. However, given the heavily eroded nature of the feature it is difficult to say whether it formed part of a larger trackway or was a single panel covering a particularly wet area of ground.

A similar, though more robustly constructed, Bronze Age hurdle trackway (PRN 038980.0g) was excavated in 1985 from the intertidal zone, in the Chapeltump area of the Caldicot Levels. The section of hurdle at Chapeltump was discovered to have a complicated structure with rods bent over and under the end sails, in order to strengthen its edge. A further layer of rods was placed evenly in a layer on top of the bent rods, crossways in east/west directions. Other rods were woven in a random manner into the main structure. The north end of this hurdle differed from its own central sections, which consisted of a single woven hurdle with the sails ranging between *c.*0.25m and 0.35m apart. The rods were woven alternatively over and under the sails but with some irregularities. Both hurdles were covered with fine brushwood and leaves (Trett 1988). Locock et al. suggest (2000: 24–5) that perhaps the location of the Upton Trackway within the silt

fills of a creek rather than on a dry peat shelf necessitated this method of construction, while the less robust construction technique of the Brynmill hurdle perhaps suggests it was constructed in a less abrasive environment than the Chapeltump trackway.

Only limited conclusions can be reached about the two structures recorded from the Oystermouth peat shelf. Their similarity in construction, with roundwoods, quarter-split and half-split timbers placed directly on the surface across the presumed axis of the trackway, along with their proximity could suggest that they form part of the same structure, but it is not certain whether this structure is a trackway or large platform.

A series of metallic objects dating to the Bronze and Iron Ages have been recovered from the western half of Swansea Bay (including Bronze Age sword: PRN 00912w and 03192w; socketed axe: 02963w; rapier: NPRN 41131; mid-rib dagger: 33451; gold hair ring: 195291 and Iron Age spear head: 02962w). Green (1985) believes that these artefacts, in particular the leaf-shaped sword (00912w) demonstrate the importance of this area of south Wales during the Bronze Age.

This find, if considered with the local Pennard and Ffynnonhau hoards ... indicates an importance for south Wales as a staging post on the lines of communication which clearly existed between the Continent, southeast England and Ireland at this phase of the Bronze Age. (285)

The evidence for Bronze Age ritual activity in the Swansea area is unusually limited: the Cefn Coed/Townhill ridge has only a single dubious place-name site, and Kilvey Hill only a very few cairns in spite of being about the same size as Harding Down (the smallest ridge on the Gower, which boasts a fine collection of Bronze Age monuments). This would seem to be a real distinction and not due to accidents of survival, since Townhill was enclosed only in 1762 and some antiquarian account would be expected if there had been any significant numbers of monuments there (RCAHMW 1976: 53).

The evidence for domestic occupation from the Swansea area in the Bronze and Iron Ages is similarly limited. The closest known settlement dating to the Bronze Age, was recorded in 1969 on Coltshill, near Mumbles approximately 700m from the coast of Swansea Bay. The excavation of an early Bronze Age cairn in advance of road construction discovered evidence for occupation in the form of postholes and a hearth of a structure about 30 feet (*c.* 9.10m) in diameter along with sherds of pottery (Savory 1969). A single, undecorated sherd of abraded prehistoric pottery was also recovered from the centre of Swansea during excavations in advance of the redevelopment of the lower Wind Street area. Jody Deacon of National Museum Wales tentatively identified this as being a sherd of an early Bronze Age collared or cordoned urn (Deacon 2006: 64). There is even less evidence for Iron Age occupation in the Swansea Bay area, apart from the isolated metal finds and the hillforts dominating the uplands to the east of Port Talbot.

However, if the model that applies at Goldcliff, Redwick and Greenmoor Arch (an inland site where three Iron Age buildings and associated trackways were constructed on dry hummocks) applies in Swansea Bay, then it is possible that Bronze and Iron Age houses lie in close proximity to the trackways excavated from the Brynmill and Oystermouth peat shelves (Bell 1993: Locock 1999). Indeed, the row of worked, possible oak timbers (temporary PRN: ELG041) recorded eroding out of the upper Brynmill peat shelf in February of this year during the Arfodir Coastal Heritage project could represent just such a structure (Graham 2011: 64).

The presence of the common nettle in the prehistoric environment and its association with defecating animals may suggest the presence of cattle in the local area; this theory is supported by the discovery of cattle hoof prints preserved in the Kenfig peat shelf (Evans and Higgins 2008). It is possible that the trackways recorded from Swansea Bay were used to move cattle around the wetland environment as has been suggested tentatively for trackways recorded in the Humber wetlands (Van de Noort 2000).

The three trackways recorded in the twentieth century from Swansea Bay have been dated conclusively to the Bronze Age and the late Iron Age/early Roman occupation of Wales. This would suggest that the bay was a heavily exploited landscape in prehistory and might explain why limited evidence for Bronze and Iron Age settlement has been discovered in the area of urban Swansea. The environmental evidence recovered from the Oystermouth peat shelf suggests that the environment shortly after the construction of the second Oystermouth structure was dominated by areas of shallow water possibly interspersed by areas of drier, higher ground. It is possible that the trackways were built to link these areas of drier land together as in the Somerset Levels. The landscape suggested by the environmental analysis is similar to that identified at Greenmoor Arch, where buildings were constructed on the higher, drier islands and it is not unreasonable to suggest that buildings associated with the recorded trackways could be discovered in Swansea Bay. Therefore, it would be prudent to consider contingency plans should one or more buildings be revealed: as noted above, these structures can be eroded quickly and it is important to act quickly in the likely event of more sites being discovered.

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Bibliography

- Anderberg, A.-L. 1994. *Atlas of Seeds and Small Fruits of Northwest-European Plant Species with Morphological Descriptions Part 4 Resedaceae-Umbelliferae* (Stockholm Swedish Museum of Natural History).
- Bell, M. 1992. Field survey and excavation at Goldcliff, Gwent, 1992, *Archaeology in the Severn Estuary*, 3, 15–29.
- Bell, M. 1993. Field survey and excavation at Goldcliff, Gwent, 1993, *Archaeology in the Severn Estuary*, 4, 83–101.
- Bell, M. 2000. Boat planks of c.1170 BC, in M. Bell, A. Caseldine and H. Neumann, *Prehistoric Intertidal Archaeology in the Welsh Severn Estuary*, CBA research report, 120, 74–82.
- Berggren, G. 1969. *Atlas of Seeds and Small Fruits Northwest-European Plant Species with Morphological Descriptions Part 2 Cyperaceae* (Stockholm).
- Berggren, G. 1981. *Atlas of Seeds and Small Fruits Northwest-European Plant Species with Morphological Descriptions Part 3 Salicaceae-Cruciferae* (Arlow).
- Cappers, R. T. J., Bekker, R. M. and Jans, J. E. A. 2006. *Digital Seed Atlas of the Netherlands*, Groningen Archaeological Studies, 4, www.seedatlas.nl (accessed January 2011).
- Caseldine, A. E. 2000. The vegetation history of the Goldcliff area, in M. Bell, A. Caseldine and H. Neumann, *Prehistoric Intertidal Archaeology in the Welsh Severn Estuary*, CBA research report, 120, 208–44.
- Caseldine, A. E. and Griffiths, C. J. 2009. Species identification, in A. Sherman, *Emergency Recording of Timber Feature Off Brynmill, Swansea Bay* (Swansea).
- Churchill, D. M. 1965. The displacement of deposits formed at sea level 6500 years ago in southern Britain, *Quaternaria*, 7, 239–49.
- Cole, L. C. H. 1934. Notes on the ground exposed during the construction of the Swansea new main drainage, *Proceedings of the Swansea Scientific and Naturalists' Society*, 1, 233–4.
- Coles, J. M. and Hibbert, F. A. 1975. The Honeygore complex, *Somerset Levels Papers*, 1, 11–19.
- Coles, J. M. and Orme, B. J. 1978. Multiple trackways from Tinney's Ground, *Somerset Levels Papers*, 4, 47–81.
- Culver, S. J. 1976. *A Study of the Post-glacial Foraminiferida of Swansea Bay, South Wales*, unpublished Ph.D. thesis, University College of Swansea.
- Culver, S. J. and Bull, P. A. 1979. Late Pleistocene rock-basin lakes in south Wales, *Geological Journal*, 14, 2, 107–16.
- Cundall, L. B. and Landman, T. 1925. *Wales: An Economic Geography* (London).
- Deacon, J. 2006. Prehistoric pottery, in S. Sell and A. Sherman, *Excavations on Land between York Street and Wind Street, Swansea*, GGAT report no. 2006/036, 64–5.
- Dunning, R. and Howell, J. K. 2005. *Waterfronts in Southeast Wales: Phase 2, Volume 2, Gazetteer*, GGAT report no. 2005/039.
- Evans, E. M. 2003. *Swansea LANDMAP: Historic Landscape Technical Report*, GGAT report no. 2003/094.
- Evans, E. M. and Higgins, J. 2008. *Kenfig Sands Upper Peat Shelf: Report on the Survey Carried Out in 2007*, GGAT report no. 2008/015.
- Evans, E. M. and Marvell, A. G. 2000. *National Waterfront Museum, Swansea: Archaeological Assessment*, GGAT report no. 2000/034.

- Gabb, G. 1986. *The Story of the Village of Mumbles* (Cowbridge).
- Gabb, G. 2006. *Swansea and its History, Volume 1* (Swansea).
- George, T. N. 1930. The submerged forest of Gower, *Proceedings of the Swansea Scientific and Naturalists' Society*, 1, 100–8.
- George, T. N. 1936. The geology of the Swansea main drainage excavation, *Proceedings of the Swansea Scientific and Naturalists' Society*, 2, 331–60.
- George, T. N. and Griffiths, J. C. 1938. The superficial deposits at the mouth of the River Tawe, *Proceedings of the Swansea Scientific and Field Naturalist' Society*, 2, 63–71.
- Godwin, H. 1940. A Boreal transgression of the sea in Swansea Bay: data for the study of post-glacial history, *New Phytologist*, 39, 308–21.
- Godwin, H. and Willis, E. H. 1964. Cambridge University natural radiocarbon measurements, *Radiocarbon*, 6, 116–37.
- Graham, E. 2011. *GGAT 103: Arfodir Coastal Heritage 2010–11*, GGAT report no. 2011/019.
- Green, H. S. 1985. Four Bronze Age sword-finds from Wales, *Bulletin of the Board of Celtic Studies*, 283–7.
- Hughes, S. 2008. *Archaeological Features near County Hall, Swansea Bay, Curatorial Site Visit*, GGAT report no. 2010/005.
- Locock, M. 1996. *GGAT 50: Coastal Survey (Glamorgan) – Loughor, West Glamorgan to Sker Point, Mid Glamorgan, Part One: Text*, GGAT report no. 96/015.
- Locock, M. 1999. *Archaeological Evaluation (Stage 2) Wilkinson Site Gwent Europark Llandeenny Newport*, GGAT report no. 99/055.
- Locock, M., Trett, R. and Lawler, M. 2000. Further late prehistoric features on the foreshore at Chapelump, Magor, Monmouthshire: Chapelump II and the Upton Trackway, *Studia Celtica*, 34, 17–48.
- Moggridge, M. 1856. On the section exposed in the excavation of the Swansea docks, *Quarterly Journal of the Geological Society of London*, 12, 169–71.
- Morris, B. 1964. The drowned lands of Swansea Bay, *Gower*, 16, 69–71.
- Nayling, N. 1998. *Swansea Bay Intertidal Survey, a Report for Cadw: Welsh Historic Monuments*, GGAT report no. 98/059.
- Penniman, T. K. 1938. Caves and shell-heaps in west Gower, *Proceedings of the Swansea Scientific and Field Naturalists' Society*, 15–17.
- Pringle, J. and George, T. N. 1948. *British Regional Geology: South Wales*, 2nd edn (London).
- Raftery, B. 1996. *Trackway Excavations in the Mountdillon Bogs, Co Longford, 1985–1991*, Irish Archaeological Wetland Unit Transactions, 3.
- RCAHMW. 1976. *An Inventory of the Ancient Monuments in Glamorgan Volume 1: Pre-Norman Part 1: The Stone and Bronze Ages* (Cardiff).
- Rider, S. W. and Trueman, A. E. 1929. *South Wales: A Physical and Economic Geography* (London).
- Rodwell, J. S. 1994. *British Plant Communities Volume 4, Aquatic Communities Swamps and Tall-herbs Fens* (Cambridge).
- Rodwell, J. S. 2000. *British Plant Communities Volume 5, Maritime Communities and Vegetation of Open Habitats* (Cambridge).
- Royal Institute of South Wales (RISW). 1893. *Royal Institute of South Wales Report 1892–1893* (Swansea).
- Savory, H. N. 1969. A forgotten round cairn at Newton, Mumbles, and its excavation, *Gower*, 20, 66–71.

- Schoch, W., Heller, I., Pawlik, B. and Schweingruber, F. H. 1988. *Botanical Macro-remains* (Berne and Stuttgart).
- Schoch, W., Heller, I., Schweingruber, F. H. and Kienast, F. 2004. *Wood Anatomy of Central European Species*, www.woodanatomy.ch (accessed January 2011).
- Schweingruber, F. H. 1978. *Microscopic Wood Anatomy* (Birmensdorf).
- Sherman, A. 2009. *Emergency Recording of Timber Feature Off Brynmill, Swansea Bay, Swansea*, GGAT report no. 2009/015.
- Sherman, A. 2010. *Wooden Structures on the Oystermouth Foreshore, Swansea*, GGAT report no. 2010/062.
- Stace, C. 2010. *New Flora of the British Isles* (Cambridge).
- Stevens, P. G. 1930. A note on the geology of Swansea Bay, *Proceedings of the Swansea Scientific and Field Naturalists' Society*, 1, 31–2.
- Strahan, A. 1907. The geology of the south Wales coalfield, part VIII – the country around Swansea, *Memoirs of the Geological Survey of England and Wales*, sheet 247.
- Stuiver, M. and R. S. Kra, eds, 1986. *Calibration issue, Proceedings of the 12th International 14C Conferences Radiocarbon 28(2B)*, 805–1030.
- Thyssen Geotechnical. 1998. *Proposed Area, Swansea: Ground Investigation Report* report no. A8066.
- Trett, R. 1988. *Site A6: Upton Trackway, Preliminary Report*, Newport Museum accession no. 88.91.
- Van de Noort, R. 2000. Reconstructing past wetland landscapes – two case studies from the Humber Wetlands, *Archaeology in the Severn Estuary*, 11, 163–74.
- Van de Noort, R. and Fletcher, W. 2000. Bronze Age human ecodynamics in the Humber Estuary, G. Bailey, R. Charles and N. Widner (eds), *Human Ecodynamics, Proceedings of the Association for Environmental Archaeology Conference 1998, Held at the University of Newcastle upon Tyne* (Oxford) 47–54.
- von Post, L. 1933. A Gothiglacial transgression of the sea in south Sweden, *Geogr Ann Stockh*, 15.
- Williams, D. N. 1993a. *Archaeological Field Evaluation, Brynmill Peat Shelf, Swansea Bay*, GGAT report no. 93/066.
- Williams, D. N. 1993b. Brynmill, Swansea, Glamorgan, *Archaeology in Wales*, 33, 50.

Appendix 1

Table 3. Details of C14 dates taken from the Brynmill and Oystermouth peat shelves

Sample data	Treatment	Pre-treatment	Measured radiocarbon age	13C/12C ratio	Conventional radiocarbon age (*)	Two sigma calibration
Beta-257022 Sample: *001	AMS- Standard delivery	(Wood): acid/alkali/ acid	3710 +/- 40 BP	-28.1 o/oo	3660 +/- 40 BP	Cal BC 2140 to 1930 (Cal BP 4090 to 3880)
Beta-294875 Sample: GGAT 101	AMS- Standard delivery	(Wood): acid/alkali/ acid	2860 +/-	-27.5 o/oo	2820 +/- 30 BP	Cal BC 1040 to 910 (Cal BP 2990 to 2860)

Appendix 2

Table 4. Waterlogged plant remains from Oystermouth

Sample	101	102	Habitat
Context	001	001	
Sample size (ml)	500	500	
Taxa			
<i>Ranunculus repens</i> type (Creeping buttercup)	2	2	Gw, S, SD, SM, W, WM
<i>Ranunculus sceleratus</i> L (Celery-leaved buttercup)	3	13	A, S, WM
<i>Ranunculus</i> Subgenus <i>Batrachium</i> (DC) A Gray (Crowfoots)	2	1	A, WM
<i>Ranunculus flammula</i> L (Lesser spearwort)	–	1	A, S, SD
<i>Rubus</i> cf. <i>idaeus</i> L (Raspberry)	1	1	H, W
<i>Rubus</i> subgenus <i>Rubus</i> (Bramble)	3	3	D, G, H, S, SD, W
<i>Potentilla erecta</i> (L) Raeusch (Tormentil)	1	2	G, H, S, SD
<i>Aphanes australis</i> Rydb (Slender parsley-piert)	–	1	C
<i>Urtica dioica</i> L (Common nettle)	5	2	C, D, S, SD, SM, W, WM
<i>Viola</i> cf. <i>palustris</i> L Marsh violet	1	1	Hw, S, SD, Ww

cf <i>Viola</i> sp. – fragment (Violets)	–	1	
<i>Alnus glutinosa</i> (L) Gaertn – cone-scale Alder	1	–	S, Ww
<i>Nasturtium officinale</i> W T Aiton (Water-cress)	22	33	A, S, WM
<i>Persicaria maculosa</i> Gray (Redshank)	-	1	C, D, S, SD, WM
<i>Persicaria hydropiper</i> (L) Spach (Water-pepper)	1	1	A, S, WM
<i>Rumex acetosella</i> L (Sheep's sorrel)	-	4	C, G, H
<i>Rumex</i> sp (Docks)	6.5	32	C, D, G, S, SD, SM, WM
<i>Lychnis flos-cuculi</i> L (Ragged robin)	3	28	
Gw, S, SD, SM, w			
<i>Chenopodium ficifolium</i> Smith (Fig-leaved goosefoot)	-	1	C, D
<i>Chenopodium album</i> L – fragment (Fat-hen)	1	-	C, D
<i>Samolus valerandi</i> L (Brookweed)	-	>2	SM, SD
<i>Veronica anagallis-aquatica</i> L (Blue water-speedwell)	1	-	Gw, S, WM
<i>Callitriche</i> sp (Water-starworts)	4	14	
A, S, WM			
<i>Teucrium</i> cf. <i>scorodonia</i> L (Wood sage)	-	1	D, W
<i>Prunella vulgaris</i> L (Selfheal)	-	2	D, G, SD, Wo
<i>Mentha arvensis</i> L/M <i>aquatica</i> L. (Corn mint/Water mint)	-	1	A, C, G, S, SD, Wo, WM
<i>Menyanthes trifoliata</i> L – fragment. (Bogbean)	-	1	H, S
<i>Cirsium palustre</i> (L) Scop/C <i>arvense</i> (L) Scop (Marsh thistle/Creeping thistle)	-	2	C, D, G, S, SD, SM, Wo, WM
<i>Hydrocotyle vulgaris</i> L (Marsh pennywort)	-	1	H, S, SD, SM, WM
<i>Apium graveolens</i> L (Wild celery)	-	1	S, SM, WM
cf <i>Apium repens</i> (Jacq) Lag (Creeping marshwort)	-	1	S, WM
<i>Lemna</i> sp (Duckweeds)	142	114	A, S, WM
<i>Alisma</i> sp (Water-plantains)	5	2	A, S, WM
<i>Typha</i> sp (Bulrushes)	4	4	S, WM
<i>Juncus bufonius</i> L (Toad rush)	>13	>14	S, SD, SM, WM

<i>Juncus</i> sp (Rushes)	>13	>5	Dw, Gw, H, S, Ww, WM
<i>Schoenoplectus tabernaemontani</i> (C Gmelin) Palla Grey club-rush	2	5	A, S, SD
<i>Eleocharis palustris</i> (L) Roemer & Schultes/ <i>E. uniglumis</i> Schultes (Common spike-rush/slender spike-rush)	8	15	A, S, SD, SM, WM
<i>Isolepis setacea</i> (L) R. Br. (Bristle club-rush)	1	–	H, S, SD, WM
<i>Carex</i> spp – biconvex (Sedge)	30	82	A, Gw, S, SD, SM, Ww, WM
<i>Carex</i> spp – trigonous Bud scale	1	5	W
Leaf scar	–	1	W
Moss	–	2	W
<i>Chara</i> sp (Stonewort)	+	+	
<i>Daphnia</i> sp – ephippium (Water flea)	>1	–	A
	–	1	A

Habitat: A = ponds, lakes, ditches, streams, rivers; C = arable, cultivated; D = disturbed, waste ground, etc.; G = grassland; H = bogs, heaths; S = swamp, tall-herb fen, marsh; SD = dune-slack, dunes; SM = salt-marsh; W = woods, scrub, hedges; WM = water-margins; w = damp, wet; o = open ground

Table 5. Wood identification and growth ring data from Oystermouth trackway

Timber number	Species id.	Number of growth rings	Diameter (mm)	Average ring width (mm)
W202	<i>Alnus glutinosa</i>	c.17	75	4.41
W203	<i>Alnus glutinosa</i>	c.23	70	3.04