A LATE HOLOCENE TIDAL PALAEOCHANNEL, REDWICK, GWENT: LATE ROMAN ACTIVITY AND A POSSIBLE EARLY MEDIEVAL FISH TRAP

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The late Holocene palaeochannel exposed intertidally at Redwick is a large structure which cuts down through peats and silts to Pleistocene deposits supporting an early Mesolithic oak forest at the base of the Holocene succession. Striking inland to the north-northeast beneath the seawall, the palaeochannel post-dates the 'main' (Neolithic-Bronze Age) peat of the area and is infilled with a variety of estuarine deposits. Stratified low down in the fill are late Roman pottery sherds and a wooden structure, dating by radiocarbon to the early medieval period, interpreted as a possible fish trap. The fill also yields a little worked wood, thermally fractured pebbles, and quarried stone. The Redwick palaeochannel further demonstrates the importance of saltmarsh creeks to the prehistoric and early historic economy of the Gwent Levels.

Introduction

The now-embanked former coastal marshes known as the Caldicot Level overlie a sequence of Holocene estuarine sediments 10-15 m thick in boreholes (e.g. Locke 1970-71) and intertidal exposures. These deposits, assigned to the Wentlooge Formation (Allen and Rae 1987), consist of a vertical alternation of silts and peats on the scale of a metre or so. The silts bear assemblages of high-intertidal diatoms and foraminifera (e.g. Haslett *et al.* 1997; Druce 1998; Walker *et al.* 1998) and accumulated chiefly on muddy salt marshes. They record times when relative sea level was rising comparatively rapidly (Allen 1990, 1995). In contrast, the peats represent freshwater-dominated marshes at highest intertidal to supratidal levels that existed when sea level was either approximately stable or falling. As each peat environment was transgressed by the sea and replaced by silt marsh, tree-like networks of branching tidal creeks may be expected to have grown and spread within the marshes, chiefly through erosion, only to shrink, infill and largely disappear when peat-forming conditions returned (Allen 1997a).

Recent work has shown that branching, meandering tidal creeks (palaeochannels) are ubiquitous and well-preserved in the Holocene deposits of the Caldicot Level (Bell & Neumann 1997a, Bell *et al.* 2000; Allen 2000), and that these features, with the characters and relationships predicted, occur in association with each peat-silt-peat depositional cycle (Allen 2000). As may be expected from their modern counterparts (Pethick 1992), and as seen in plan and profile in the sediments well-exposed along the coast, the palaeochannels range from gutters no more than a few decimetres in cross-section to substantial trenches many metres deep and in excess of 100 m wide.

It is becoming increasingly clear that such creeks played at many times in the past a vital and varied role in the human exploitation of the Caldicot Level (Allen & Rippon 1997). Here we give further evidence of this in a preliminary account of the geoarchaeology of another major palaeochannel exposed on the coast near Redwick, roughly 12 km east-southeast of Newport. This palaoechannel proves to have been active in late Roman and early medieval times, but is now devoid of any substantial surface expression.

The palaeochannel and its fill

Lying to the southeast of Redwick village, the palaeochannel (P45 of Allen 2000) can be traced north-northeastward for about 500 m across the intertidal zone, from low-water mark to beneath a thin development of modern mud reaching up to the seawall (Fig. 1a, b). Inland from the seawall, the palaeochannel (or a major branch) extends for a short distance as a residual feature in the form of a vague, occasionally flooded depression, along the line of a curving sequence of hedges and drains. Intertidally, the creek cuts a Holocene sequence of pale bluish-green, clayey-sandy silts and at least four intercalated, ledge-forming peats, of which the highest, or 'main' bed, is the thickest (Fig. 1c). Hence the palaeochannel belongs to the youngest set of tidal creek networks to have been formed in the Caldicot Level prior to attempts at embanking. The peats mentined were radiocarbon-dated using samples collected chiefly from within a few hundred metres of the palaeochannel (Fig. 1c, Table 1). The

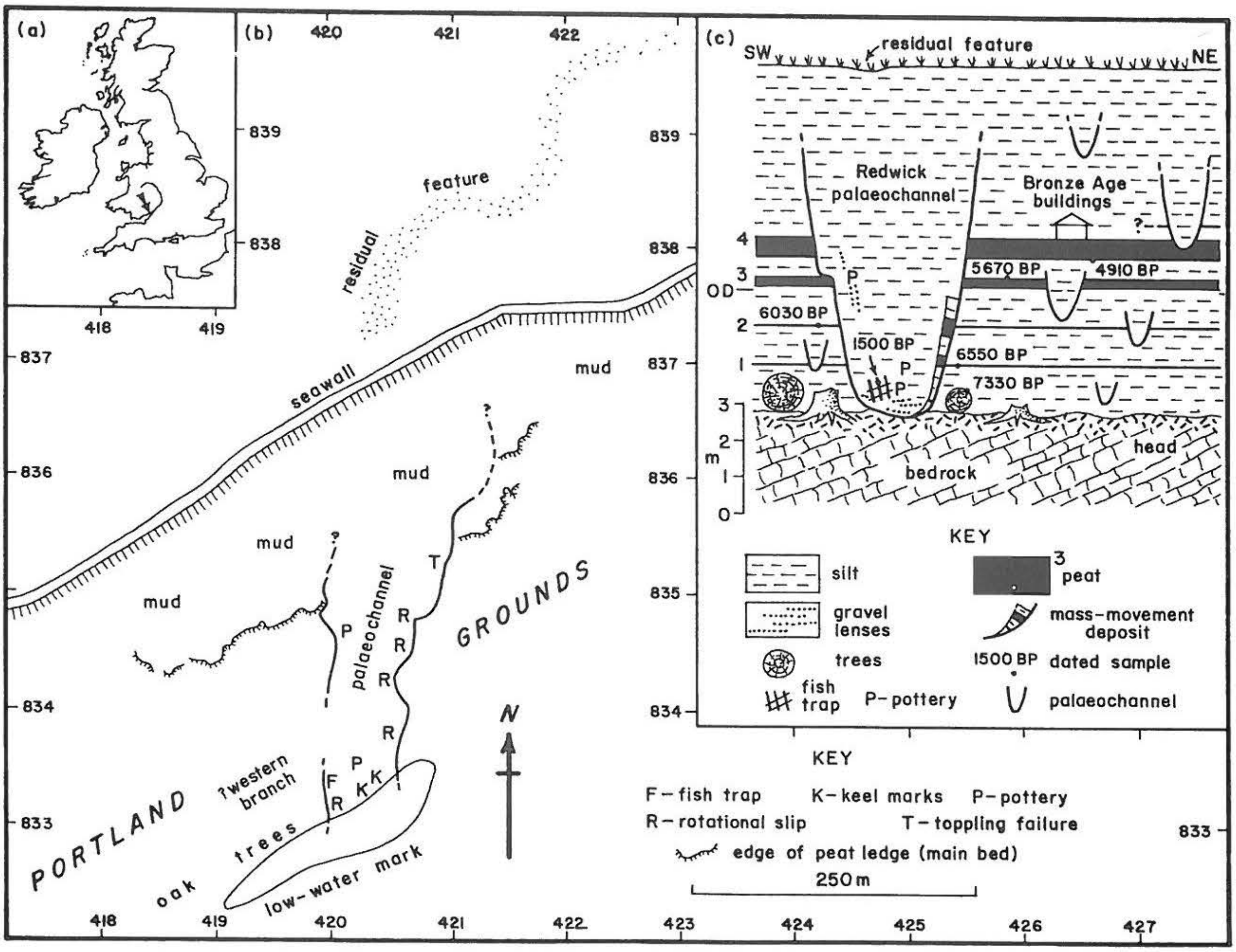


Figure 1: The Redwick palaeochannel. (a) General setting. (b) Plan. (c) Generalized stratigraphic section in the vicinity of the palaeochannel (see also Table 1).

Figure 2: Erosional margin (arrowed) at left bank of palaeochannel. Rucksack rests on top of main peat. Spade for scale 0.94 m long.

Figure 3: Toppling failure of silts and peats (arrows show dip direction), left bank of palaeochannel. Spade for scale 0.94 m long.

main peat is also dated by four rectangular buildings, yielding uncalibrated radiocarbon dates between 3060-2930 BP, erected on its upper surface (Bell and Neumann 1997a). Judging from exposures a few hundred metres to the northeast, a thin, still-higher peat may occur a few decimetres above the main bed in the ground enclosed by the seawall, but it has not yet been proved there.

The palaeochannel apparently bottoms at the level of a Pleistocene head-like deposit composed of a pale brown, altering to grey-green, silty sands with dispersed angular to well-rounded pebbles and lumps of Trias. On this deposit had thrived close-grown oaks, preserved in the overlying silts as upright stumps and branching, prostrate trunks up to an observed length of at least 20 m measured from the upturned rootball. Marine transgression of this forest occurred some time shortly after 7330+/-70 conventional radiocarbon years BP (Fig. 1c, Table 1). The rockhead itself is not exposed near the palaeochannel, but at Magor Pill, 2 km to the northeast, it reveals late Pleistocene ice-wedge casts on a low offshore ridge (Allen & Rippon 1997).

The outcrop of the palaeochannel (Fig. 1b) is much obscured by shifting and variable modern deposits of mud in the middle parts of the intertidal zone and of sand, in the form of ebb-directed tidal dunes, and patches of semi-mobile, silty gravel in the lower parts. The feature attains a width of about 100 m at the erosional level of the ledge formed by the main peat. Here its eastern bank can be traced for a short distance as a sharp, erosional contact between the olive-grey clayey-sandy silts of the fill and the slightly finer textured, bluish-green, root-shot silts interbedded with the peats (Fig. 2). Further seaward this boundary is chiefly defined by a series of mass-movement deposits, derived from the channel banks (Allen 1985), weathering out as upstanding masses. These deposits range from variously oriented clasts and blocks less than a metre across, including a distinctive silty detritus peat found in the main bed, to tilted slices up to 30 m long composed of a sequence of alternating silts and peats, commonly including the main bed. Among these slices is a large toppling failure, recognised by internal bedding dipping toward the palaeochannel axis (Fig. 3), and many rotational slips, with outward-dipping beds (Fig. 4). The western margin of the palaeochannel, which may have been gentler, is marked by very few mass-movement deposits, and so is more obscure. The third peat, however, can be seen to have created a conspicuous ledge a few metres wide on this bank of the active creek. At low-water mark occur steeply

Figure 4: Rotational slip of interbedded silts and peats (arrows show dip direction), left bank of palaeochannel. Spade for scale 0.94 m long.

Figure 5: Lowermost part (beds dip almost vertically to lower right) of a large rotational slip with base failure, right bank of palaeochannel near low-water mark. Spade for scale 0.94 m long.

Figure 6: Undulose laminated beds in palaeochannel fill. Spade for scale 0.94 m long.

uptilted silts and peats forming part of a multiple rotational slip that had experienced base failure (Fig. 5).

The palaeochannel apparently has a branch to the west (Fig. 1b). In thickly obscured ground near the main feature, the outcrop of the interbedded silts and peats is broken and replaced by olive-grey silts over a northeast-southwest zone about 30 m wide. On the northern side of this zone is a giant rotational slip measuring 35 m in length. From here the branch can be traced intermittently along and across the shore as it curves inland to cut the main peat near the seawall, beneath which it appears to

Fig. 7. Laminated silts separated by erosional discordances (arrowed) in palaeochannel fill. Spade for scale 0.94 m long..

pass heading north-westward to the north-northeast of Sea Street Lane, Redwick (NGR c. ST 4170 8345). Like the main palaeochannel, its fill is replete with peat blocks, rotational slips and toppling failures, and peat ledges on its margins reveal related patterns of nested, curved slip surfaces, as at Magor Pill (Allen & Rippon 1997).

The main palaeochannel has an extremely variable fill. Predominant are structureless to well-laminated, olive-grey, clayey-sandy silts. Their generalised dip varies from sub-horizontal and rolling (Fig. 6), in the eastern part of the fill, to a moderate value directed at a channel axis displaced toward the western bank. Cross-cutting beds abound (Fig. 7), together with, locally, disturbed and irregularly folded layers, slickensided glide-surfaces, and cross-faults overlain by unaffected strata. Also evident in the fill, and especially toward its western margin, are scoured horizons overlain by lenses of rounded silt clasts accompanied by occasional pebbles of stone (some thermally fractured), rounded lumps of peat and finely divided organic detritus. Widely dispersed rounded stones can also be found toward this margin, together with angular blocks and plates of sandstone (including Old Red Sandstone) with a quarried look. Toward the base of the fill lenses of coarse material are more commonly interbedded among the silts. They are variable mixtures of well-rounded pebbles of various sandstones and quartzites, with some vein quartz, and rounded lumps of peat accompanied by twigs, leaves and other plant detritus. What the fill lacks, however, at the erosional levels provided by the foreshore, are any of the pale brown silts which at Magor Pill and elsewhere (Allen 1997b; Allen & Rippon 1997) date from the earliest centuries of the second millennium AD.

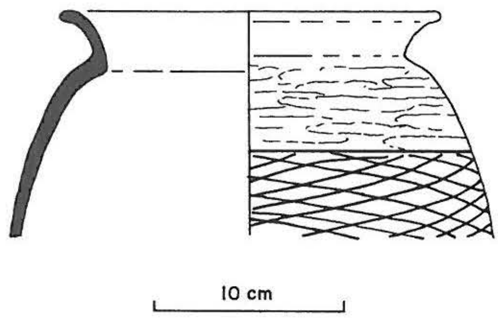
Pottery

The pottery associated with the Redwick palaeochannel occurs in two distinct contexts. Only the sherds from one of these is contemporaneous with the active phase of the channel.

Near low-water mark patches of semi-mobile gravel erosively overlie the palaeochannel fill and the sediments into which it was emplaced. These yield (I. Smith *pers. comm.* 1999) the unstratified and disarticulated bones of cattle (*n*=10), horse (3), dog (3), sheep (1) and deer (1). This collection resembles one recorded by Allen & Rippon (1997) from the intertidal zone at Magor Pill, 2 km to the northeast. Also present are small numbers of weathered and abraded Romano-British, medieval and early modern pottery sherds. These compare in preservation and fabric range with the multi-period pottery assemblage reported from Magor Pill (Allen and Rippon 1997; Allen 1998, 1999) and, together with many of the bones, were probably drifted from there by ebbing tides. The pottery and animal remains represent a transposed assemblage now greatly removed from its primary contexts.

The other and much more significant context is provided by silts and gravelly lenses within the palaeochannel fill itself (Fig. 1b, c). Four sherds have at various times been found stratified in these deposits, one being kindly donated by Derek Upton. They are distinguished by their pristine appearance, showing signs of neither weathering nor wear. A non-diagnostic body sherd from a Romano-British South Wales Greyware jar (Webster *in* Manning 1993) occurred among dispersed pebbles and worked wood near the western bank at about the level of the third peat. The other three sherds, two of which conjoin, were sealed in the fill near its base and represent Southeast Dorset Black Burnished Ware No. 1, the other common fabric in Roman Gwent (Allen & Fulford 1996). Represented by the conjoining sherds (Fig. 8) is a medium-sized, everted-rim jar with an obtuse lattice decoration incised into a finely granulated surface and separated by a scored line from a horizontally burnished shoulder. The interior is coarsely wiped, and carbonised food adheres to the outer surface. The lattice pattern and scored line suggest the late third or fourth century AD (Gillam 1976, fig. 2.11-14), and the uniformly thick rim, which is burnished internally, also compares with forms of this or slightly earlier date (Gillam 1976, fig. 1.8, fig. 2.10, 13).

Figure 8: Pottery stratified in palaeochannel fill. Late Roman Southeast Dorset BB1 jar (two conjoining sherds).



A wooden structure and other wooden objects

A small structure of woven roundwood detected by Derek Upton in August 1999 was later surveyed and excavated (Fig. 9), sampled and recorded (Figs. 10, 11) under the direction of Steven Allen. The structure (ST4200 8335) lies at -2.65 m OD close to the base of the palaeochannel (Fig. 1b, c). It is contained in dark grey silt, but about 0.3 m to the south, and roughly following the line of the main area of wood, is the edge of a lighter-coloured deposit containing some peat clasts. The structure consisted of at least two groupings of worked wood and was seen to cover a distance of over 4 m. Samples taken from 38 pieces of wood (both large and small elements) showed that only hazel (*Corylus avellana*) had been exploited (K. Barrow *pers. comm.* 2000).

The main grouping measures 2.8 m by a maximum of 1 m, consisting of five pieces of roundwood of average diameter 45 mm, four of which are parallel and spaced at intervals of 0.3-0.4 m. Diagonal to the larger roundwood elements are 27 smaller roundwood pieces ranging in diameter from 7-22 mm (av. 15 mm), the longest of which measures 1.3 m. The sole excavated piece of wood (Figs. 10, 11, item 2034) showed a simple chisel end, the axe facet being flat in cross-section.

The second grouping 1.4 m to the north consists of seven pieces of roundwood forming a curve 1 m across. These ranged from 17-38 mm in diameter (av. 28 mm). After excavation, the northernmost piece (Fig. 10, 2035) also revealed a simple chisel end. The westernmost piece is forked in a manner suggesting that it helped to anchor the structure.

Roughly 2.3 m to the east of the structures an oval oak timber measuring 230 mm by 10 mm was found in the fill in association with peat clasts. Nearby were two other oak timbers. Their 50 growth rings proved insufficient for dendrochronological dating (N. Nayling *pers. comm.* 1999).

Roundwood element 2035 from the main structure (Fig. 10) gave a conventional radiocarbon age of 1500+/-60 years BP (Beta-134641). The equivalent calibrated range at two standard deviations (Stuiver *et al.* 1998) is AD 425-655, placing the structure firmly within the early medieval period.

The two excavated pieces had cut ends only about 0.2 m below the surface of the sediment on which they were exposed. In the main area of wood the small roundwood elements continued both east and west of the larger pieces. The inference, from admittedly very limited excavation, is that what survives may represent the eroded base of a much

Figure 9: The wooden structure (possble fish trap) as partly excavated. Scale measures 0.5 m long. Photograph E. Sacre.

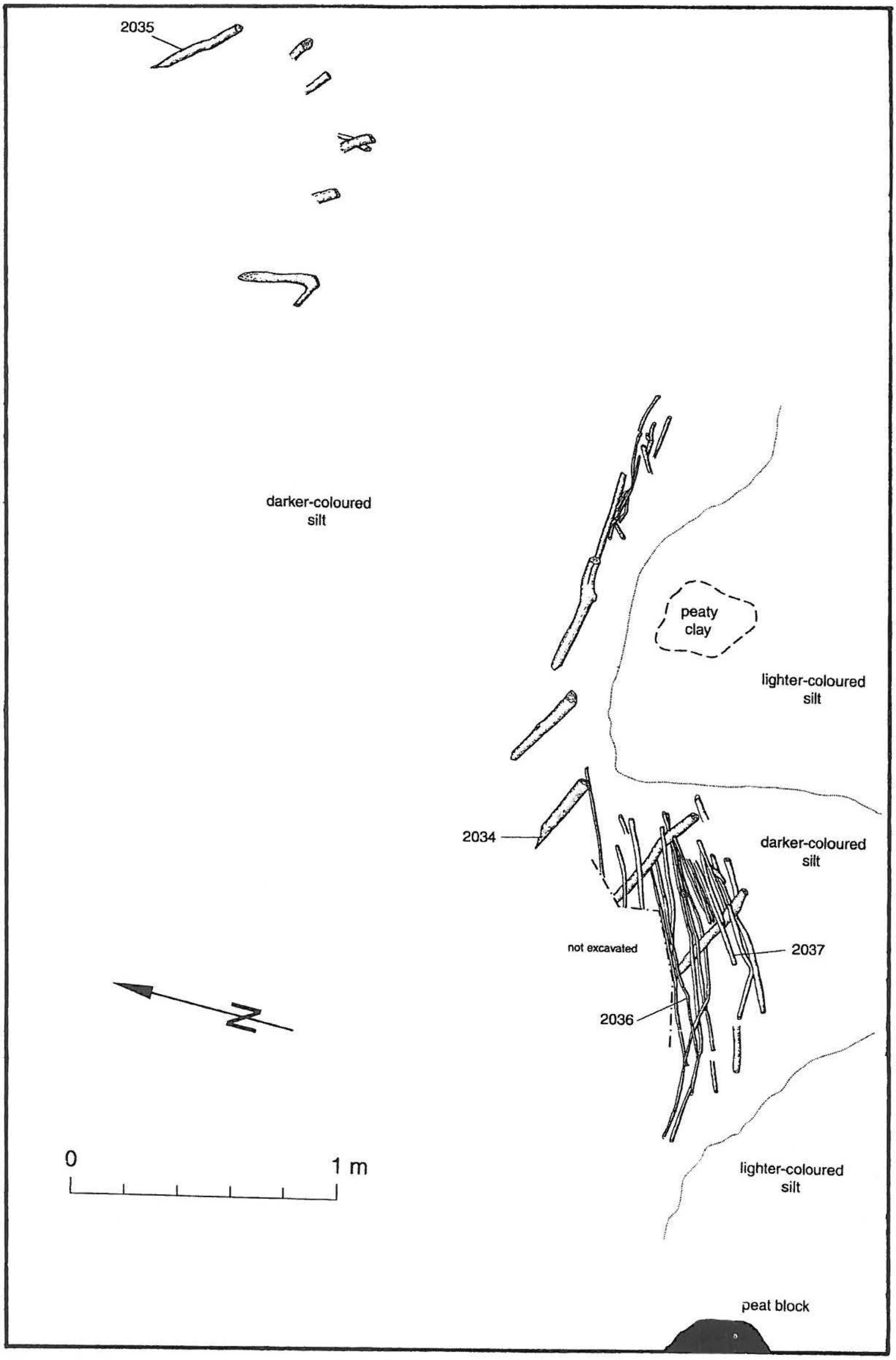


Figure 10: Plan of wooden structure (possible fish trap), lowermost part of palaeochannel fill (see also Fig. 1b and Table 1). Drawn by S. Allen.

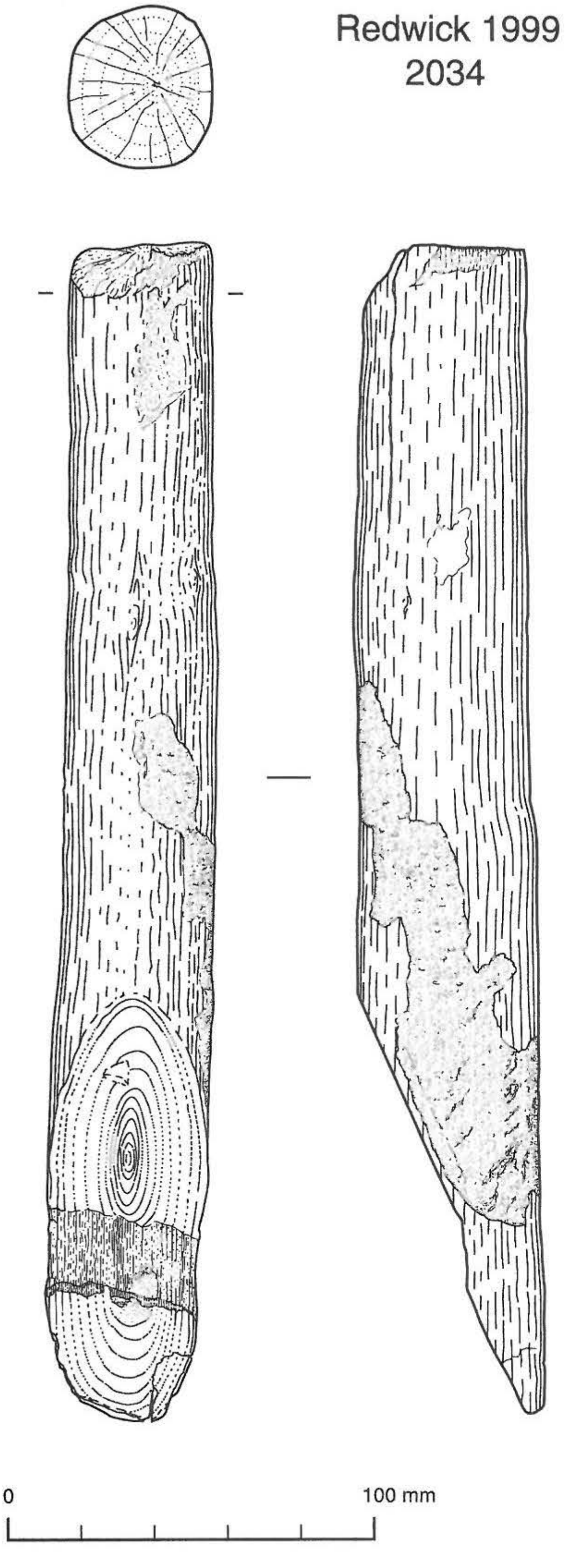


Figure 11: Cut piece of roundwood (item 2034) from the possible fishing structure. Drawn by S. Allen.

larger structure. The most plausible interpretation of the main wood groupings seems to be that they represents a hurdle or wattle work structure, most probably the latter in view of the curving shape. The position of the cut ends suggests that it may have been constructed on or close to the ultimate channel floor.

Today the wooden structure is about 1 m above mean low tide level. In the mid first millennium AD, however, sea level was 1.0-1.5 m lower than today (Allen & Fulford 1987, fig. 1). Assuming a broadly comparable tidal regime, the structure in the active channel would have stood at roughly 2.0-2.5 m above mean low water. Although still low in the tidal frame, it is likely to have been exposed for varying periods at all tides, even neaps. The limited evidence means that it is not possible to be certain about the function of this structure, but its form and position in relation to the tidal frame when it was made suggest that it may have formed part of a fish trap. Less likely, in view of its apparently curving form, is that it is part of an eroded trackway (which could have serviced a fish trap). The find is similar in form to more complete wooden structures which can be confidently associated with fishing activities, including undated examples from Holocene deposits exposed in the middle Severn Estuary at Woolaston, Gloucestershire (Townley 1998), and in the Shannon, Fergus and Deel estuaries of Ireland, where some of the structures are of comparable date to that at Redwick (O'Sullivan 1994, 1995, 2000).

Keel marks

Several gravel lenses in the lowermost part of the palaeochannel fill exposed near the low-water line preserve structures thought to be keel marks (Fig. 1b). The latter appear to be sealed by the overlying silts, and so must be regarded as roughly contemporaneous with the emplacement of these low-lying gravels.

The marks are evident as groups of narrow, slightly raised alignments of rounded pebbles and occasional cobbles with a strong vertical fabric (Fig. 12), reminiscent of clasts reoriented by freeze-thaw under periglacial conditions. Normally, the pebbles which make up the gravels are roughly flat-lying. The alignments at Redwick lie approximately parallel with the palaeochannel axis, are generally straight and parallel to subparallel, and can be traced for 2-3 m over the exposed surfaces of the lenses, before apparently disappearing into the surviving body of the channel fill.

The alignments could have formed as keeled boats moored in the creek settled on the bed, first

Figure 12: Parallel alignments of vertically oriented pebbles and cobbles (possible keel marks), lowermost part of palaeochannel fill (see also Fig. 1b).

shifting slightly over the bed as the tide gradually fell and wave conditions changed, and finally becoming more deeply impressed into the sediment as the channel drained further. Similar structures accompany gravel lenses in the palaeochannel at Magor Pill to the northeast, where there may have been boat traffic from Romano-British to early modern times (Allen & Rippon 1997; Nayling 1997, 1998). Another possibility, but one less consistent with the observed field relationships, is that the alignments represent pebbles trapped in steep-sided erosional grooves formed on the channel floor.

Discussion

The silted-up tidal creek we describe from the foreshore at Redwick is one of the largest of the late Holocene cycle of palaeochannels exposed along the coast of the Gwent Levels (Allen 2000). Since it cuts the main peat on which Bronze Age buildings stand (Bell & Neumann 1997a), and incorporates numerous masses detached from that bed, its inception is likely to date to some time during the first millennium BC. For a period thereafter, the channel widened and deepened as it expanded erosively into the simultaneously growing sequence of silts and peats. Judging from the pottery and wooden structure stratified low down within the fill, the channel may have been at or near its widest and deepest, and carrying the greatest tidal discharges, during the middle centuries of the first millennium AD. Such a substantial creek is likely to have been a high-order, if not the highest-order, channel in a large, branching network (Pethick 1992) that plausibly extended far back toward the inner edge of the wetland. By the time this part of the Caldicot Level was embanked, however, apparently by an early date in the second millenium (Rippon 1997), infilling and obliteration of the network was largely complete.

With its contained mass-movement deposits that include the main peat, the Redwick palaeochannel ranges for at least 500 m across the lower foreshore, as far as the outermost remaining exposures of the Holocene sequence. In this it resembles the Magor Pill palaeochannel 2 km to the northeast, which was traced outward for at least 800 m (Allen & Rippon 1997). It is plausible from this and related kinds of evidence that the coast of the Caldicot Level has retreated inland by perhaps as much as a few kilometres since the main peat ceased to form 2000-3000 years ago (Allen 2000).

Human activities of several kinds at or near the palaeochannel are hinted at by the possible fish trap, worked wood, pottery, thermally fractured pebbles, apparently quarried stone and possible keel marks, all securely stratified in the fill. The full extent of these activities is not yet clear, but it appears to have involved fishing and the use of boats. For example, given its position and orientation, the Redwick palaeochannel, along with an even bigger, contemporaneous channel at Elver Pill 2.5 km to the west, is a candidate for the route of the Barland's Farm Romano-British boat (Nayling *et al.* 1994; McGrail & Roberts 1999) to its final resting place in a creek 3 km away near the inner wetland margin.

The possible fish trap at Redwick is an important addition to the evidence for an increasingly long history of wooden fishing structures in the Severn Estuary. As early as the Mesolithic, the small size of the fish remains excavated at Goldcliff strongly suggests the use of traps (Ingrem *in* Bell *et al.* 2000), although none of such early date have so far been found. The earliest known possible structure lies on the shore at Peterstone Wentlooge (Bell *et al.* 2000). It is a setting of roundwood posts along the line of a palaeochannel antedating the equivalent of the main peat at Redwick. One post has a conventional radiocarbon date of 3910+/-60 years BP (GrN-24149), which, whether or not part of a fish trap, represents rare evidence for late Neolithic or early Bronze Age activity on the Gwent Levels. Nearby, in association with another palaeochannel, a grouping of six pegs, possibly a small setting for a basket, is dated to 3000+/-70 years BP (GrN-24150). Several possible structures spanning the Bronze Age are known from palaeochannels with tidal influences at Caldicot (Nayling & Caseldine 1997). A palaeochannel at Cold Harbour Pill (Bell *et al.* 2000, fig. 16.19) contains a linear wooden structure along one side of the channel and a circular, woven basket-like structure dated 2520+/-60 years BP (Swan-241). Dating to 2120+/-60 years BP (Car-1179) in a large palaeochannel at Oldbury-on-Severn in the middle Severn Estuary is a woven wooden structure thought to be a fish trap (Allen & Fulford 1992, illus. 5). Closely associated with it is a circular construction of closely spaced, upright pieces of roundwood presumed to be of the same or similar date.

Later in the medieval period, from the tenth century onward, there is evidence for fishing structures between Magor Pill and Caldicot (Goldbold & Turner 1994; Allen & Rippon 1997; Nayling 1997). Almost all of these, it is important to note, were laid out on the open shore, across the path of the tidal streams, at a time when coastal retreat was already well-advanced. Unlike the older structures just discussed, they do not occur in palaeochannels and record fishing in a quite different context and probably on a significantly larger scale. Post-medieval, open-shore traps are also well represented on the southern coast of the Bristol Channel (McDonnell 1994), and are known from other British salt-water contexts (Salisbury 1991).

The new Redwick discovery is of particular interest in demonstrating the continuance of activity on the Gwent Levels into the early medieval period, a time which is very poorly represented by archaeological evidence from the levels themselves. In contrast to the English side of the Severn Estuary (Rippon 1997), the dryland fringes of the levels in Wales during this period are also ill-known archaeologically. A very notable exception, just to the west near Cardiff, is the high status site of Dinas Powys (Alcock 1963), which begins at about this time, and the cemetery at Llandough (Thomas & Holbrook 1994). Other burials and cemeteries of the period are known at Caerleon (Campbell & Macdonald 1993; Evans 2000) and Caerwent (Knight 1996), and there was wider activity, to judge from less well dated or more fragmentary evidence (Edwards & Lane 1988). The degree of continuity and change in this period on dryland and wetland alike is largely unknown and a question of considerable importance in Welsh archaeology.

Evidence already gained from the Severn Estuary Levels has highlighted the important role played by wetland tidal creeks in providing opportunities for food-gathering and the creation of activity/occupation sites, as well as in facilitating trade and communication by water (Allen 1998, 1999; Allen & Fulford 1992; Allen & Rippon 1997, 1998; Bell & Neumann 1997a, 1997b; Bell *et al.* 2000; Nayling 1998; Nayling & Caseldine 1997; Nayling *et al.* 1994). Although so far few, the diverse finds we report from the Redwick palaeochannel add usefully to this evidence, and further strengthen our view that fossilised tidal creeks are prime targets for archaeological prospection in estuarine and coastal wetlands.

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Table 1. Radiocarbon ages of peats and other organic materials associated with the Redwick palaeochannel (see also Fig. 1).

Material and laboratory number	*Conventional radiocarbon age (years BP)*	*Calibrated radiocarbon age (years BC/AD)*[1]
base fourth or main peat (Beta 113004)[2]	4910+/-70	BC 3805-3620
top third peat (Beta-128779)[3]	5670+/-90	BC 4715-4340
second peat (Beta-134641)[4]	6030+/-80	BC 5205-5170
first peat (Beta-134640)[4]	6550+/-70	BC 5625-5365
oak in basal bed (outer tissues) (Beta-134639)	7330+/-70	BC 6375-6030
wooden structure (?fish trap) (Beta-134642)	1500+/-60	AD 425-655

1 - Stuiver *et al.* 1998, two standard-deviation range.

2 - The top of this bed at Redwick is dated by the buildings it supports (see text). Immediately below the base at the palaeochannel is a thin reed peat (not shown in Fig. 1c; age span roughly 250 radiocarbon years) on a pause/erosion surface which gradually descends northeastward toward the third peat.

3 - The top of this peat between Magor Pill and the Redwick palaeochannel is variable in age. At Magor Pill the base of the bed is known to be about 140 radiocarbon years older than the top.

4 - Whole-bed samples.

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