

Two early medieval cemeteries in Pembrokeshire: Brownslade Barrow and West Angle Bay

By POLLY GROOM, DUNCAN SCHLEE, GWILYM HUGHES, PETE CRANE, NEIL LUDLOW and KEN MURPHY

with contributions by Ros Coard, Dee Brennan, Astrid Caseldine and Catherine Griffiths,¹ Katie Hemer,² Paul Courtney,³ Tim Young,⁴ Wendy Carruthers,⁵ Martin Bell and Alex Brown⁶

This paper describes the results of two excavations on early medieval cemeteries in south-west Pembrokeshire: Brownslade Barrow and West Angle Bay.

At Brownslade two phases of late prehistoric agriculture, evidenced by cultivation marks and cereal remains, were overlain by windblown sand. An early medieval cemetery of long cist graves and simple dug graves was cut into the sand. The cemetery is associated with a round barrow and was first investigated in the 1880s, but it is unclear from those investigations whether the barrow is Bronze Age in date or later. Place-name evidence and local tradition refers to a chapel, but investigation of the remains of a small rectangular building proved inconclusive. Radiocarbon dates obtained from bones from the cemetery range from the early fifth century AD through to the early eleventh century, with a floruit of the mid seventh century to the end of the ninth century AD. Bone preservation was good and allowed for full skeletal analysis and stable isotope analysis. Several individuals exhibited a distinct pathology of the hip bone, probably linked to occupation and locomotion. Several also had marked robusticity of the arms and this with the pathology points to a strenuous lifestyle. Isotopic analysis indicates a highly mobile population with the possibility that some individuals originated either from the extreme west coast of Ireland or north-west Scotland, and others possibly from the Mediterranean region. The only evidence for a contemporaneous settlement was a small assemblage of early medieval quernstones. Medieval and post-medieval pottery points to later occupation near the cemetery.

Geophysical survey at West Angle Bay demonstrated that a small, egg-shaped cemetery enclosure lay within a larger rectangular enclosure. Documentary evidence places a chapel dedicated to St Anthony at West Angle Bay, and indeed an anomaly on the geophysical survey within the cemetery enclosure may be of a rectangular building, although this was not tested by excavation. Two distinct areas of burials were recognised, one on the cliff edge, but within the rectangular enclosure, and the other in the cemetery enclosure. Skeletal remains from a long cist grave eroding out of the cliff were dated to the mid seventh to the late eighth century AD. The cemetery enclosure seems to have been in use by the end of the seventh century AD and had gone out of use by the early-twelfth century, at the latest. Bone preservation was poor, but intercutting graves and loose bone indicate an intensively used cemetery. A relatively high proportion of infants or children to adults suggests that the part of the cemetery enclosure excavated may have been used, at least latterly, specifically for the burial of children. Owing to the poor bone preservation only limited skeletal analysis was possible. The rectangular enclosure was the earliest recognised element of the site, associated with sixth/seventh century AD radiocarbon dates. A corn dryer or hearth and evidence of cereal cultivation suggests that it may have been part of a settlement pre-dating or contemporaneous with the cemetery.

Brownslade represents the largest and most extensively investigated assemblage of early medieval burials in west Wales, while West Angle Bay has evidence for a possibly linked cemetery and settlement, something not previously recorded in south-west Wales.

INTRODUCTION

Although little understood within Welsh history, the early medieval period has had a significant effect on the landscape we experience today, through the establishment of settlements, administrative boundaries, churches and chapels. However, very few pre Anglo-Norman conquest church or chapel buildings have been identified, and none of them in masonry, while few ecclesiastical and cemetery sites have demonstrable early medieval origins. A project—the Early Medieval Ecclesiastical Sites Project (EMES)—undertaken by the four Welsh Archaeological Trusts between 2001 and 2004 and grant-aided by Cadw aimed to identify those ecclesiastical and cemetery sites in Wales that were likely to have pre Anglo-Norman conquest origins, to note threats affecting them, and to recommend the best examples for statutory protection. Dyfed Archaeological Trust carried out the EMES project for the three counties of south-west Wales: Ceredigion, Carmarthenshire and Pembrokeshire (Ludlow 2003a; 2004a; 2004b).

Coincident with the EMES project was the development of a research agenda for Wales. This highlighted cemeteries as a site type requiring significant further work (Edwards *et al.* 2005, 40). Whilst a number of important excavations have been carried out in south-west Wales, there has been no large-scale excavations to match work in south-east Wales such as that undertaken at Llandough, Glamorgan (Holbrook and Thomas 2005) or further afield at Cannington in Somerset (Rahtz *et al.* 2000). The lack of large-scale excavation meant that fundamental questions introduced in the research agenda remained unanswered.

The excavations at Brownslade Barrow and West Angle Bay were undertaken with reference to this research framework, but in the context of monuments at risk rather than one of pure research. Both sites are geographically close (Fig. 1) and share comparative attributes; therefore the excavation results are presented here as a single article. The two excavations are dealt with separately, followed by a short discussion. Evidence from both sites indicates a long-held tradition of sanctity. Neither is there clear-cut evidence for settlement in the immediate vicinity, although there is sufficient at West Angle Bay to be reasonably confident that the settlement preceded or was contemporary with the cemetery. However, in both cases there are large gaps in our knowledge—in particular at West Angle Bay where the excavations investigated only a very small part of what is clearly a large and complex site. The relationship of both of these cemeteries with chapels or churches, either contemporary with or post-dating the Anglo-Norman conquest, is also unknown; in neither case do we have clear archaeological confirmation of an associated chapel/church building contemporaneous with burial.

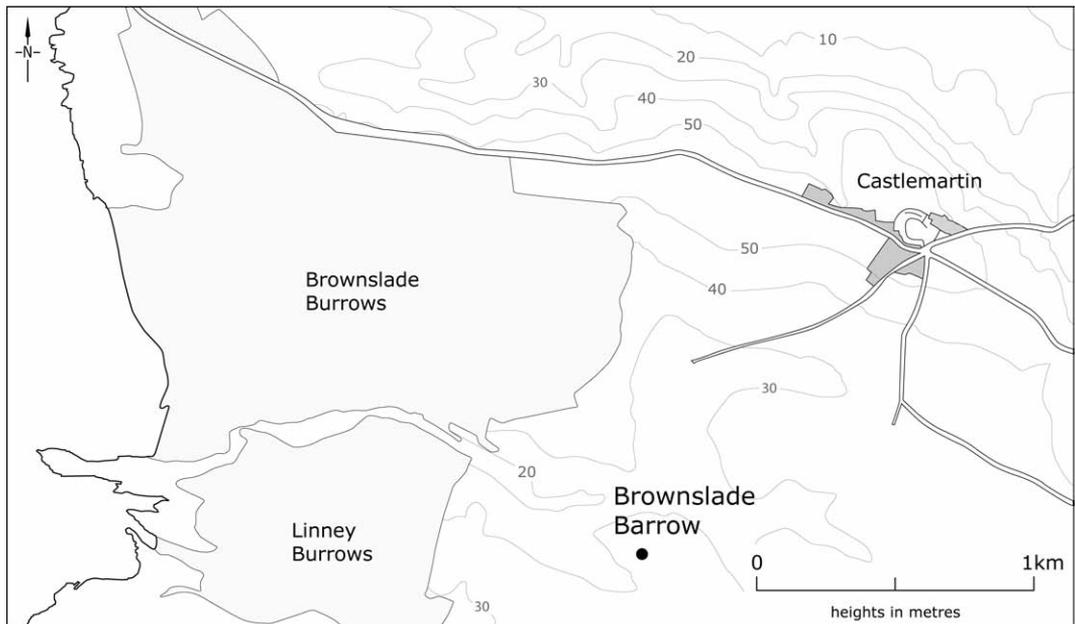
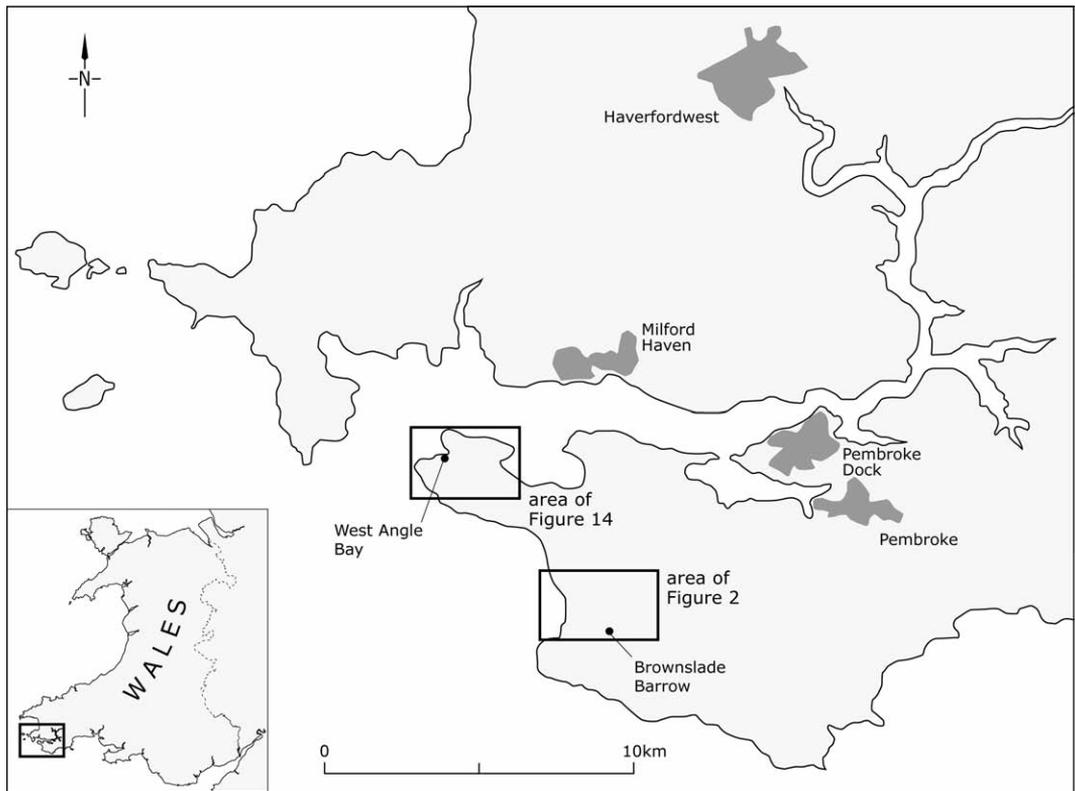
EXCAVATIONS AT BROWNSLADE BARROW

By Polly Groom, Gwilym Hughes and Pete Crane

Introduction

Brownslade Barrow (SR 905 972) lies in Castlemartin Parish towards the western tip of the Castlemartin peninsula, Pembrokeshire (Fig. 2). It is within an area requisitioned by the Ministry of Defence in 1938 as range for live firing and dry training. The range is a plateau of Carboniferous Limestone (British Geological Survey 1974, Sheet 224) overlain by loess deposits. The barrow lies towards the western end of the range, 700m inland from the dune systems of Brownslade/Linney Burrows, but within an area of blown sand 1600m from the sea.

The barrow, a scheduled ancient monument, occupies a slight east/west trending ridge in a position of high visibility, 42m above sea level. It is oval rather than circular, 40m by 34m and standing 2m high. It is grass covered but apparently constructed from sand. The irregular surface to the turf probably results



Above Fig. 1. General location of Brownslade Barrow and West Angle Bay.

Below Fig. 2. Location of Brownslade Barrow.

from several processes, including the excavations undertaken by Edward Laws during the 1880s (Laws 1882, 51–58; Laws 1888, 57–59), historic live firing and badger burrowing. It stands near a modern fence line, marking it off from the firing area of the range, and seems to sit within a rectangular enclosure formed by banks no more than 0.5m high, probably part of an old field system of unknown date. A small quarry lies to the north of the barrow, on the northern edge of which are fragmentary remains of stone foundations of a small rectangular building.

The small rectangular building appears to be shown on a 1790 estate map as an open rectangle (Pembrokeshire Record Office D/Angle 74). It is clearly shown as an open rectangle on the 1865 Ordnance Survey 1st edition 6-inch map, suggesting it was then roofless. It is not shown on subsequent Ordnance Survey maps. Fields in the vicinity of the barrow are no longer functional and are represented by low stony banks. According to the 1790 estate map the barrow and rectangular building stood in a field called 'Churchy Bank', with the field to the north known as 'The Bank'. On the Castlemartin tithe survey of 1838 (copy in the National Library of Wales) these two fields are shown united and called 'Bank Piece'. The field immediately to the south is called 'Churchway Meadow' and those to the east 'Upper Church Hill' and 'Lower Church Hill'. Several sources (Laws 1882, 57; RCAHMW 1925, 61, no. 140) have incorrectly stated that the barrow stands in a field named 'Churchways'.

The date of the barrow is not known. Laws' account is not clear (Laws 1882, 51–8), but it seems that a stone-lined cist, measuring '4ft by 3ft', was revealed 1m beneath the summit of the mound. It contained a decayed human skeleton, charred bones and animal bones, and a sherd of burnt, 'wheel-turned' pottery. None of these attributes are characteristic of either Bronze Age or early medieval burial; wheel-turned pottery is not prehistoric, while grave-goods are otherwise unknown in early medieval burial in west Wales, if indeed what Laws found were grave goods. It is possible that a Romano-British burial is described; inhumation had begun to replace cremation by the later-third/fourth century (Arnold and Davies 2000, 133), and the use of cists had begun (see Discussion). A fragmentary Group II early medieval inscribed stone—a cross-carved stone, now lost—was also recovered from the cemetery area during the 1880s excavations, but its precise location is unknown (Edwards 2007, 514–5; Laws 1882, 54). Nancy Edwards suggests that it may have been either part of a cist structure, or a grave-marker (*ibid.*).

The 1880s excavations also revealed a large number of burials of 'men, women and children' some of which occupied cist graves without lintel slabs. They were described as 'packed in tiers at least three deep, like pigeons in a pie'. The burials were extended and oriented, and were therefore presumed to be Christian, but no dating evidence was recovered. The precise location of the burials is not clear in the accounts of the 1880s, but Laws describes his investigations as commencing on the south-eastern side of the barrow.

Laws (1888, 377–8) relates that two small stone buildings lay to the north of the barrow; one had been used as a cottage within the last 20 years and the other was known locally as 'The Chapel'. This latter building, measuring 15ft by 10ft was investigated by Laws, but nothing was found to indicate its function or that it was of any great antiquity.

Considerable badger disturbance to the environs of the barrow was observed in 2001. This disturbance had brought a considerable number of human bones to the surface, and concerns were raised about the damage being caused to this important archaeological site. Defence Estates therefore commissioned a topographic and geophysical survey in 2002, followed in 2003 by small-scale excavation of the small stone building to the north of the quarry (Ludlow 2002; 2003b). Three radiocarbon determinations from collected human bone provided a date range from cal. AD 430 to cal. AD 940 (Beta-179378, 17937 and 179380). All radiocarbon dates in this report are expressed calibrated at 2 sigma range. The results of this work demonstrated the archaeological potential and significance of the barrow. It was also clear that it and its immediate environs faced a significant threat from continuing badger activity. Defence Estates

therefore took the decision to relocate the badger sett, erect badger-proof fencing around the undisturbed areas and to commission full excavation of those areas most severely affected by badgers. Stage 1 of this investigation comprised the excavation of two trenches to the north of the barrow in May 2006 and Stage 2 the excavation of the badger sett to the south of the barrow. This paper is based on an interim, unpublished report on these investigations (Hughes *et al.* 2007).

Apart from Trench 3 all trenches were hand-excavated (Fig. 3). Two significant problems were faced in Trench 3, the main excavation area. First, time for excavation was limited before live firing on the range resumed, and second, badgers had severely disturbed upper archaeological deposits. The trench was initially divided into six areas (numbered 5–10) divided by 2m-wide baulks, and measuring in total c. 26m by 22m. Two hand-dug transects were excavated in the south-east area to test the depth of badger disturbance and to characterise the underlying stratigraphy. The upper disturbed deposits were then removed by machine across the whole of the trench; remaining deposits were then cleaned to define archaeological features including graves and then hand excavated. No graves were encountered in Area 6 and parts of neighbouring areas, and so towards the end of the excavation the opportunity was taken to mechanically remove an area 6m by 6m to investigate pre-sand deposits.

Artefacts were scarce and almost all were in deposits disturbed by badgers, or in residual contexts. An exception was a grave marker found at the head of a grave.

Pre-sand deposits and features at Brownslade

The lowermost deposit encountered (at 1.25m below present ground level) was loess, a yellow-brown silty-clay (272). This was cut by gullies (281, 289) and by two small postholes (279, 282). Gully 289 contained fragments of animal bone including a cow molar. A radiocarbon date ranging from 750–400 cal. BC (Beta-228418) was obtained from this tooth. Small quantities of charred grain (emmer wheat, spelt wheat and barley) were recovered from the postholes and a sloe stone from gully 289. The loess and gully 289 were cut by a series of shallow linear gullies (278), interpreted as criss-cross cultivation marks possibly created by an ard (Figs 4 and 5).

The loess, the cut features and the cultivation marks were overlain by a 0.2m thick brown sandy-silt buried soil (271). A further set of criss-cross cultivation marks (277) cut this buried soil. These were on a different alignment from the lower set, and also slightly deeper cut and more widely spaced.

Few charred plant remains or pollen were found in the buried soil (271), suggesting a period of stabilisation and soil development followed by cultivation represented by the second set of cultivation marks. Mixed cereal grains and a charred hazelnut shell were identified from a sample associated with the cultivation marks 277, and a date of 350–50 cal. BC (Beta-229587) was obtained from one of the cereal grains.

A thin, 0.2m thick, layer of yellow-brown sand overlay the buried soil; this was associated with a linear stony feature (290), possibly a field boundary, running south-west/north-east across the site. For the majority of its length it only survived as a single course of stones, but in Area 9 it comprised three layers of dry-stone coursing, suggesting it might have functioned as a wall. In Area 9 it shared its alignment with a further series of cultivation marks (297) that were similar in character to those in Area 6 (277).

Sand inundation at Brownslade

In Trench 3 a deposit of wind-blown sand up to 0.7m thick (223 and 294 in Area 6; 194, 283 and 287 in Area 5) overlay the possible wall (290) and associated cultivation marks (277, 297). This deposit varied across the site. On the western side it was yellow and coarse, resembling the build-up of a sand dune; on the eastern side it was siltier and browner. In Areas 5 and 6 the lower section of this deposit comprised a yellow calcareous sand (194, 223), through which it is likely, though not certain, that the early medieval

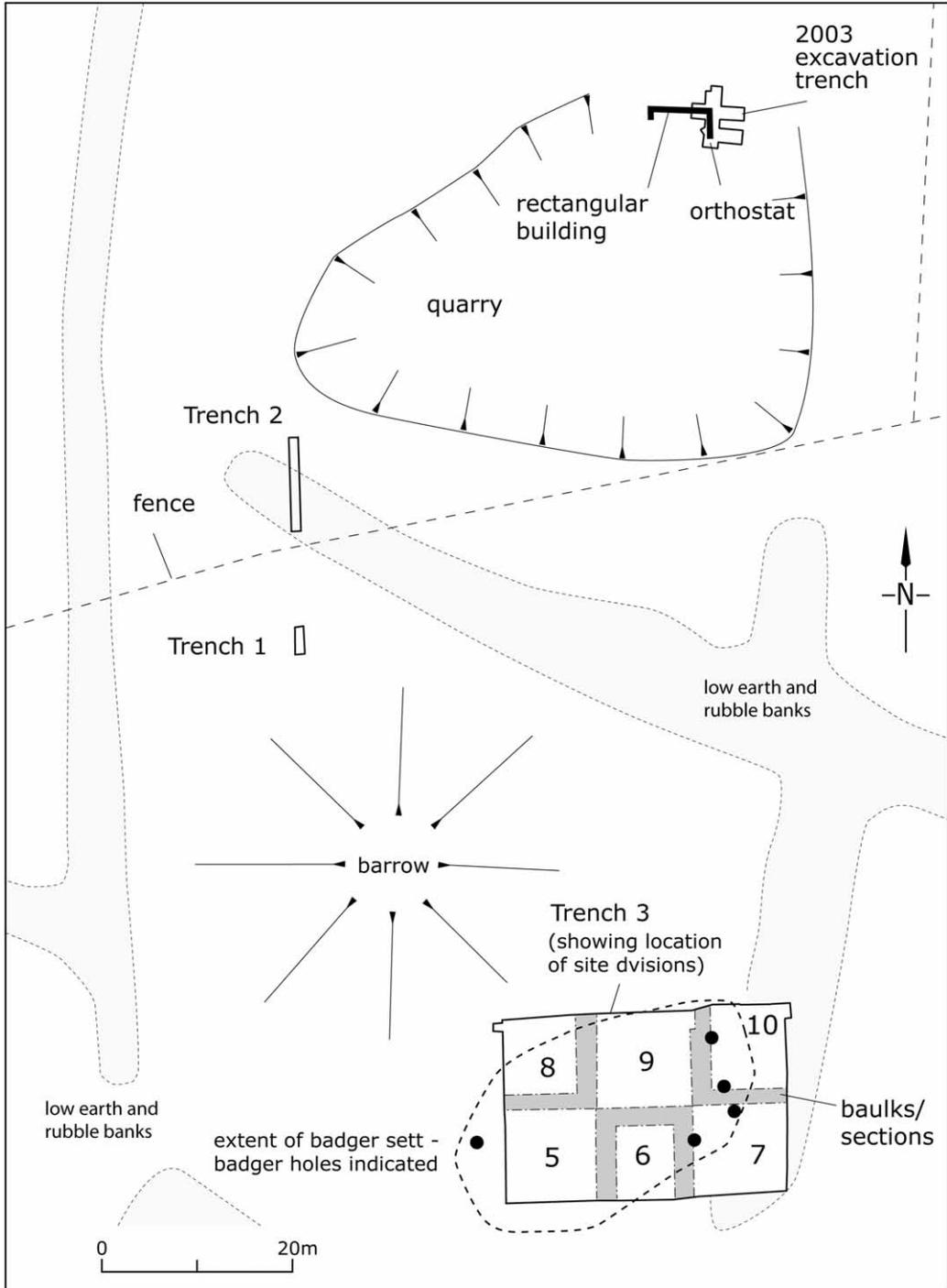


Fig. 3. Location of Brownslade Barrow and location of excavation trenches.

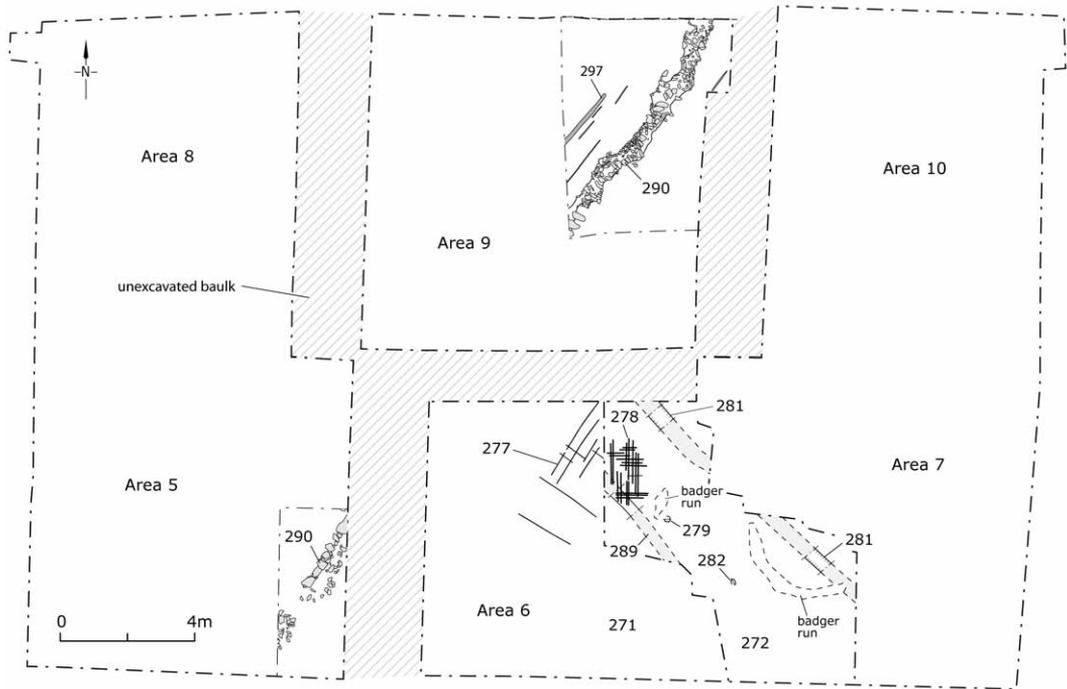


Fig. 4. Brownslade. Pre-sand features and deposits in Trench 3.

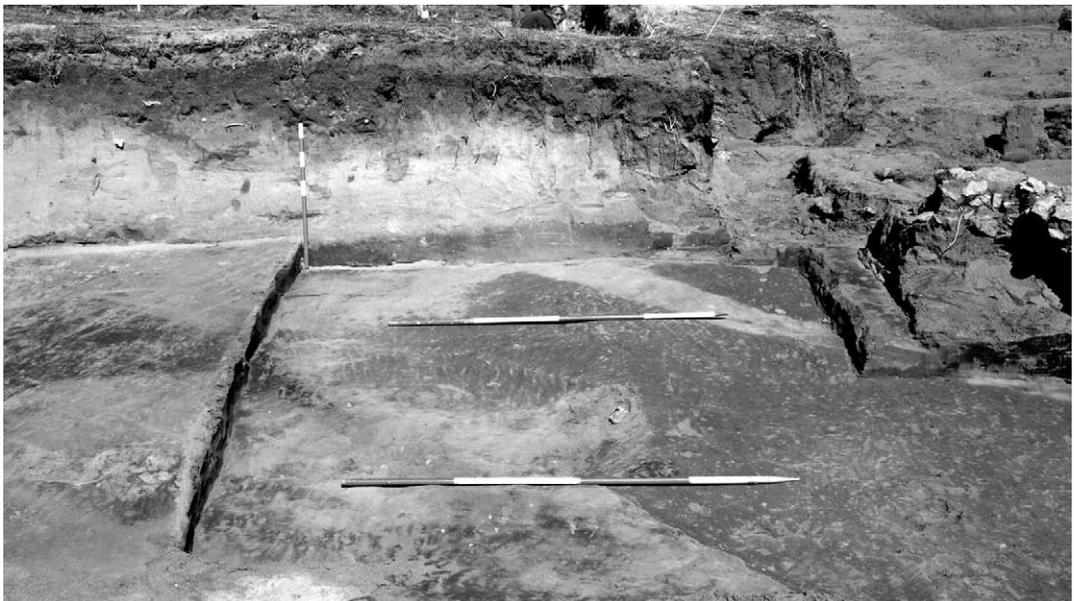


Fig. 5. Brownslade. View of both sets of cultivation marks. Upper set, 277, on left of photograph, and lower set, 278, centre left. Gullies 281 and 289 run diagonally across the photograph from right to left. Scales 2m and 1m.

burials were cut. The whole of the sand deposit contained a well-preserved assemblage of land molluscs. Samples were collected from two columns in Areas 5 and 6. The overall sequence suggested by the land molluscs is of a calcareous shell-sand indicative of only partly vegetated sand, and therefore a dune system which was still mobile. The dunes seem to have developed differently in different parts of the site, with perhaps the dune at the eastern side developing first. Sand inundation must have started after 350 cal. BC – 50 cal. BC, the date associated with the upper set of cultivation marks, and must have been at least partly stabilised by the time the early medieval cemetery became established around *c.* AD 500. Subsequently the dunes became stabilised and vegetated suggesting a dry grazed grassland environment with very little evidence for scrub or trees.

The early medieval cemetery at Brownslade

A total of 32 human burials were recorded in Trench 3, cut into wind-blown sand. Although the preservation of the bone was excellent, the survival of the burials themselves was highly variable since badgers had, to some degree, disturbed all. Some were almost intact, but others were very fragmentary. Twelve of the burials were associated with stone cists, 14 were associated with simple dug graves and six were disarticulated remains. Between them these 32 burials were found to contain the skeletal remains of 52 individuals. In addition to the remains contained within the graves, a substantial quantity of disarticulated human skeletal material was also recovered from badger-disturbed topsoil. The good bone preservation meant that all parts of the skeleton were represented in the assemblage (Figs 6 and 7; Table 1).

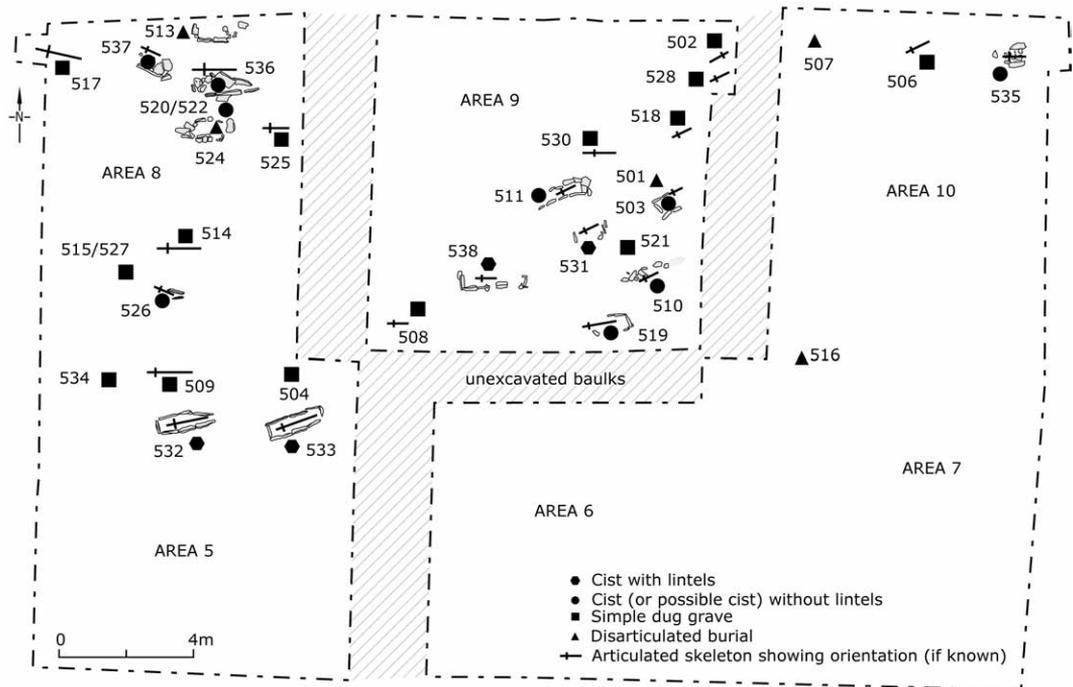


Fig. 6. Brownslade. Trench 3 plan of all burials showing the grave type and orientation of the skeleton. Disarticulated burials are included.

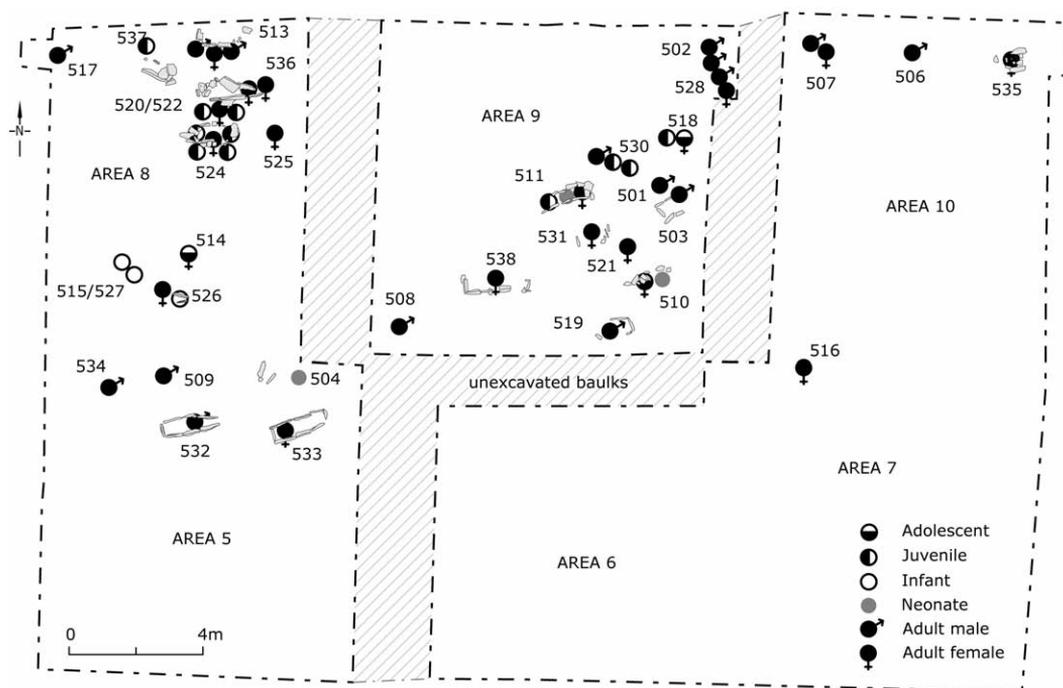


Fig. 7. Brownslade. Trench 3 plan all burials showing age and sex, where known.

The badger sett in Trench 3 was treated as an archaeological feature and recorded in plan and in section. The runs penetrated to a depth of over 1.25m and the chambers were up to 1m in width. In Areas 6 and 7 the runs had penetrated the loess deposit. Large volumes of material had been displaced by the badgers, and in the centre of Trench 3 the majority of the material excavated had no discernible stratigraphic relationships.

None of the burials was completely undisturbed. The extent of the disturbance varied, and in some cases the stone slabs of the cists were also displaced. In terms of understanding the site, the disturbance of burials had various effects. In the majority of cases, it meant that details of posture could not be ascertained—for example, it was normally impossible to see the positioning of hands, or whether feet and ankles were crossed. It was sometimes unclear whether a burial was *in situ*, due to the amount of disarticulated and disturbed bone present on the site. Details of cist construction were also sometimes lost.

Over 1000 pieces of disarticulated bone were recovered from topsoil and from the amorphous, badger-disturbed soil. In the vast majority of cases these can neither be re-joined to individuals, confidently ascribed to a particular phase of the site's use, or attributed to a specific area of the cemetery. They include evidence for the only perinatal individual. The specialist metallurgical report identified evidence for iron-smelting, as well as identifying probable non-tapped iron smelting slags, but like the disarticulated bone this could not be assigned to a phase of the site. Non-tapped slags have not been previously identified in south-west Wales, but elsewhere in Britain are known from both pre-Roman and early medieval iron-working sites. The absence of context means that the Brownslade slags cannot be dated and thus their potential to shed light on early Welsh iron-working is considerably diminished.

In addition to the human remains there were a number of animal burials including a pig (Coard 2006). However, these burials are later than the early medieval cemetery and so are not reported on here.

The south-eastern and south-western limits of the cemetery appear to have been identified by the absence of burials, although no form of boundary was recognised. Burials clearly continued beyond the edges of Trench 3 to the north and north-west in the direction of the barrow, and from the 1880s investigations it seems likely that the cemetery continues right up to the edge of the barrow and at least onto its south-eastern side.

It is difficult to construct an argument for any formal organisation of the burials within the cemetery. There is a suggestion that the burials fell into two clusters or bands. The first is a cluster in the northern part of Area 8. The second is a north-east/south-west band extending across the south-eastern half of Area 9, into the northern part of Area 5 and the northwest part of Area 10. Notably, there was little clear evidence for intercutting burials. This contrasts with Laws' description that burials were 'stacked like pigeons in a pie' (see above). Even allowing for the fact the Laws was probably excavating within the barrow mound, the contrast between the 1880s excavations and the 2006 excavations is striking.

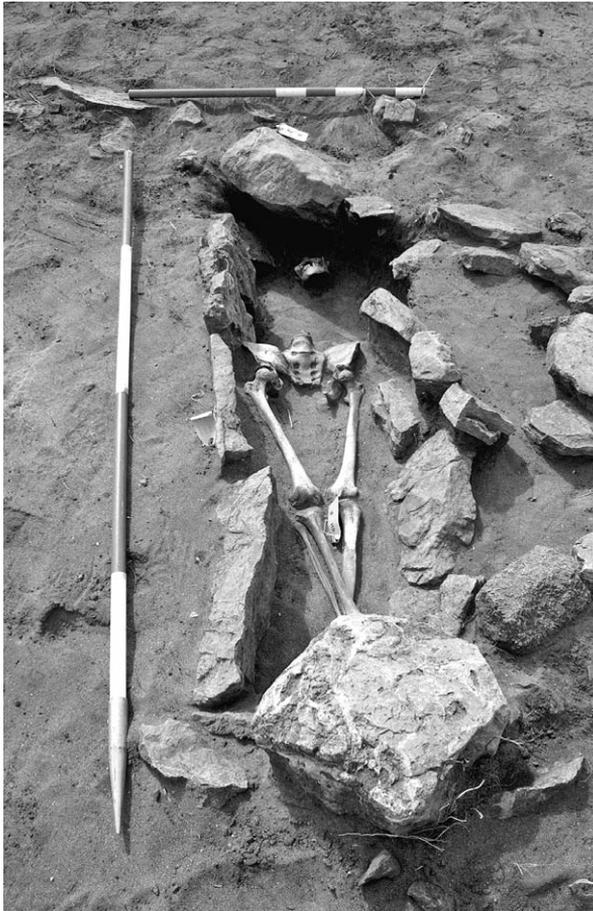
The burials associated with stone cists were generally less disturbed than simple dug graves. However, even some of the cist burials had been undermined by badger runs and had subsequently partly collapsed. A summary of the character of the 32 recorded burials and 52 identified individuals is provided Table 1. The 52 individuals include 50 skeletons of varying completeness, (some are almost complete, others very fragmentary) and two excavated skulls which were within the cemetery but had been disturbed by the badgers. The unstratified bone from surface collection and from topsoil is not included. The 32 burials could be subdivided according to the character of the associated grave as follows:

1. Cists with lintels containing extended inhumations (4)
2. Cists or possible cists without lintels containing extended inhumations (9)
3. Simple dug graves containing extended inhumations (14)
4. Cists without lintels and pits containing disarticulated human bone (4)

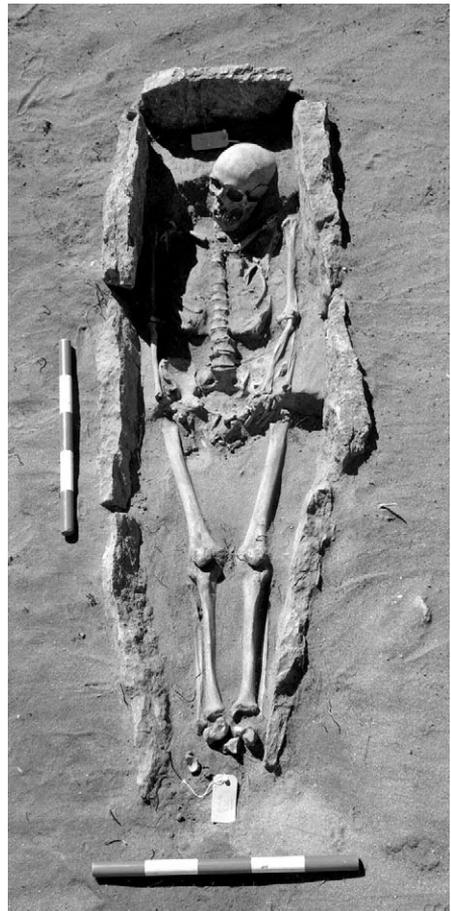
The distribution of these grave types is illustrated in Figure 6, along with the orientation of the grave if known, and Figure 7 shows information about age and sex.

During the osteo-archaeological analysis, it became clear that a number of graves contained the remains of more than one individual. This is not evidence for multiple burials, but the result of disturbance of soft sandy deposits on a site with very good bone preservation. For example, burial 511 (Fig. 8) was a cist containing the virtually complete articulated skeleton of an adult female and bones belonging to a juvenile and a neonate. However, the neonate was represented by a single bone and the juvenile by just nine fragmentary bones. Given the relative completeness and articulation of the adult female it would be difficult to argue that the bones of the other two individuals were *in situ*. Almost certainly they entered the grave by other means, probably re-deposited by badgers. This pattern was repeated in a number of graves, where disarticulated bone was recovered in addition to the principal skeleton.

Looking solely at those considered to be *in situ* we are left with three graves considered to be multiple burials. The first of these, burial 515/527 contained the remains of a near complete infant skeleton and a second partial infant skeleton. Similarly, Burial 510 contained the partial remains of a neonate skeleton and the partial remains of an adolescent skeleton. The remains of both skeletons appeared to be articulated even though the grave was heavily disturbed by badgers. Burial 524 contained evidence for no fewer than five individuals, including the near complete skeleton of a juvenile, and the partial or fragmentary remains of three other juvenile skeletons along with the partial remains of an adult female skeleton. There was no indication that any of these skeletons was articulated, and it would seem that they



Left Fig. 8. Brownslade. This burial (511) of an adult female has been disturbed by badgers, resulting in the collapse of the cist at the west end. The skeleton was almost complete, and there was no evidence for a multiple burial, suggesting that other bones identified during the osteo-archaeological analysis had entered the grave as a result of post-depositional processes. Scales 2m and 1m.



Right Fig. 9. Brownslade. Grave/skelton 532, one of the best preserved Brownslade burials. Scales 0.5m.

were re-deposited in a stone-lined pit following removal from their original resting place. It is unknown whether this took place in antiquity, or following the 1880s investigation.

Males and females, of all ages, were both found in simple dug and cist graves, with no clear pattern emerging. However, within those individuals buried in cists, a possible trend was the burial of adults in cists with lintels, and juveniles/infants in cists without lintels. Although the numbers are very small (only four cists with definite lintels were uncovered), the pattern appears to be reinforced by the observation that the two oldest individuals on the site (a male aged 50+ at death, and a female aged 45–50) were both buried in cists with lintels which were of notably superior construction to the others. Individuals buried in cists without lintels had estimated ages at death of under 25.

Apart from three, all the burials were aligned approximately east/west, and were face-up, in an extended posture. These three are briefly described:

Burial 502A was one of the oldest adult males (aged 50+), laid on his back but with his head to the east. Reverse burials may be linked to penance and punishment, perhaps as Gilchrist and Sloane (2005, 153) have suggested, to disorientate the soul on the Day of Judgement.

Burial 526a was the only instance where the individual was laid on its side with legs together and bent. Skeletal analysis of this individual concluded that it was affected by a form of short-limbed dwarfism. One of the complications in infants and young children of the most common form of short-limbed dwarfism—achondroplasia—is the external rotation of hips and bowing of the legs, sometimes resulting in an inability to walk. These problems with the lower limbs may be more pronounced were an individual to be laid on its back. It could be argued that the burial posture has been specifically selected to minimise the appearance of symptoms associated with short-limbed dwarfism.

The posture of Burial 530 is of particular interest. The right leg was bent, and the whole body was lying slightly on one side, with the head bent to the right. The posture of the leg is not thought to be a result of badger disturbance since the bones of the leg were still clearly articulated.

Grave 517 was the only one associated with a burial marker, a much degraded carved stone at the head of the grave. This was the only individual that according to the isotopic analysis consumed a diet rich in meat both in childhood and later in life. Indeed skeletal analysis indicated that this individual suffered from DISH (Diffuse Idiopathic Skeletal Hyperostosis), which is often linked to obesity or the onset of Type 2 diabetes in modern populations. It is likely therefore that the grave marker was an indication of status. It is unknown whether the possible Mediterranean region/continental Europe origin of this individual is of significance in relation to this presumed high status.

There was no further evidence for early medieval memorials or grave markers. However, there were no intercutting graves and graves within the same area closely followed similar alignments—for example in Area 9 cists 503, 510, 511, 519, and 5318 all follow the same north-east/south-west alignment, and it is therefore likely that some forms of marker were present, perhaps grave-mounds or organic markers of which no traces have survive (see Discussion). The case for grave-markers is supported by the environmental evidence which suggests that the graves were cut into a dune system that was still at least semi-mobile, and therefore in such a transient landscape grave-markers may have been the only way to confidently identify grave locations. But any such markers would also have been vulnerable to sand inundation and disappearance unless they were maintained at regular intervals.

Radiocarbon determinations provide the only reliable dating for the cemetery. Ten radiocarbon dates were obtained; three from loose bone collected during the evaluation and seven from burials in cist graves and dug graves. The overall date range is from cal. AD 430 to cal. AD 1020, indicating a cemetery in use for up to seven centuries. However, the *floruit* of the site as expressed by seven radiocarbon dates was from the mid-seventh century through to the end of the ninth century. Two dates (cal. AD 430–650 Beta-179380; cal. AD 440–650 Beta-228422) indicate that burial may have been taking place from the mid-fifth century, and the latest date (cal. AD 830–1020 Beta-228419) could be interpreted as belonging to the main period of burial, and the cemetery therefore may not have carried on into the eleventh century.

The small stone building at Brownslade

Prior to excavation this building was represented by a rectangular east/west depression. The southern side of the building had been truncated by a quarry, but a large orthostat was considered to mark its south-east corner, providing approximate dimensions of 6m by 4m. Mortared masonry survived up to six courses in height at the north-east corner, and an extensive spread of limestone rubble represented collapsed walls; it is likely that collapse was in a single episode rather than slow degradation. The

evaluation produced an assemblage of seven medieval and 94 post-medieval pottery sherds, mostly from topsoil. A piece of fifteenth to sixteenth-century glazed ridge tile was also recovered. There was no evidence for burials or grave-cuts, but it is worth noting that the evaluation only revealed a restricted area of undisturbed natural soil and that grave-cuts were practically invisible in the sandy matrix. The evaluation therefore failed to reveal either the date or function of this building. This is likely to be one of the two stone buildings mentioned by Laws in 1888 (377–8), perhaps the one considered to be ‘The Chapel’.

Post-sand inundation features at Brownslade

Remains of stone walls and a shell midden post-dating the cemetery were excavated and removed during the excavation of Trench 3. These are not described here. However, although not dated, samples taken from a shell midden (269) contained the highest concentrations of charred plant remains from the site.

RADIOCARBON DATES FROM BROWNSLADE

The following radiocarbon dates have been calibrated using Radiocarbon Calibration Program Calib Rev 6.0.0 (<http://calib.qub.ac.uk/calib/>).

Beta-179378

Sample and context: human femur from the evaluation trench.

Result BP: 1240±60 BP

Calibrated range at 2 sigma: cal. AD 660–900 and cal. AD 920–940

Beta-179379

Sample and context: human humerus from the evaluation trench.

Result BP: 1290±60 BP

Calibrated range at 2 sigma: cal. AD 650–880

Beta-179380

Sample and context: human scapulae fragments from the evaluation trench

Result BP: 1480±50 BP

Calibrated range at 2 sigma: cal. AD 430–490 and cal. AD 510–520 and cal. AD 530–650

Beta-228418

Sample and context: cow tooth from fill of gully (289) cutting the loess.

Result BP: 2410±40 BP

Calibrated range at 2 sigma: 750–690 cal. BC and 670–640 cal. BC and 590–400 cal. BC

Beta-228419

Sample and context: human bone from burial in cist grave 503.

Result BP: 1100±40 BP

Calibrated range at 2 sigma: cal. AD 830–840 and cal. AD 870–1020

Beta-228420

Sample and context: human bone from grave 509.

Result BP: 1290±40 BP

Calibrated range at 2 sigma: cal. AD 650–80 and cal. AD 790–810 and cal. AD 840–860

Beta-228421

Sample and context: human bone from juvenile burial in cist grave 510.

Result BP: 1180±40 BP

Calibrated range at 2 sigma: cal. AD 720–740 and cal. AD 770–970

Beta-228422

Sample and context: human bone from female adult from ‘cist’ 524, possibly redeposited as a result of 1880s excavations.

Result BP: 1480±40 BP

Calibrated range at 2 sigma: cal. AD 440–480 and cal. AD 530–650

Beta-228423

Sample and context: human bone from juvenile from 'cist' 524, possibly redeposited as a result of 1880s excavations.

Result BP: 1360±40 BP

Calibrated range at 2 sigma: cal. AD 610–720 and cal. AD 740–770

Beta-228424

Sample and context: human bone from burial in cist grave with lintels 532.

Result BP: 1300±40 BP

Calibrated range at 2 sigma: cal. AD 650–780 and cal. AD 790–810

Beta-228425

Sample and context: human bone from burial in cist grave 535.

Result BP: 1350±40 BP

Calibrated range at 2 sigma: cal. AD 610–720 and cal. AD 740–770

Beta-229587

Sample and context: charred plant material from a sample associated with the upper set of cultivation marks (277).

Result BP: 2130±40 BP

Calibrated range at 2 sigma: 350–290 cal. BC and 230–50 cal. BC

SKELETAL REMAINS FROM BROWNSLADE⁷

By Ros Coard

The human skeletal material recovered from the site has been reported in several interim reports and is summarised here (Coard 2003; Coard and Sables 2006; Coard and Sables 2007).

Completeness and condition

The condition of the bone ranged from excellent to poor. Generally the bone surface texture was good, primarily due to the more non-acidic nature of the depositional environment; this is rare for Wales. The juvenile group displayed more extensive damage due to the more fragile nature of the bone. In adults much of the damage was confined to the epiphyses of long bones, or other bone extremities, resembling damage caused by acidic conditions. Although the bone surface texture was generally good the level of bone fragmentation was high; presumably due to the extensive post-depositional disturbance which has taken place at the site. Fifty-two individuals were recognised during the analysis.

An assessment made of the relative completeness of the 52 identified skeletons based on the approximate percentage of remaining bones divided the inhumations into three broad groups:

Percentage Complete	Total
70%-100%	12
10%-70%	24
<10%	16

The latter group mostly consists of single bones most probably isolated due to post-depositional disturbance (e.g. S501, a single but relatively complete cranium).

Sex of the individuals

The technique used to sex the individuals varied depending on the survival of the appropriate bones, but, wherever possible, was based on the morphology of the pelvis and/or the cranium. Standard osteological criteria and techniques to indicate sexual dimorphism were used in the absence of these bones to distinguish the sex groupings. Estimates of sex were established for the adult group and where the sexual

characteristics were more completely developed in the adolescent group. It was possible to identify the sex of 33 individuals of which 16 are male and 17 female. The remaining individuals are sex indeterminate. In terms of percentages, the data suggest a balanced population in that 48.5% were female and 51.5% were male

Age distribution

In ageing the individuals the assumption taken here is that the degree of skeletal maturity (biological age) is equivalent to chronological age. The age classifications are adapted from Scheuer and Black (2000) and are based on stages of skeletal maturation or skeletal biology (for example, fusion or the lack of for major bone groups). Age determinations are based on standard anthropological techniques using bone length and development, epiphyseal union, dental development and age related changes to the auricular surface of the ilium, the pubic symphysis, ribs and vertebral column. In the adult categories, age estimates are dependent on dental wear only in the absence of other skeletal markers for aging. Within this text the term *juvenile* is used here in a general sense to refer to all skeletal remains (or individuals) in any stage previous to adult (i.e. full skeletal maturity). Any remains, or individuals, having achieved full skeletal maturity are termed *adult*. Table 1 provides some detail of the burials, and Table 2 gives specific age groupings.

The ages assigned to 46 individuals are shown in Table 2, and it is clear that there are peaks in several age groups. Relatively few deaths occur in the youngest age categories with two mortalities in the months following birth. This increases to four in the Infant category, i.e. up to 3 years old. These mortalities may relate to infants who suffered from the stress of birth and the weaning process. The mortalities rise to twelve individuals in the juvenile, or 3–12 years, category. The data suggest that something (relatively) unusual occurs in this group. It is possible that some of the individuals in this group suffered a specific period of stress, relating to diet or possibly due to a more physical or harsh life style. Of this group, five mortalities are associated with individuals aged between 11 and 15 years old. The mortality rate falls for the 12–18 years olds, the adolescents, and then rises sharply into adult years and, and with one fluctuation, remains high.

There is a lack of resolution within the adult categories in terms of the age ranges but interesting patterns emerge when these are compared to the sex of the individuals. The data in Table 3 show a slight trend for female mortality being numerically dominant in the young adult category but evens out in the adult and above. Compared to the male data, the female mortality is higher in the young adult and adult classifications, N=7, than that the males where N=3 for similar ages. The higher female mortality in these age groups could be related to child bearing and the complications associated with it.

When compared to other sites, Llandough demonstrates a similar trend for greater female mortality in these age categories for the entire cemetery site and evident in Areas II and III. The patterning is not so evident and shows an opposite trend in Area I, the area associated with the earlier burials (Loe and Robson-Brown 2005). Similar conclusions, mortality related to childbirth processes and complications, are suggested by the authors (*ibid.*). However, such a female dominated trend is not noted by Wilkinson (2001) at Greyfriars, Carmarthen. The male mortality pattern is more unevenly distributed at Brownslade with increasing mortality in the older adult categories (middle and mature adults). This pattern is also evident at Llandough (Loe and Robson-Brown 2005), however the small number really prevents further interrogation of the Brownslade data.

The percentage of juvenile mortality for the site at 20 is around 46% of the stratified population. This compares to other sites where estimates for early medieval and medieval sites where ranges from around 20% to 50% of the population. What is more striking is that different patterns within the juvenile mortality group emerge. At Llandough, 28% fail to reach adulthood with mortality peaks in the earlier

Table 1. Summary of the character of the Brownslade burials

Burial No	Grave type	Orientation	Skeleton No.	Sex (if known)	Maturity	Condition of skeleton	<i>In situ</i> or not	Radiocarbon date range	Isotope sample
501	Disarticulated	—	S501	Male	Mature Adult (+50)	Frag. (disartic.)	No	—	—
502	Dug grave	ENE–WSW	S502A	Male	Mature Adult (50+)	Partial (artic.)	Yes	—	502A
			S502b	Male	Young adult (20–25)	Partial (disartic.)	No	—	—
503	Cist grave	ENE–WSW	S503	Male	Young Adult	Partial (artic.)	Yes	cal. AD 830–1020	—
504	Dug grave	—	S504	—	Neonate (4 weeks)	Partial (artic.)	Yes	—	—
506	Dug grave	ENE–WSW	S506	Male	Middle Adult (30–35)	Near complete (artic.)	Yes	—	—
507	Disarticulated	—	S507a	Male	Adult	Partial (disartic.)	No	—	—
			S507b	Female	Adult	Frag. (disartic.)	No	—	—
508	Dug grave	E–W	S508	Male	Adult (24–30)	Partial (artic.)	Yes	—	508
509	Dug grave	E–W	S509	Male	Middle Adult (35–45)	Near complete (artic.)	Yes	cal. AD 650–860	—
510	?Cist grave	E–W	S510a	Female	Adolescent (11–13)	Partial (artic.)	Yes	—	—
			S510b	—	Neonate (40 weeks 1 week postnatal)	Partial (artic.)	Yes	cal. AD 720–970	—
511	Cist grave	ENE–WSW	S511A	Female	Middle Adult (40–45)	Near complete (artic.)	Yes	—	511A
			S511a	—	Juvenile (7–8 years)	Frag. (disartic.)	No	—	—
			S511b	—	Neonate (2 weeks)	Frag. (disartic.)	No	—	—
513	Disarticulated	—	S513a	Male	Middle Adult (35–40)	Partial (disartic.)	No	—	—
			S513b	Female	Young Adult (20–24)	Partial (disartic.)	No	—	—
			S513c	?Male	Adult	Frag. (disartic.)	No	—	—
514	Dug grave	E–W	S514	Female	Adolescent (13)	Near complete (artic.)	Yes	—	514
515/527	Dug grave	—	S515	—	Infant (18–20 months)	Partial (artic.)	Yes	—	—
			S527	—	Infant (1.5–2 years)	Near complete (artic.)	Yes	—	—
516	Disarticulated	—	S516	Female	Mature Adult (45+)	Frag. (disartic.)	No	—	—
517	Dug grave	ESE–WSW	S517	Male	Mature Adult (55–58)	Near complete (artic.)	Yes	—	517
518	Dug grave	ENE–WSW	S518A	—	Juvenile (11)	Partial (artic.)	Yes	—	—
			S518b	—	Adolescent (14–15 years)	Frag. (disartic.)	No	—	—
519	Cist grave	ENE–WSW	S519	Male	Young Adult (15–20)	Partial (artic.)	Yes	—	—
520/522	?Cist grave/ ?disarticulated	—	S520	—	Juvenile (c. 5 years)	Frag. (disartic.)	No	—	—
			S522a	Female	Young adult	Frag. (disartic.)	No	—	—
			S522b	—	Juvenile (5.5 years)	Frag. (disartic.)	No	—	—

continued

Table 1. Summary of the character of the Brownslade burials (continued)

Burial No	Grave type	Orientation	Skeleton No.	Sex (if known)	Maturity	Condition of skeleton	<i>In situ</i> or not	Radiocarbon date range	Isotope sample
521	Dug grave	—	S521	Female	Middle-Adult (40–45)	Partial (artic.)	Yes	—	—
524	Stone-lined pit with disart. bone	E-W	S524A S524b S524c S524d	Female — — —	Adult (30–35) Juvenile (5.5–6) Juvenile (4.5–5) Juvenile (2–3) Juvenile (1–5)	Frag (disartic.) Near complete (disartic.) Partial (disartic.) Frag (disartic.) Frag (disartic.)	No No No No No	cal. AD 440–650 cal. AD 610–770	— — — — —
525	Dug grave	E-W	S525	?Female	Mature Adult (45–50)	Partial (artic.)	Yes	—	—
526	Cist grave	E-W	S526A S526a	?Female	Adult (25–30) Infant (1.5–6)	Frag (disartic.) Partial (artic.)	No Yes	—	—
528	Dug grave	ENE-SWS	S528A S528b	Male Female	Young Adult (20–25) Adult	Partial (artic.) Frag (disartic.)	Yes No	—	528A —
530	Dug grave	E-W	S530A S530a S530b	Male — —	Middle-Adult (35–40) Juvenile (6–8) Juvenile (11)	Near complete (artic.) Frag (disartic.) Frag. (disartic.)	Yes No No	—	530A — —
531	Cist grave (lintels)	ENE-SWS	S531	Female	Middle Adult (35–40)	Partial (artic.)	Yes	—	—
532	Cist grave (lintels)	ENE-SWS	S532	Male	Mature Adult (50+)	Near complete (artic.)	Yes	cal. AD 650–810	532
533	Cist grave (lintels)	ENE-SWS	S533	Female	Mature Adult (45–50)	Near complete (artic.)	Yes	—	—
534	Dug grave	—	S534	Male	Middle Adult (35–45)	Partial (artic.)	Yes	—	—
535	Cist grave	E-W	S535	Female	Young Adult (20–25)	Partial (artic.)	Yes	cal. AD 610 - 770	535
536	Cist grave	E-W	S536A S536b	Female Female	Young Adult (18) Adult	Partial (artic.) Partial (?disartic.)	Yes ?No	—	—
537	Cist grave	NW-SE	S537	—	Juvenile/possibly infant	Partial (artic.)	Yes	—	—
538	Cist grave (lintels)	E-W	S538	Female	Adult (25–30)	Near complete (artic.)	Yes	—	538

Condition: Near Complete = 80% or more of skeleton present; Partial = 20–80% of skeleton present; Fragmentary = less than 20% of skeleton present
 The possible place of origin column is from isotopic analysis by Hemer (2010); results of this analysis are summarised and discussed in by her in this paper.

Table 2. Age estimates, where possible, for the Brownslade population

Skeletal development	Chronological age	No. of individuals
Perinate	Up to/ around time of birth	0
Neonate	Birth–2 months	2
Infant	2 months–3 years	4
Juvenile	3–12 years	12
Adolescent	12–18 years	2
Total		20
Young adult	18–25 years	7
Adult	25–35 years	4
Middle adult	35–45 years	8
Mature adult	Over 45 years	7
Total		26

Table 3. The number of females and males mortalities in the adult categories at Brownslade

	Female	Male
Young adult	4	2
Adult	3	1
Middle adult	3	3
Mature adult	3	4

age groups, under 2 years, under 6 years and under 10 years (Loe and Robson-Brown 2005). This pattern is contrasted, however, at Greyfriars choir and northern nave extension where the mortality pattern shows greater peaks between 10 years to 18 years (Wilkinson, 2001). A similar pattern is seen in the Greyfriars graveyard population, where only three under 5 years old are represented compared to 7 in the 5–10 year old group (Wilkinson 2001). In this respect, Brownslade more closely matches Greyfriars, although the peaks are at different ages in the juvenile samples.

The osteology does not reveal why such peaks should occur but the explanations are more probably embedded in the social and cultural attitudes of the time.

Height and stature estimates

Heights of the individuals were undertaken using the standard osteological techniques, as outlined in Bass (1995) and based on the long bones, noting that it is modern ranges outlined by Bass. Where survivorship allowed the lower limbs were used but in rare cases only the upper limbs were available and were used (even though this is thought to produce less reliable results). The distributions of sex and height for 21 individuals, comprising 11 females and 10 male are presented in Table 4. The mean height and range of heights by sex division for Brownslade and other sites can be seen in Table 5. The body build could be characterised as robust with few showing marked gracility.

Table 4. The estimate heights (cm) of males and females in the Brownslade population

	151	153	156	158	160	163	165	168	170	172	176
Male	–	–	–	–	1	–	1	5	–	1	2
Female	1	4	1	2	3	–	–	–	–	–	–

Table 5. The mean height (cm) and range of heights of skeletal assemblages from Brownslade and elsewhere for comparative purposes

Site	Male		Female	
	Mean	Range	Mean	Range
Brownslade	168.9	160–176	156.1	151–160
Llandough	169.57	156–186	156.8	144–169
Atlantic Trading Estate	165.19	N/A	156.75	N/A
Greyfriars: chapter house and cloisters	172.5	164–183	N/A	N/A
Greyfriars: choir and northern nave extension	N/A	167–183	N/A	157–167

The female heights range from 151–160cm (4ft 11in–5ft 3in) and the males from 160–177cm (5ft 3in–5ft 9in). The mean height for males is 168.9cm or around 5ft 6in, and the modal height is 1.68cm or 5ft 6in. The mean height for females is 155.9 cm, just less than 5ft 1in, and the modal height is 153cm or 5ft 0in.

The range in height and the average height were compared to stature estimates from skeletal remains from published medieval sites within Wales (Loe and Robson-Brown 2005; Wilkinson 2001). When compared to other early medieval populations, the Brownslade sample falls within the range of other examples but is at the lower end. For example, although later medieval in date, Wilkinson (2001) noted at Greyfriars that the body height for the males in the choir and northern nave extension ranges from 167–183cm (5ft 6in–6ft 0in) and the Chapter House and Cloisters males as 164–183cm (5ft 4½in–6ft 0in) with an average of 172.5cm (5ft 8in). At Llandough (not specified by area), the male heights range from 156–186cm with an average of 169.5cm. With this comparison in mind it would be tempting to view the Llandough sample as more comparable, however, caution should be urged due to the fact that these represent a compounding of all areas at Llandough (early medieval through to medieval) and therefore, any period specific resolution is lost.

A similar pattern is seen in the Brownslade female data. The females of Greyfriars choir and northern nave extension (Wilkinson 2001) record heights of 157–167cm or 5ft 2in–5ft 6in again, putting them taller than the Brownslade sample. Equally at Llandough, the females range from 144–169cm, with a mean of 156.8cm (Loe and Robson-Brown 2005). Again, this puts both examples as taller than the Brownslade females. Again, and for the same reasons as stated above, caution should be urged due to the

compounding of the data by areas at Llandough. Loe and Robson-Brown (2005) quote average heights for the Atlantic Trading Estate, Barry, population as an average of 165cm for males and 156.7cm for females. This would indicate that this population would be more comparable in that the male height is less than at Brownslade, leaving the female still slightly taller. What appears as unusual in the Atlantic Trading Estate data is that the range of heights for the males indicates no tall individuals either, adding to their comparative value for Brownslade.

In reality there is little difference between the mean heights of the individuals at Brownslade and Llandough. Both of these sites register higher mean heights than is seen at Atlantic Trading Estate but these are all lower than those observed at the monastic site of Greyfriars. In reality there may be no statistical difference between any of the sites reported here with the samples being so small (Llandough aside). Hemer (2007) noted no statistical difference between a subset of the Brownslade populations and other early medieval (including Welsh) populations. What is more striking with the mean heights recorded here is that those associated with the Greyfriars monastic cemetery (Wilkinson 2001) register as higher than those at the other sites. This data may add weight to the argument of the higher status inferred and better nutrition observed in the skeletons of those associated with ecclesiastical sites. Equally striking is the range of heights in that the maximum height of the Brownslade males is only 177cm, making them 6cm or more shorter than other early medieval populations. The average deviation from the mean height of the Brownslade males is only 3.5cm.

Pathology

Assessments of the range of pathologies displayed indicate that this population is probably within the boundaries of what could be expected for a pre-modern, pre-industrialised population and the levels of disease and trauma are broadly in keeping with contemporary populations. The pathology displayed is not untypical for this period with several of the individuals displaying multiple disorders and some appear rare.

Trauma associated with bone breakage is rare but includes one healed fracture to the ulna of S513b. An excellently healed break to a radial fragment of a young adult was noted from the sample of unstratified remains in 2006.

Disorders associated with dietary deficiencies are evident and include forms of iron deficiency or anaemia, such as *cribra orbitalia*, noted on S509 and S517, and porotic hyperostosis on skeleton S511 (Hemer 2007). Other conditions relating to malnutrition and/or other environmental trauma, such as enamel hyperplasia is evident on S514, S530A and S535. As enamel hyperplasia occurs when young (typically before the age of three in modern populations) this can be seen as an indicator of stress at a particular maturation phase. Dietary stress indicative of excess is rarer but possibly evident as DISH (Diffuse Idiopathic Skeletal Hyperostosis) in S517A (Hemer 2007). Isotope analysis identified the Mediterranean region/continental Europe as the origin of this individual. Although the exact aetiology of DISH is uncertain, in archaeological contexts it is often associated with a rich diet of oily fish or offal (Waldron 2006), for example, and/or high status. In modern populations it is often linked to obesity or the onset of Type 2 diabetes (Roberts and Cox 2003) and within an archaeological context to high status or monastic burials. Waldron (1985; 2006, 262) linked the possibility of DISH to occupation at the monastic cemetery at Merton Priory and suggested it may be an occupational disease for those following a religious life and marked status. Although S517A occupied a simple dug grave and was somewhat typical in terms of attitude, being a supine and extended inhumation, it is of one of the oldest males, and perhaps significantly was the only burial to have a recognised grave marker.

Disorders of the later stages of the maturation process, such as DJD (degenerative joint disease), osteoarthritis, the development of Schmorl's nodes, vertebral osteophytic lipping, along with advanced

dental wear and dental disorders, are also evident in several older individuals. These disorders are not necessarily linked to occupation so much as the maturation process.

Other disorders associated with growth and development are present within this population and include disruption to the growth plates of the long bones (S509), mild spina bifida occulta (S511A, S533, Hemer 2007) and dyschondrosteosis (skeleton S526A), a pseudoautosomal dominant condition and a form of short limbed dwarfism (Aufdehde and Rodríguez-Martín 1998). Many of these, including enamel hyperplasia, are associated with stress during the early growth years and some, associated with the late infant or early adolescent group, may suggest a physical or harsh lifestyle beginning during this phase of skeletal development. Attributes are also present in the Brownslade population that have an inherited component or indicate a simple genetic background, e.g. the metopic or medio-frontal suture (Ashley-Montagu 1937) which normally disappears within humans in the first few years of life but presents a persistent metopic suture in S502A. This is prevalent in a small number of individuals within modern populations although the instances vary (*ibid.*).

A number of marked pathologies and bone modifications are present in this population including a flaring of the lateral diameter or curvature of iliac crest (hip-bone) and present as a pronounced triangular pattern on skeletons 509, 513A/b and 533. A further group consisting of skeletons 502A, 513a/b, 514, 530A, 532, 534, 535, and 524b, display a more moderate flaring of the iliac crest. Skeletons 511A, 513a/b, 518A, 526A, and 531, displayed no such development. The feature observed consisted of a relatively normal medial curvature to the iliac crest but a pronounced but gently rounded lateral curvature (in the case of the moderate group) or sharply angulated (giving a triangular shape) in the more pronounced or developed group. The three main patterns observed are plotted in Figure 10, the terms

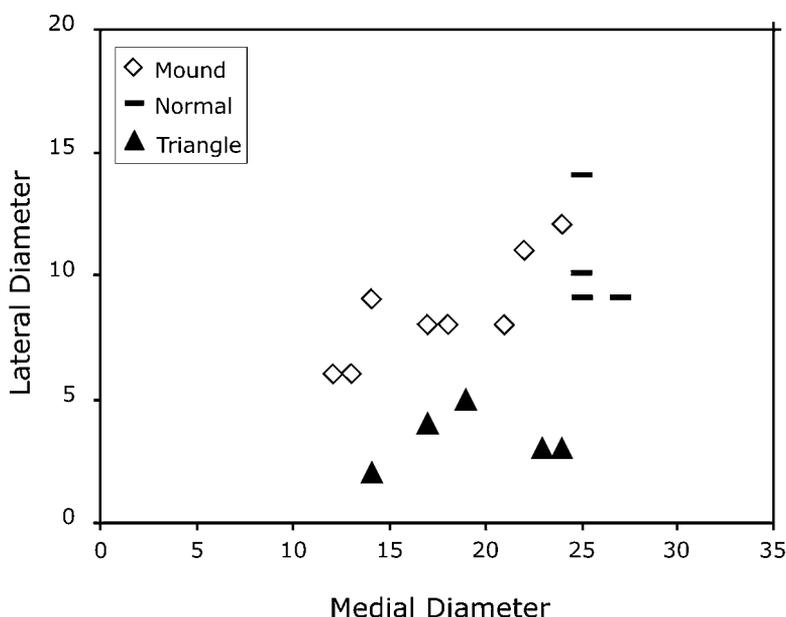


Fig. 10. Scatterplot showing the three main patterns observed on the pelvic iliac crest. Note: those showing no obvious development are termed *normal*, those showing some development, classed as *mound*, and those with pronounced development, termed *triangle*.

chosen here reflect the shape of the feature and are intended to be purely descriptive. The small group with the pronounced triangular hip feature are clearly distinguished. This is an unusual feature and is most probably linked to occupation and locomotion, and suggesting a repetitive process sufficient to cause these modifications.

Muscular skeletal markers of the upper limbs

Few skeletons survived complete enough to undertake extensive analysis of muscio-skeletal markers (MSM) but four skeletons were selected for consideration of the MSM of the upper arm bones (Davies 2008, 33), with particular emphasis on the long bones, humeri, radii and ulnae. The skeletons include two mature males, S502A and S532 and two females, S536A and S538. Although only two of these individuals were in cist graves, possibly accounting for their better preservation, it was entirely on the levels of preservation both to indicate skeletal markers and relative completeness of the bones, lack of disturbance (or completeness of burial) and age (all adults) that determined their use. The contra precluded the use in the other individuals. A range of measurements of the selected bones for length, width, circumference, diameter along with indices of robustness following standard osteological procedures outlined in Bass (1995) for each bone. The method outlined by Hawkey and Merbs (1995) to measure and assess the selected muscle sites was employed. Measurements were taken to assess both the asymmetry (indicator of handedness) and robusticity (indicator of physical activity) of the individuals. All were found to be asymmetrical, indicating right hand dominance. The asymmetry is particularly marked in the male S532 but less so in the females generally. The robusticity indices suggest strenuous activities for the individuals, and again are more marked in S532. Also prominent is the bowing to the upper limb bones possibly indicating strenuous arm movement. These features along with the assessment of the robusticity of the MSM indicate a severe pattern of use (Davies 2008). The sex differences identified suggest that the females were right handed but used their muscles on their left arms more so than the right. The male group suggests a more bilateral use of the arms but again right hand dominance. Both groups suggest very strenuous lifestyles. It may be significant that both males possibly originated from the western Irish coast, the western Outer Hebrides, Cornwall *or* continental Europe. Female S538 may have originated from the Mediterranean region or continental Europe.

Homogeneity and status

It should be noted that, despite the cemetery being in use across several centuries, observations suggest that this population represents a very homogeneous group. No outstandingly different individuals were noted in either the male or female categories (for example, both the mean and modal heights were the same for each sex grouping). This suggests that no very tall, or conversely very short, individuals are present. The height of the individuals, the robusticity, as well as the trends in pathology, all suggest a local and possibly a confined community. However, this homogeneity observed during skeletal analysis contrasts sharply with the results from the isotopic analysis, which indicates a highly mobile population, with individuals originating from several different areas of Great Britain and Europe.

To what extent the burial pattern reflected the status of any of the Brownslade individuals remains unclear. The presence of a cist does not necessarily imply status here nor does the simple assumption of higher the status and better the health and diet. Cist graves were used for male and female, young and old, as were simple dug graves. The presence of lintel stones associated with skeletons S532 and S533 could indicate status differentiation, but they are associated with high levels of pathology. In the case of S533, a mature adult female in a cist, recorded dental pathologies (tooth loss, crown obliteration, abscesses etc.), along with extensive osteophyte formation to hands and feet, Schmorl's nodes, mild spina

bifida occulta, and pronounced asymmetry of the upper arm bones with the right arm being 1cm longer than the left all occur. Equally, in cist, S532, a mature adult male recorded high levels of pathology including, osteoarthritis, Schmorls nodes, dental disorders along with asymmetry of the upper arm bones and markedly pronounced stress lesions on the upper arm bones. Both of these individuals had physically strenuous lives

FINDS FROM BROWNSLADE

Medieval and post-medieval pottery from Brownslade By Paul Courtney and Dee Brennan

A total of 219 sherds of medieval and later pottery and one medieval ridge tile fragment were recovered from excavation Trenches 1, 2 and 3, and 101 sherds were recovered from the evaluation trench. Most was from topsoil or badger-disturbed deposits and none was from securely sealed contexts; therefore only a summary of results is presented here. The 182 sherds of medieval pottery date from the twelfth century to at least the thirteenth century, though some could be as late as the fifteenth century. The mix of local Welsh fabrics and imports from south-west England is typical of the region. Dyfed gravel tempered wares (jugs and cooking pots/jars) and Llanstephan ware jugs predominate amongst the local wares. Seventy-two per cent of the medieval sherds from the site were unglazed and thus cooking pots/jars would appear to be the commonest form amongst the assemblage. There is also an absence of continental imports, such as Saintonge ware. Both features are a reflection of the rural nature of the site and its presumed derivation from households of peasant status. Two sherds from Ham Green A jugs can be dated to *c.* 1120–60. Bristol pottery type 114 ('proto-Ham Green ware'), believed to have been manufactured at Pill, near Bristol, accounts for *c.* 20% of the medieval pot by sherd count. No characteristic late medieval or transitional wares, such as Newport-type wares, were recovered from the site. There may therefore be a hiatus in occupation or ceramic use in the fifteenth to sixteenth centuries, though the assemblage is too small to be certain

A total of 138 sherds of post-medieval pottery were recovered. The assemblage is dominated by undecorated North Devon coarse wares, which may date from the late sixteenth to nineteenth centuries, although overall the assemblages likely to be largely seventeenth- or eighteenth-century in date.

Quernstones from Brownslade (Fig. 11) By Ken Murphy

The quernstones from Brownslade (Fig. 11) are all from unstratified contexts or, in the case of no. 4 from post-medieval rubble. Apart from no. 5, which is a dolerite probably from northern Pembrokeshire, but is found in glacial deposits further south, all are of locally derived Devonian 'Ridgeway' sandstones/conglomerates (John Davies, pers. comm.) All are of roughly modified boulders and consequently are oval or irregular in shape and of varying thickness, they have no radial groves on their grinding faces, no evidence of rynds, and no raised collars around their central holes, and are therefore comparable with examples from other early medieval sites such as those from Llandedrgoch, Anglesey, where they occur in eighth-/tenth-century contexts (Redknap 2000, fig. 115). More local to Brownslade are six examples found at a settlement at South Hook, 8km to the north on the Milford Haven waterway, dated to the eighth/tenth century AD (Redknap and Horák 2010), and at Newton, also on the Milford Haven waterway, where a quernstone was found discarded in a corn dryer also dated to the eighth/tenth century AD (Redknap and Horák 2004, fig. 8). The Brownslade quernstones are all worn and broken, and therefore were discarded. They are becoming increasingly recognised as indicators of early medieval settlements; at Brownslade they are the only evidence for such a settlement, presumably lying close to the cemetery.

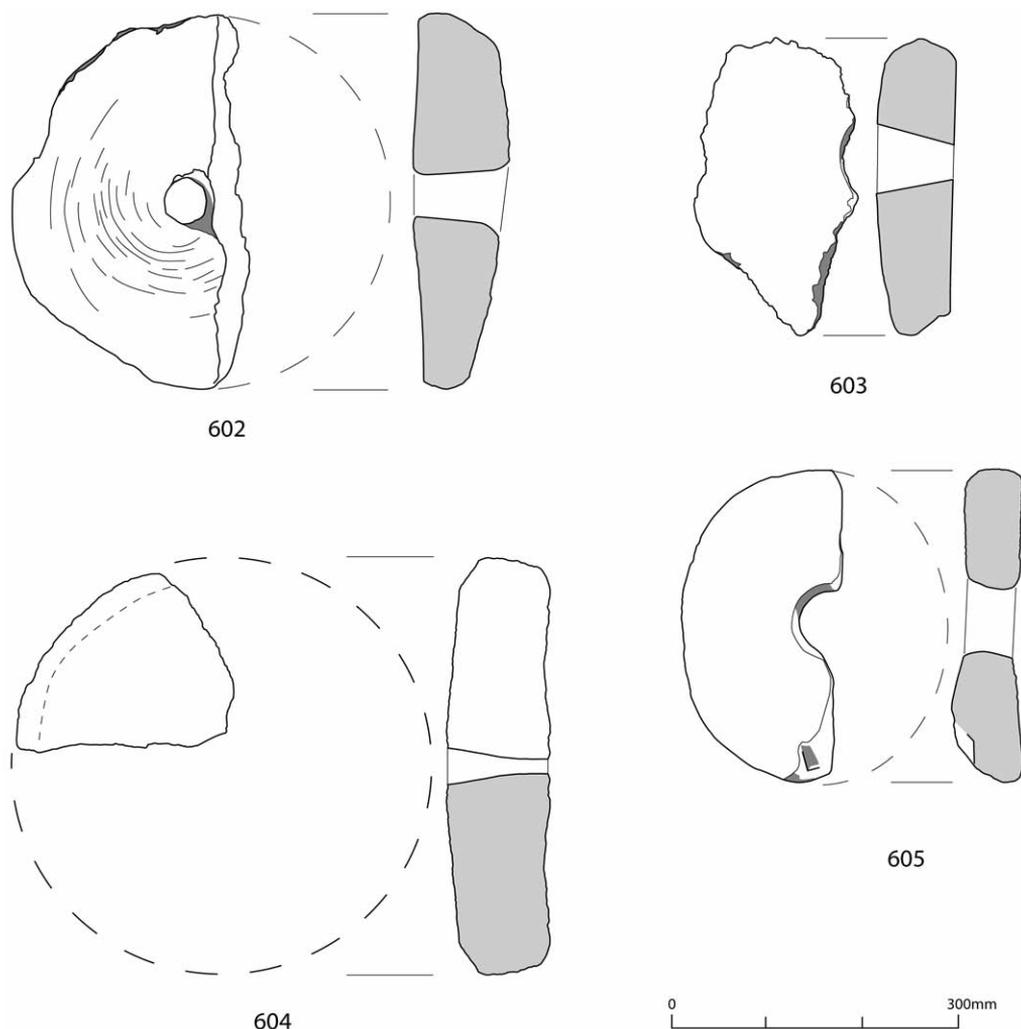


Fig. 11. Brownslade. Quernstones. Scale 1:8.

1. Unstratified, found after machine removal of overburden. Lower rotary quernstone of fine-grained Old Red Sandstone. Approximately 60% of an irregularly-shaped stone, 340mm to 390mm across, with central hole 54mm tapering out to 90mm on the underside of the stone. Maximum thickness 90mm, minimum 45mm. The convex working surface is worn. (SF 602).
2. From rubble of a post-sand inundation wall. Upper rotary quernstone of conglomerate with quartz and stone clasts up to 25mm. Approximately 30% of an irregularly-shaped stone c. 400mm across, with a central hole c. 90mm diameter tapering down to c. 70mm on the underside of the stone. Maximum thickness 68mm, minimum 60mm. The slightly concave working surface is worn, with evidence of circular wear marks, and the pebble inclusions flattened. (SF 603).
3. From modern turf and topsoil. Lower rotary quernstone of Old Red Sandstone with quartz clasts varying from 2mm to 20mm. Approximately 20% of an oval/circular stone c. 440mm diameter, with

a narrow central hole. Maximum thickness 115mm, minimum 90mm. The convex working surface is worn, with the outer edge roughly bevelled, reducing the grinding surface to *c.* 380mm diameter. (SF 604).

4. From modern turf and topsoil. Upper rotary quernstone of fine grained Old Red Sandstone. Approximately 50% of an oval shaped stone 330mm diameter, with central hole 85mm diameter tapering slightly down to 70mm on the underside of the stone. Maximum thickness 68mm, minimum 50mm. The stone has fractured along a (rectangular?) handle slot cut 25mm in the top surface and 50mm from the edge of the stone. The working surface is slightly concave and worn. (SF 606).
5. From modern turf and topsoil. Probably a lower rotary quernstone of a grey/green Dolerite. Less than 10% of this stone survives. Probably roughly circular, with a diameter greater than 400mm. Maximum thickness 100mm. (SF 613).

Grave marker from Brownslade (Fig. 12) By Ken Murphy

Single piece of shaped, fine-grained, quartz-rich Old Red Sandstone, 380mm long, a maximum of 250mm wide and 95mm thick, found at the head of grave 517. The lower part of the stone tapers from 220mm wide at the base to 190mm wide 180mm from the base. The upper part of the stone then widens out into a roughly circular upper part *c.* 250mm diameter. The edges on the lower part of the stone are bevelled. Both faces of the stone are flat, although part of one face on the upper part has been lost. The stone seems to have been shaped by pecking, but this is not certain, as all surfaces except the base are very heavily weathered and pockmarked. There is no evidence of detailed carving. The stone probably stood upright; this accounts for its unweathered base. Indeed the stone still stands upright on a flat surface without support.

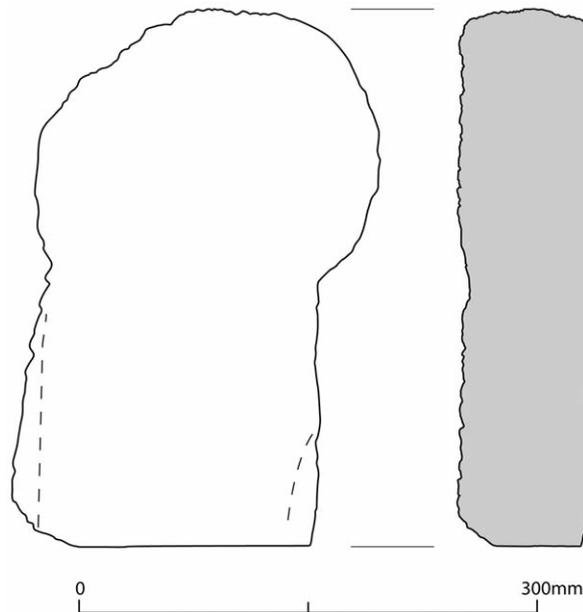


Fig. 12. Brownslade. Grave marker. Scale 1:5.

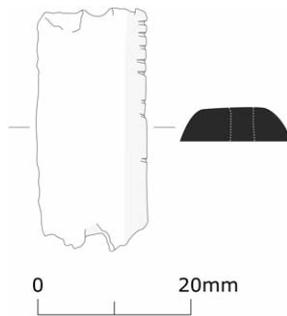


Fig. 13. Brownslade. Bone comb. Scale 1:1.

Bone comb from Brownslade (Fig. 13) By Ken Murphy

Part of a bone side-plate of a composite double-sided comb; unstratified (found after machine removal of overburden). Made from an animal long bone split down the centre. It is broken at both ends through rivet holes. Its original length is uncertain, but it survives to 32mm in length, 15mm wide and 4mm thick. The only decoration comprises eight shallow score marks along one edge. Comparable examples of early medieval composite double-sided combs have been found in Wales at Dinas Powys, Glamorgan (Alcock 1963, 154–59, fig. 34, pl. VIII) and Llanbedrgoch, Anglesey (Mark Redknap, pers. comm.).

Copper alloy aglet from Brownslade By Ken Murphy

A simple, undecorated aglet, 18mm long, made from a small piece of folded copper alloy, from sand beneath a post-medieval wall.

ARCHAEOMETALLURGICAL RESIDUES FROM BROWNSLADE

By Tim Young

This summary of the results of archaeometallurgical residues is based on two reports by Young (2006; 2010). The unstratified Brownslade assemblage included 0.69kg of bloomery iron smelting slags, 2.69kg of smithing slags, 0.76kg of indeterminate iron slags and 2.88kg of goethitic iron ore.

Iron-smelting was represented by five small pieces (each less than 80g) with textures compatible with, but not certainly indicative of, tapped slags, plus one large block 502g with a lobate vertical margin, indicative either of solidification within the tapping arch area of a slag-tapping furnace, or within the basal pit of a non-tapping slag-pit furnace. Analysis demonstrated that the smelting slags were linked to the goethitic ores found on the site.

Iron-working was represented by pieces of at least nine smithing hearth cakes. Well-preserved examples ranged in weight from 140g up to an estimated 900g. Examples towards the heavier end of this range may be indicative of bloomsmithing (primary smithing) rather than blacksmithing (secondary smithing).

The iron ores are goethitic ores and appear to include both replacive and surface-coating morphologies typical of the ores found hosted by Carboniferous limestones within the Bristol Channel

Orefield. There are approximately 80 pieces of ore in the collection, a level in excess of that normally found on smelting sites. This strongly suggests that the ores may outcrop close to the site and that the ores found in the excavations may be largely present through natural, rather than artificial, processes. For instance, karstic dissolution (and other weathering processes) may release iron ore from their host limestones.

Despite the material not being stratified, the presence of iron-smelting slags in conjunction with iron ore raises the importance of the assemblage and may suggest Brownslade as a previously unrecognised source of iron ore. The possible occurrence of non-tapping iron smelting slags is also significant, for these have not been recorded in southern Wales, although elsewhere in Britain they are known from both pre-Roman and early medieval iron-smelting sites.

CHARRED PLANT REMAINS FROM BROWNSLADE

By Wendy Carruthers

A total of eight soils samples were processed from the site from a variety of contexts. Six of the samples were taken from the buried soil (271) and associated features underlying the sand in Areas 6 and 7 (277, 279, 281 and 289), and the other two were taken from the shell midden (269) cutting the sand in Area 8. Standard methods of bucket floatation were used to process the soil samples, with the flot being caught in a 250 micron mesh sieve and the residue being retained in a 1mm mesh. The soils were very sandy, so processing was quick and easy and the residues were small. All of the residues were scanned for charred plant remains as a check on recovery. As very few charred remains were found in the residues, the floatation was considered to have been successful.

Results

Table 6 presents the results of the full analysis. Nomenclature and most of the habitat information follows Stace (1995).

The state of preservation for most of the charred plant remains was fairly poor, with surface erosion of the cereal grains being the main problem. This was particularly notable for barley grains from the shell midden pit (269), probably due to the charred material having been redeposited from floor and hearth sweepings. The sandy nature of the soils may also have caused abrasion. The poor state of preservation limited identification of the barley to *Hordeum* sp. in most cases. However, it is likely that hulled six-row barley (*Hordeum vulgare*) was being grown, since some evidence of husks and twisted lateral grains were observed.

Although most of the hulled wheat (emmer/spelt, *Triticum dicoccum/spelta*) chaff was too fragmented to be identified to species level, a few well-preserved glume bases from sample 616 (the early cultivation marks 277) demonstrated that spelt wheat was being grown (*T. spelta*). Hulled wheat grains cannot be reliably identified to species level (Jacomet 1987), but the lightly eroded grains in samples 601 (the linear gully 289) and 616 (the cultivation marks) were more characteristic of spelt than emmer, being more robust and blunt-ended.

Several oat grains (*Avena* sp.) were recovered from the shell midden pit (269) sample 614. Although no floret bases were preserved to confirm the presence of cultivated rather than wild oat, the large size and relatively large number of grains suggested that oats were a crop plant. Judging from the grain size and shape, common oat was probably represented, in contrast to the smaller cf. bristle oats found at West Angle Bay (Caseldine and Griffiths, this report).

Table 6. Charred plant remains from Brownslade

Sample no.	601	629	602	603	616	617	614	615
Area	6	6	6	6	6	6	8	8
Context	273	273	274	276	277	271	239	239
Feature	gully 289	gully 289	posthole 279	linear feature 218	plough marks	buried soil	shell midden pit 269	shell midden pit 269
Sample volume processed (litres)	20	19	4	20	20	19	20	20
Charred plant remains per litre	0.1	0.4	3.8	0.2	3.6	1.1	6.7	4.4
GRAIN								
<i>Triticum dicoccum/spelta</i> (emmer/spelt grain)	1	cf. 1	–	–	3	–	–	–
<i>Hordeum</i> sp. (hulled barley grain)	–	–	1	–	–	–	–	–
<i>Hordeum</i> sp. (poor, eroded barley grain)	–	1	6	–	1	–	53	34
<i>Hordeum vulgare</i> L. emend. (barley grain – twisted)	–	–	1	–	–	–	1	–
<i>Avena</i> sp. (wild/cultivated oat grain)	–	–	–	–	–	–	9	–
Indeterminate cereals	1	2	6	–	10	–	49	53
CHAFF								
<i>Triticum spelta</i> L. (spelt glume base)	–	–	–	–	3	–	–	–
<i>T. dicoccum/spelta</i> (emmer/spelt glume base)	–	–	–	1	32	–	–	–
<i>T. dicoccum/spelta</i> (emmer/spelt spikelet fork)	–	–	–	–	12	–	–	–
<i>Avena</i> sp. (oat awn frag.)	–	–	–	–	++	–	–	–
WEEDS etc.								
<i>Ranunculus acris/bulbosus/repens</i> (buttercup achene) D, G	–	–	–	–	1	–	–	–
<i>Corylus avellana</i> L. (hazelnut shell frag.) H, S, W	–	–	–	–	1	–	2	–
<i>Chenopodium album</i> L. (fat-hen seed) C, D, n	–	–	–	1	–	–	–	–
Caryophyllaceae embryo (chickweed etc.) C, D, G	–	1	–	–	–	–	–	–
<i>Rumex</i> sp. (dock achene) C, D, G	–	–	–	–	1	–	1	1
<i>Prunus spinosa</i> L. (sloe stone) H, S, W	–	1	–	–	–	–	–	–
<i>Medicago/Trifolium/Lotus</i> sp. (medick/clover/trefoil seed) G, D	–	1	–	–	2	1	1	–
<i>Plantago lanceolata</i> L. (ribwort plantain seed) G, o	–	–	–	–	2	–	–	–
Poaceae (small seeded grass caryopsis) C, D, G	–	1	–	–	1	–	–	–
<i>Carex</i> sp. (trigonus sedge nutlet) M, P, w tubers; <i>Ranunculus ficaria</i> -type (lesser celandine type)	–	–	1	–	–	10	–	–
rhizome; Cyperaceae type (sedge-type)	–	–	–	1	–	10	–	–
tuber NFI	–	–	–	–	–	–	1	–
cf. seaweed frag.	–	–	–	–	1	–	17	–
TOTAL	2	8	15	3	71	21	134	88

Ecology: C = cultivated soils; D = disturbed ground; G = grassland; H = hedgerows; M = marsh, bogs; P = ponds, ditches etc.; S = scrub; W = woods; n = nutrient-rich soils; o = open ground; w = wet/damp soils; NFI = not further identifiable; ++ = several

Discussion

Features cutting the loess (272) in Area 6

Linear gully 289 (samples 601 and 629). The dark brown sandy silt fill of this v-shaped ditch contained signs of charcoal staining, burnt and unburnt bone and a few large grey stones. Several large (>2mm) fragments of charcoal and charred plant remains were recovered from the flots, although the overall concentration was low, being < 0.3 fragments per litre of soil processed (fpl). Two emmer/spelt grains and a barley grain (*Hordeum* sp.) were identified. The presence of a charred sloe stone (*Prunus spinosa*) suggested that wild foods were being exploited. The remaining few seeds were from common grassland/cultivated land weeds, including a clover-type seed (*Trifolium/Medicago/Lotus* sp.), a grass seed (indeterminate Poaceae) and a chickweed-type embryo (Caryophyllaceae). The seeds may have become charred as arable weeds or amongst hay, bedding, tinder etc. This small, mixed assemblage of charred grain, a fruit stone and bone are indicative of dumped domestic waste.

Posthole 279 (sample 602). The chocolate brown sandy silt fill of this small, circular posthole contained several large fragments of charcoal, some large grey stones and frequent fragments of burnt bone. The small soil sample (4 litres) produced several barley grains, including some that were well-enough preserved to show that hulled six-row barley (*Hordeum vulgare*) was being grown. The only other charred remain present was a lesser celandine-type (*Ranunculus ficaria*-type) tuber. Lesser celandine is common in damp meadows and hedgebanks. The tubers can become charred within turf as they are borne quite near to the surface, for example if a bonfire was laid in a grassy location. However, there is also evidence for their use as food and for medicinal purposes in early prehistoric times, as described by Mason and Hather (2000, 422–3). These remains could have been present in the soil at the time the posthole was being dug. Alternatively, they may have entered the hole when the post was removed, or they could represent material that was lying around the post when it was burnt out. In this latter case, the identification of the lesser celandine tuber suggests that the surrounding vegetation type was damp grassland. Although this was only a small sample, the presence of frequent burnt bone and relatively common charred grains (3.8 fpl) does suggest that domestic activities were occurring nearby.

Linear gully 281 (sample 603). This shallow ditch contained orange/brown silty sand with very few inclusions. A few poorly preserved bone fragments were present in the residue, and the flot contained several fragments of charcoal. Charred plant macrofossils, however, were scarce, with a poorly preserved emmer/spelt glume base and a fat hen (*Chenopodium album*) seed being the only identifiable remains (0.2 fpl). A charred sedge-type (Cyperaceae) rhizome fragment was present, suggesting that sedges may have grown in the damper stretches of the ditch. This small assemblage probably derives from low-level domestic waste.

The buried soil 271 (sample 617)

Overlying the loess and some early cultivation marks was a buried soil (271). This orange/brown sandy silt was the only sample that contained a notable clay component. A few fragments of charcoal were recovered from the flot, but no cereal remains were found. The only charred plant remains were several tubers/rhizomes of both the lesser celandine type and the sedge type. A single clover-type seed was present. The results suggest that a period of stabilisation may have occurred, when damp grassland vegetation became established across the site. If grazed, these meadows could have been maintained for some time. Bonfires or burning of the vegetation *in situ* for clearance may have caused the tubers and seed to become charred.

Plough marks 277 (sample 616)

A second set of cultivation marks was cut into the top of the buried soil in Area 6 (277). The orange, sandy soil from in and around these cuts was surprisingly productive (3.6 fpl), containing the only assemblage of probable cereal processing waste from the site. Emmer/spelt chaff fragments were the most frequent component of the assemblage, at a ratio of 2:6:1 grain to chaff to weed seeds. Spelt wheat (*Triticum spelta*) was positively identified from a few well-preserved glume bases and tentatively from three well-preserved grains. A radiocarbon date of between 350–290 cal. BC and 230–50 cal. BC (Beta-229587) was obtained from emmer/spelt grains from this context. A single poorly preserved barley grain was also recovered. The few weed seeds present were characteristic of grasslands or open, cultivated soils, such as ribwort plantain (*Plantago lanceolata*) and docks (*Rumex* sp.). They may have been growing as arable weeds, or they could have come from burnt hay or dung. A fragment of hazelnut shell (*Corylus avellana*) indicated that other types of domestic waste had been mixed in with the cereal processing waste, and that wild foods were being collected. Both burnt and un-burnt bone was present in the residue. Together with the cereal processing waste, this deposit is indicative of burnt domestic waste that was probably being used to manure the fields. Waste may have first been collected in a midden, although there was no evidence that conditions of preservation had been moist enough to have produced mineralised plant remains. Mineralisation can occur where there is an accumulation of highly organic material if drainage is restricted (Carruthers 2000). The hulled wheat remains were probably the waste product from day-to-day cereal de-husking over a domestic fire prior to cooking, as hulled wheats were likely to have been stored in spikelet form in order to prevent spoilage (Hillman 1981). There was no evidence to suggest that large-scale cereal processing was taking place on the site. In fact, the scale of arable cultivation throughout the periods sampled at Brownslade Barrow appears to have been generally small, judging from the low concentrations of charred plant remains recovered from the site. One item of note was a charred fragment that appeared to be seaweed, having the dense cell structure and general morphology of one of the wrack (*Fucus* sp.) seaweeds. A larger number of fragments was recovered from the shell midden pit 269 (see below), some of which had parts of the bladder-shape preserved. It is fairly certain, therefore, that seaweeds were being collected for use as fertiliser, as has long been the tradition in coastal areas. Some seaweeds can also be consumed, and Mabey (1972, 119) mentions bladder wrack (*Fucus vesiculosus*) as being one that can be cooked and eaten as a vegetable.

Shell midden pit 269 (samples 614 and 615)

The samples that produced the highest concentrations of charred plant remains (6.7 and 4.4 fpl) came from the shell midden pit in Area 8 (269). These two samples produced abundant limpet shells and other molluscs, in addition to frequent bone fragments. Some of the bone fragments were large, such as fragments of jaw bone and teeth. The material in this pit clearly represents both burnt and un-burnt domestic waste. If the charred cereal remains derived from human food debris, rather than animal fodder, the principal grain being consumed at this time appears to have been barley. A single twisted lateral barley grain indicated that hulled six-row barley was present. The condition of the grains was particularly poor in these samples, suggesting that the material may have been left exposed to the elements for some time before being re-deposited in the pit. Barley is the most salt-tolerant of the cereals, so it is well-suited to being grown in coastal locations. It also grows well in free-draining soils, so would have coped well with the sandy silts present on site. As several large oat (*Avena* sp.) grains were present in sample 614, a mixed crop, dredge (oats and barley) may have been grown. Alternatively, oats may have been grown as an occasional crop, or primarily for fodder. Dredge (or drage) is frequently mentioned in documentary sources from the medieval period, and several archaeobotanical charred assemblages have now been identified: e.g. at the medieval malting kiln at Burton Dassett, South Warwickshire (Moffett 1991); the

c. sixteenth-century barn at Wharram Percy, Yorkshire (Carruthers 2010a). The advantages of growing maslins or mixed crops range from an effective 'insurance policy' in case weather conditions or pests and diseases cause the failure of one of the cereals, and to help prevent lodging. Dredge was also used for brewing in the medieval period. The only additional evidence of food from the midden pit was a couple of small charred hazelnut shell fragments (*Corylus avellana*). Wild foods from woodland margins and hedgerows may still have been useful supplements to the diet at this time. In addition to a couple of seeds from common weeds of disturbed soils (dock, clover-type), several fragments of probable charred seaweed, possibly wrack (*Fucus* sp.), were recovered. As noted above, seaweed would have been valued as a fertiliser, probably first having been burnt to ashes, since seaweed takes a long time to rot. In post-medieval times seaweeds were collected and burnt to produce alkali, and this was used to make soap, glass, alum and paper. Seaweeds may also have been gathered as food, or used for 'packaging' for the molluscs, as it helps to keep them fresh.

Conclusion

The features cutting the loess and sealed by the buried soil, and the plough marks cutting the buried soil produced assemblages that suggested small-scale spelt wheat and hulled six-row barley cultivation was taking place during the Late Bronze/Iron Age. The few accompanying weed taxa were more typical of grassland and disturbed places than well-established arable fields, suggesting that cultivation may have been short-lived, or located on newly ploughed grassland. Alternatively, the seeds may have been charred amongst hay that became mixed with the cereals, rather than growing as arable weeds. However, grassland taxa are often frequent in later prehistoric cereal assemblages, and it is possible that this relates to specific crop husbandry methods, such as long periods of fallow. Wild foods such as hazelnuts and sloes were being collected from hedgerows and woodland margins, and seaweed was probably being used as fertiliser.

Evidence from the later, possibly post-medieval, shell midden pit 269 suggested that hulled six-row barley and perhaps dredge were the principal cereals being consumed. Hazelnuts were still being collected, as was seaweed. Weed seeds were scarce indicating that burnt domestic waste containing processed grain had been deposited. The presence of clover-type weed seeds in all of the periods sampled suggests that the nutrient content of the local sandy soils was poor, so manuring with household waste and seaweed ash would have been necessary to produce reasonable yields. Comparisons with the early medieval samples from West Angle Bay and other sites in Wales (Caseldine and Griffiths, this report) show that oats and barley have been important crops throughout the medieval period, with the addition of bread-type wheat on some sites. At South Hook, Herbranston, Pembrokeshire (Carruthers 2010b) substantial evidence for the use of dredge was recovered from three early medieval corn dryers, as well as evidence for malting and for the cultivation of both common and bristle oat.

LAND MOLLUSCS FROM BROWNSLADE

By Martin Bell and Alex Brown

Two columns of samples were analysed. The methods used are essentially those outlined by Evans (1972).

Column 1

This was from the south-east corner of Area 5. The results are presented in Table 7. This column presents an essentially similar sequence to that in Column 2. Five samples were analysed; again there were no

Table 7. Mollusc from Column 1 at Brownslade

Context	287 top	287B	194 top	194B	283
Sample	605		6592		609
<i>Carychium minimum</i>	1	–	–	–	–
<i>Cochlicopa lubrica</i>	3	1	–	–	9
<i>Cochlicopa lubricella</i>	2	2	–	–	–
<i>Cochlicopa</i> sp.	0	2	1	1	–
<i>Columella edentula</i>	0	–	–	1	–
<i>Vertigo pygmaea</i>	24	4	1	–	–
<i>Pupilla muscorum</i>	7	16	4	2	–
<i>Vallonia costata</i>	1	6	–	–	–
<i>V. excentrica</i>	192	67	5	–	5
<i>Vallonia</i> spp.	–	–	–	3	–
<i>Punctum pygmaeum</i>	1	–	–	–	–
<i>Vitrina pellucida</i>	3	–	–	–	1
<i>A. nitidula</i>	4	–	–	–	–
<i>Euconulus fulvus</i>	–	–	1	–	–
<i>Ceciloides acicula</i>	2	–	–	–	–
<i>Candidula intersecta</i>	5	–	–	–	–
<i>C. gigaxii</i>	1	–	–	–	–
<i>Ceruella virgata</i>	56	168	9	–	1
<i>Helicella itala</i>	40	18	26	59	85
<i>Cochlicella acuta</i>	162	244	36	9	6
<i>Ashfordia granulata/Ponentina subvirescens</i>	27	4	1	1	–
<i>Trichia hispida</i>	44	9	7	1	25
<i>Cepaea/Arianta</i> spp	1	1	–	–	–
Land mollusc total	576	542	91	77	132
<i>Mytilus edulis</i> (common mussel)	5	–	+	+	1
<i>Balanus</i> sp. (barnacles)	–	2	1	+	–
<i>Patella vulgata</i> sp. (limpet)	1+13F	1+	+	+	4
<i>Patina pellucida</i> (blue rayed limpet)	–	–	–	1	–
Marine gastropod	–	5	–	58	–
Marine bivalve	–	–	–	3	–
Marine fragments	5	–	–	–	–
Ostracod	–	1	–	–	–
Mite	–	2	–	–	–
Small mammal bone	–	1	–	–	–
Bone	3	4	1	+	5
Rodent bone	–	1	–	–	–
Earthworm granules	–	+	–	–	–
Foram	–	–	–	–	1
Charcoal	–	5	–	+	+
Cereal grain	–	1	–	–	2
Seed	–	–	1	–	–
Charred seed	–	7	–	–	–
Sponge	–	–	–	+	–

shells in the buried soil. Above the buried soil there was a yellow-brown band (283), the sand associated with a drystone wall (290). This was dominated by *Helicella itala* and also present were *Trichia hispida*, *Cochlicella acuta*, *Cerņuella virgata*, *Vitrina pellucida*, *Vallonia excentrica* and *Cochlicopa lubrica*. This suggests patchy grassy vegetation. The overlying yellow sand assemblage (194) is essentially similar to 223 in Column 2, but there are some differences. In this column *Helicella itala* is abundant at the base and declines upwards. In Column 2 the reverse obtained. In this column *Cochlicella acuta* increases from the base upwards, whereas in Column 2 it decreased from the base upwards. Thus, if the yellow sand is essentially the same stratigraphic unit in both columns, then the evidence suggests it may not have accumulated at exactly the same stage in the two areas of the site examined. This is consistent with the patchy vegetation implied and the way in which sand dunes form and move.

Two samples were examined from the overlying mid-grey sand in Column 1 (287). This produced a very abundant mollusc fauna, over 500 shells in each sample. The dominant species is once again *Cochlicella acuta* but *Vallonia excentrica* is also abundant and other significant species are *Trichia hispida*, *Helicella itala* and *Vertigo pygmaea*. This assemblage is more diverse than any of the other samples, suggesting increasing stability and vegetation cover at the top of 287. Even so, there is no evidence of shade or trees and the environment suggested is a grassy stabilised dune landscape from the number of molluscs obtained over an extended time-scale.

Of note in the assemblage are some species which are considered to be Holocene introductions to the British fauna. Of these, *Cochlicella acuta* is present from the earliest levels in both columns. It is abundant later in Column 1 and Column 2. *Cerņuella virgata* is abundant later in Column 1 and Column 2. This might suggest that the yellow sand accumulated in Column 2 first and Column 1 subsequently. The dates at which these species, and the other introduced species present, *Candidula intersecta* and *C. gigaxii*, were introduced are not at present clear. The general view is that they were medieval introductions. As *Cochlicella acuta* and *Cerņuella virgata* appear to occur in prehistoric contexts at Brean Down (Bell 1990) they may have appeared at an earlier date in coastal enclaves. For instance, *Cochlicella acuta* occurs in Dark Age contexts at Bantham, Devon.

Column 2

Column 2 was from the north section of Area 6 where a sequence of 7 samples was analysed. Results are presented in Table 8. The loess (272) contained no land snails and the buried soil (271) contained only two shells, individual examples of *Cochlicella acuta* and *Helicella itala*. It appears that the buried soil was non-calcareous and conditions only became calcareous and suitable for mollusc preservation with the subsequent encroachments of blown sand. The later sand samples contain a high proportion of marine mollusc fragments: thus they are quartz and shell sand with abundant tiny marine gastropods, which are considered to be a natural constituent of the sand. The buried soil was overlain by yellow sand (223), from which a sequence of three mollusc samples was analysed. At the base *Cochlicella acuta* predominated but declined upwards. In the upper two samples *Helicella itala* was the dominant species. The other species at this stage are: *Vallonia costata*, *Candidula intersecta*, *Cerņuella virgata*, *Trichia hispida*, *Cochlicopa*, *Pupilla muscorum* and *Vitrina pellucida*. *Cecilioides acicula* is present but as a burrowing species has no ecological significance. The fauna at this stage is a restricted one dominated by two species, *Cochlicella acuta* and *Helicella itala*. This suggests a rather specialised environment for molluscan life. The species present are consistent with a dry dune environment with patchy vegetation cover and a lack of shade. It is likely, but not certain, that the early medieval burials were made at the top of the yellow sand and thus apparently in the type of semi-mobile patchy vegetated dune system described, that is, unless there has been some truncation of the sequence at this point as a result of animal disturbance or deflation.

Table 8. Molluscs from Column 2 at Brownslade

Sample	620	621	622	623	624	625	626	627
Context	132	294 top	294 bottom	223 top	223 middle	223 bottom	271	272
<i>Carychium minimum</i>	–	1	–	–	–	–	–	–
<i>Cochlicopa lubrica</i>	4	8	3	–	–	–	–	–
<i>Cochlicopa</i> spp.	2	5	–	2	–	–	–	–
<i>Vertigo pygmaeae</i>	–	11	–	–	–	–	–	–
<i>Pupilla muscorum</i>	6	17	12	1	–	–	–	–
<i>Vallonia costata</i>	6	8	–	–	–	–	–	–
<i>Vallonia excentrica</i>	25	175	33	1	2	11	–	–
<i>Acanthinula aculeata</i>	1	–	–	–	–	–	–	–
<i>Puntum pygmaeum</i>	–	3	–	–	–	–	–	–
<i>Discus rotundatus</i>	2	–	–	–	–	–	–	–
<i>Vitrea pellucida</i>	–	–	–	1	–	–	–	–
<i>Nestrovitrea hammonis</i>	–	1	–	–	–	–	–	–
<i>Aegopinella nitidula</i>	1	11	–	–	–	–	–	–
<i>Ceciloides acicula</i>	5	4	10	–	2	–	–	–
<i>Candidula intersecta</i>	3	1	–	–	14	–	–	–
<i>Candidula gigaxii</i>	9	–	–	–	–	–	–	–
<i>Cernuella virgata</i>	42	20	21	–	12	21	–	–
<i>Helicella italia</i>	23	15	14	51	75	13	1	–
<i>Helicella virgata</i>	–	–	–	–	–	5	–	–
<i>Cochlicella acuta</i>	64	98	135	1	26	39	1	–
<i>Trichia hispida</i>	8	67	–	17	–	–	–	–
Cepaea	–	–	–	1	–	–	–	–
Total land molluscs	201	445	228	75	131	89	2	–
Marine spp.	–	–	40	–	–	–	1	–
Limpits	2	–	6	–	–	–	–	–
Total marine	2	–	46	–	–	–	1	–
Land plus marine molluscs	203	445	274	75	131	89	3	–

Above this was badger disturbance, from which samples were not analysed. That was overlain by grey sand (294) from which two samples were analysed and the topsoil (132) from which one sample was analysed. Both produced essentially similar mollusc assemblages. *Cochlicella acuta* remained the dominant species in two samples but *Vallonia excentrica* is also significant and predominates in the upper sample of 294. Other significant species at this stage are: *Cernuella virgata*, *Helicella italia*, *Trichia hispida* and these are accompanied by nine other species. These upper more diverse assemblages are consistent with a relatively stable vegetated dune system which, as the *Vallonia excentrica* suggests, was grass-covered and grazed. There is only slight evidence for shade, perhaps the odd tree or scrubby patch of vegetation not near the site. By this stage the dune system appears to have been fully stabilised.

Conclusion

In conclusion, the overall sequence is of a non-calcareous cultivated soil without molluscan evidence, that was overlain by calcareous shell sand which supported a restricted mollusc fauna suggestive of an only partly-vegetated and thus still mobile dune system. The burials appear to have been made in this context. Subsequently the dunes became stabilised and were vegetated, suggesting a dry grazed grassland environment with very little evidence of scrub or trees.

EXCAVATIONS AT WEST ANGLE BAY

By Duncan Schlee and Neil Ludlow

Introduction

Overlooking the Irish Sea at the entrance to Milford Haven, in a gently sloping field just eight kilometres north-west of Brownslade, the site at West Angle Bay is represented by an egg-shaped, low-earthwork, cemetery enclosure, and outlying burials, lying within a second, larger, rectangular enclosure. The field (SM 850 030) slopes downhill from 20m to 7m OD, to terminate as a low cliff on the south side of West Angle Bay (Fig. 14). Underlying geology is Carboniferous Limestone (Geological Survey of Great Britain 1974, Sheet 226 and 227), with drift deposits that include, on the eastern side of the field, Quaternary clays. The vulnerability of the site was dramatically highlighted in 1997 when human bones were found on the beach having eroded out of one of three long cist graves at the top of the cliff-face.

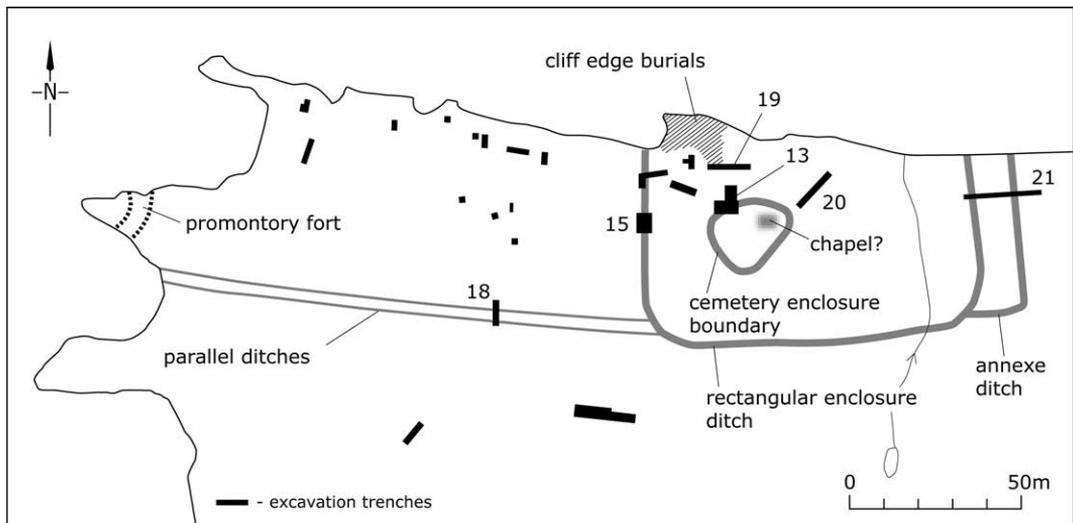
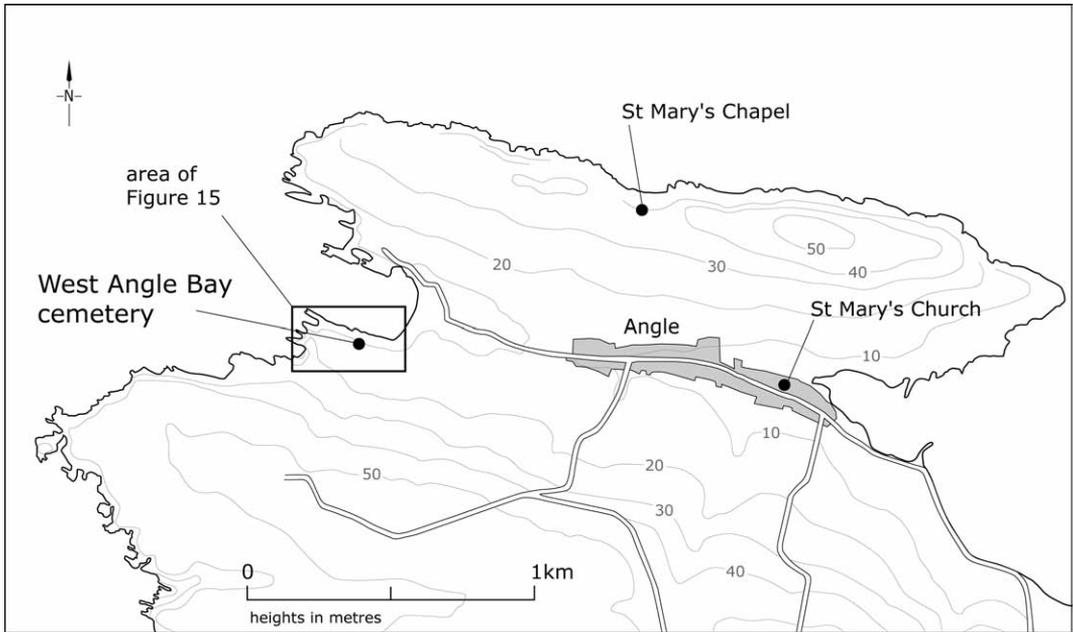
West Angle Bay lies within the parish of Angle, a little over one kilometre west of Angle village (Fig. 14), which is a planned, linear Anglo-Norman settlement of the twelfth century (Kissock 1997, 126–7). Angle parish church appears to have been a new foundation, contemporary with the settlement, and was granted to the Benedictines of Monkton Priory, Pembroke; it was mentioned by Giraldus Cambrensis in 1175–76 when he was rector (Davies 1946, 280).

By the late medieval period there were three subsidiary chapelries in the parish. Chapelries were as common a feature of west Wales parishes as they were elsewhere in Britain during the post-Conquest period, particularly in the more populous regions such as south Pembrokeshire. Not all, however, were strictly subsidiary and ‘parochial’. While some were formal chapels-of-ease, holding regular services, others were chantries, pilgrimage chapels, well chapels and devotional chapels, endowed by for example St David’s Cathedral, the monastic houses, or through lay patronage. At least some of these chapels had early medieval origins and may represent perpetuation of tradition. Few possessed burial rights, which had normally been assumed by the respective parish churches by the mid twelfth century.

The remains of a chapel, 500m north of Angle village, are marked on nineteenth-century Ordnance Survey maps. Traditionally identified with St Mary, the chapel was associated with a well, also dedicated to St Mary, and appears to have become ruinous by the early eighteenth century (RCAHMW 1925, 12). The chapel has now gone. A second chapel lies in Angle parish churchyard. This is a late medieval building, with probable origins as a chantry or mortuary chapel, which has been historically identified as the ‘Chapel of St George the Martyr’ of the sources (*ibid.*, 11).

The third chapel was dedicated to St Anthony. Its temporalities appear to have been assumed by St George’s Chapel around 1500, when a will bequeathed to St George’s land that had formerly been granted to St Anthony’s (RCAHMW 1925). Consequently, the churchyard chapel has also been called St Anthony’s. This suggests that the original St Anthony’s Chapel had become disused and had been succeeded by St George’s.

The egg-shaped cemetery enclosure excavated at West Angle Bay was recognised in the nineteenth century when it was depicted on Ordnance Survey 25-inch maps, and labelled ‘Burial Ground (site of)’.



Above Fig. 14. Location of West Angle Bay excavation.

Below Fig. 15. West Angle Bay. Location of excavation trenches in relation to geophysical anomalies. Only the major anomalies are shown.

However, the field in which it lies is named 'Old Church' on the tithe map of 1844, implying the presence of a church or chapel. It has, moreover, traditionally been regarded as the site of the St Anthony's Chapel mentioned in historical sources (*ibid.*), and while the identification is as yet unconfirmed, geophysical survey suggests that the enclosure is occupied by a building.

No investigations had taken place until the recent excavation. However, the antiquarian Richard Fenton visited the site in *c.* 1811. His account describes a visit to a chapel that he calls 'St Mary's', but the topographical detail makes it clear that he means the West Angle Bay site—'to the west of the village in a field, to this day called Church Field, may clearly be traced the site of a chapel . . . called St Mary's, as having a large cemetery extending to the shore below it, on who's shivery banks that bounded it, as they are gradually washed away be the tide, graves and stone coffins appear' (Fenton 1811, 220).

The site comprises an egg-shaped cemetery enclosure measuring *c.* 55m east/west by *c.* 45m north/south, defined by a stony bank which survives as a low earthwork (Fig. 15). It lies slightly west of centre within a much larger rectangular enclosure, with rounded corners, whose west, south and east boundary ditches were revealed by geophysical survey (Heard 2006; Smalley 2008). It now measures *c.* 110m east/west by 60m north/south, and an 'annexe', 30m wide, lies on its eastern side. A spring-fed stream flows through the annexe. Both enclosure and annexe now terminate at the cliff edge, but may originally have extended further north where coastal erosion may have removed a northern boundary.

The geophysics (both resistivity and gradiometry) also revealed a probable rectangular building in the east side of the egg-shaped enclosure, aligned east/west and measuring approximately 6m by 5m. It is uncertain from the surveys whether this is a stone or timber building.

During 2010, a previously unrecognized Iron Age coastal promontory fort was noted *c.* 200m west of the enclosure (Fig. 15). It is bivallate, with banks standing up to 5m high, of which only short lengths remain. The interior has been completely removed by coastal erosion.

During the summer of 2005, 13 hand-dug test pits (Trenches 1–13) were excavated (Ludlow 2005a). For clarity only those trenches that contained archaeologically significant remains are numbered on Figure 15. These were randomly located, primarily along the cliff edge, with the aim of defining the extent of the cemetery. Two of these (1 and 13) were subsequently machine enlarged, followed by hand-excavation. Following a geophysical survey in the field of the enclosure (Heard 2006), further, more targeted, excavation was undertaken in the summer of 2006 (Schlee 2006; 2008) (Trenches 15–18) and Trenches 1 and 13 reopened. In all instances topsoil was removed by machine, followed by hand excavation. The geophysical survey was extended in the field to the west in 2008 (Smalley 2008), and in spring 2010 three additional trenches (19–21) were machined opened to examine part of the site most threatened by coastal erosion (Schlee 2010).

No archaeology was present in several of the hand-dug trenches, some contained remains of limited interest, and in others archaeology was not fully investigated. Only those trenches with significant archaeological remains are described.

Rectangular enclosure: enclosure ditches and cist graves

The ditch on the western side of the rectangular enclosure (230) was examined in two sections (Fig. 15, Trench 15). It was cut through the bedrock and was substantial, being 2.6m wide, 1.5m deep, with a flat-bottomed, V-shaped profile (Fig. 16). The fills in both sections suggested a slow accumulation of deposits. Plant macrofossils from the basal fills (209 and 229) include emmer/spelt glume bases, oat awns and a few weed seeds, perhaps from crop-processing or midden waste. A radiocarbon date of cal. AD 540–650 (Beta-229574) was obtained from charcoal from fill 209. There was no surviving bank associated with this ditch, or with the annexe ditch, indicating considerable loss of archaeological deposits in and around the enclosure.

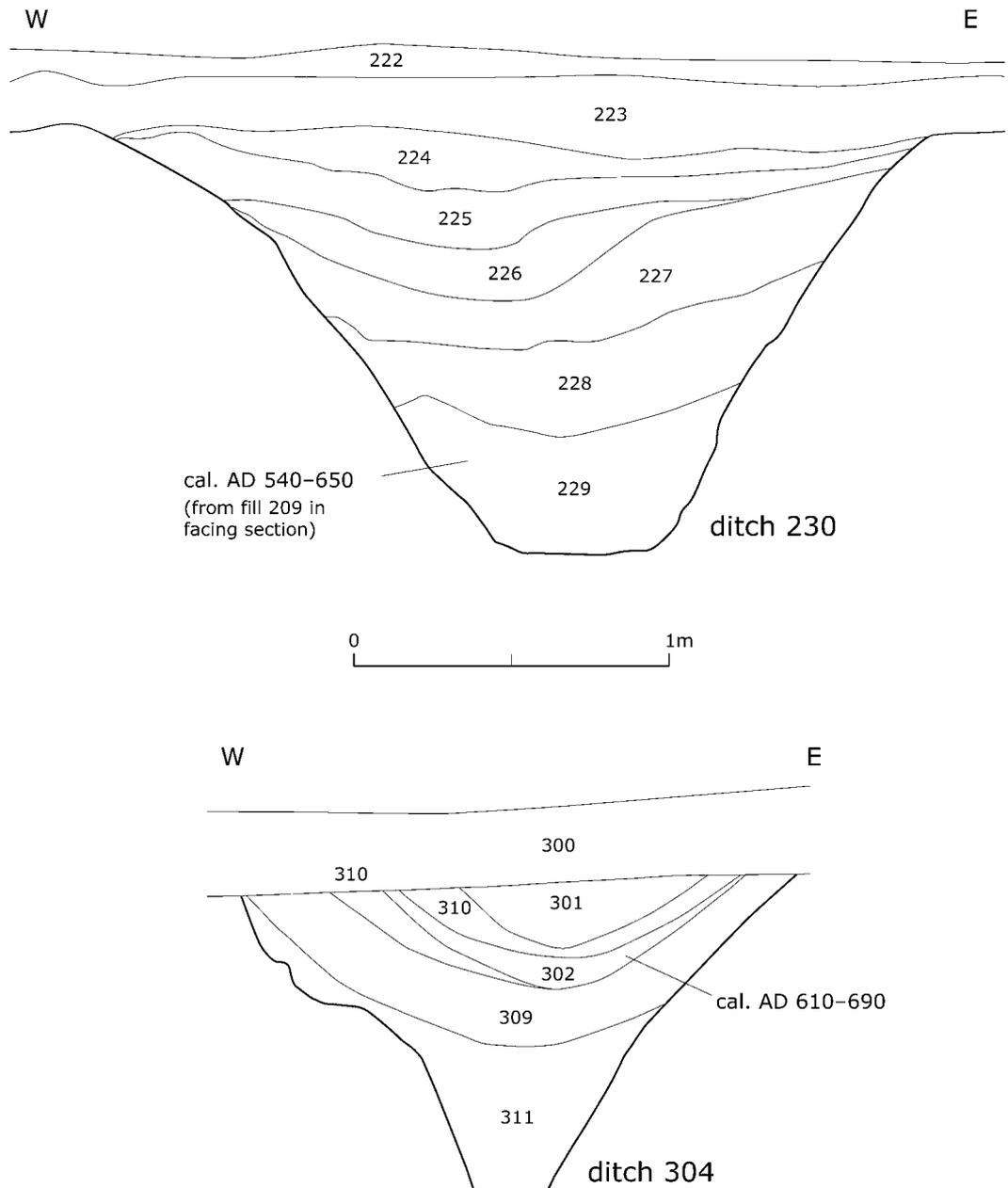


Fig. 16. West Angle Bay. Top – ditch section of rectangular enclosure in Trench 15. Bottom – ditch section of annexe ditch in Trench 21.

The ditch around the annexe (304) was slighter (Fig. 15, Trench 21). It had a V-shaped profile and was 1.7m wide and 1.2m deep (Fig. 16). The basal fill (311) contained several large stones that may originally have been packed around upright posts, and above it was backfill (309), possibly deposited after removal of the posts. Above this, fills (301, 302, 310) may represent periodic deposition or natural infilling. A radiocarbon date of cal. AD 610–690 (SUERC-32876) was obtained from charcoal from fill 302.

A linear feature (313) lay within the annexe. It ran across the full width of the 1m-wide trench and was c. 0.5m wide (not illustrated). It had stone slabs lining its sides, several of the stones had been exposed to heat, and the base of the feature was also heat-reddened. It was interpreted as the remains of a hearth or corn dryer, with an upper fill (303) representing collapse or backfill. A radiocarbon date of cal. AD 610–690, but with a possible addition range of cal. AD 750–760 (SUERC-32877) was obtained from charcoal from fill 303.

Four cist graves were located in the north-west corner of the rectangular enclosure. Three were recorded eroding out of the low cliff on the northern edge of the site in 1997. All three had side- and lintel-slabs, but no base-slabs. Bone, presumably from one of these cists, was collected from the beach below in 1997. It belonged to an adult aged 55+, probably male, and was radiocarbon dated to cal. AD 650–780 (Beta-229577). A further cist burial was identified during the recent excavations, approximately 20m to the east of these graves (Fig. 15; Trench 19). It was not excavated, but could be seen to have side-slabs but no lintel-slabs.

The egg-shaped enclosure: boundary bank and cist graves

It is estimated that less than 5% of the enclosure interior was sampled by excavation, in a trench measuring 8m east–west and 9.20m north–south, located towards its north-east edge and mainly overlying the bank (Fig. 15, Trench 13). The interior remains largely unexplored, and the possible building has not been excavated. The field has been cultivated in the recent past and the upper levels of the enclosure were heavily plough-damaged.

The bank was of two phases (Figs 17–20). The first comprised a ditch (238), 0.8m wide and 0.5m deep, with an earthen bank (239), 0.4m high and averaging 2m wide, on its inner (southern) side. The bank rested on a buried soil (241), which was cut by the ditch. Samples taken from the two ditch fills, (221 and 223), contained emmer/spelt wheat, bread wheat, oat and barley grains as well as weeds indicative of grassland/cultivated land and scrub and charcoal fragments, suggestive of crop processing or other domestic activity in the vicinity, and with deliberate deposition in the ditch. A radiocarbon date of cal. AD 660–870 (Beta-229576) was obtained from charcoal from the lower fill 223 of the ditch.

The second phase consisted of a stone-faced earthen bank (45) following the alignment of the earlier bank and ditch, overlying both. It was heavily plough-damaged and spread, but sufficient survived to show that both its inner and outer faces were faced with locally-sourced stones, ranging in size from small stones to large boulders. A fragment of human bone incorporated in the bank was radiocarbon dated to cal. AD 770–980 (Beta-208268).

Ten cist graves (varying from full cists to one or two slabs lining the side of a grave), two possible cist graves and a dug grave lay wholly or partially within the excavated area (Figs 18–20; Table 9). No direct relationship was observed between the burials and either of the two bank phases. However, the density of burial resulted in a gradual raising of levels within the enclosure, so that the latest burials were higher than the base of enclosure bank 45. The longevity of the cemetery was demonstrated by the intercutting of several graves (Fig. 21): for example, grave 211 cut 247, and both were later than 213 and 217, while 55 cut 42. The presence of intrusive bone in graves was another indication of longevity and/or plough damage. However, the fragmentary remains of a neonate in grave 211 were probably associated with the adult, female burial; this might explain the burial posture; head to the west, placed on its left side and

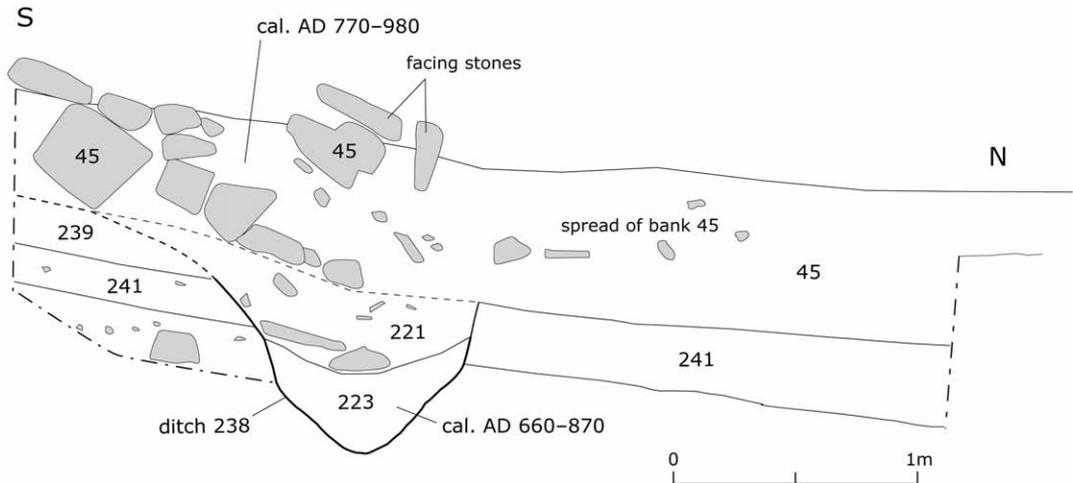


Fig. 17. West Angle Bay. Section through cemetery enclosure boundary.

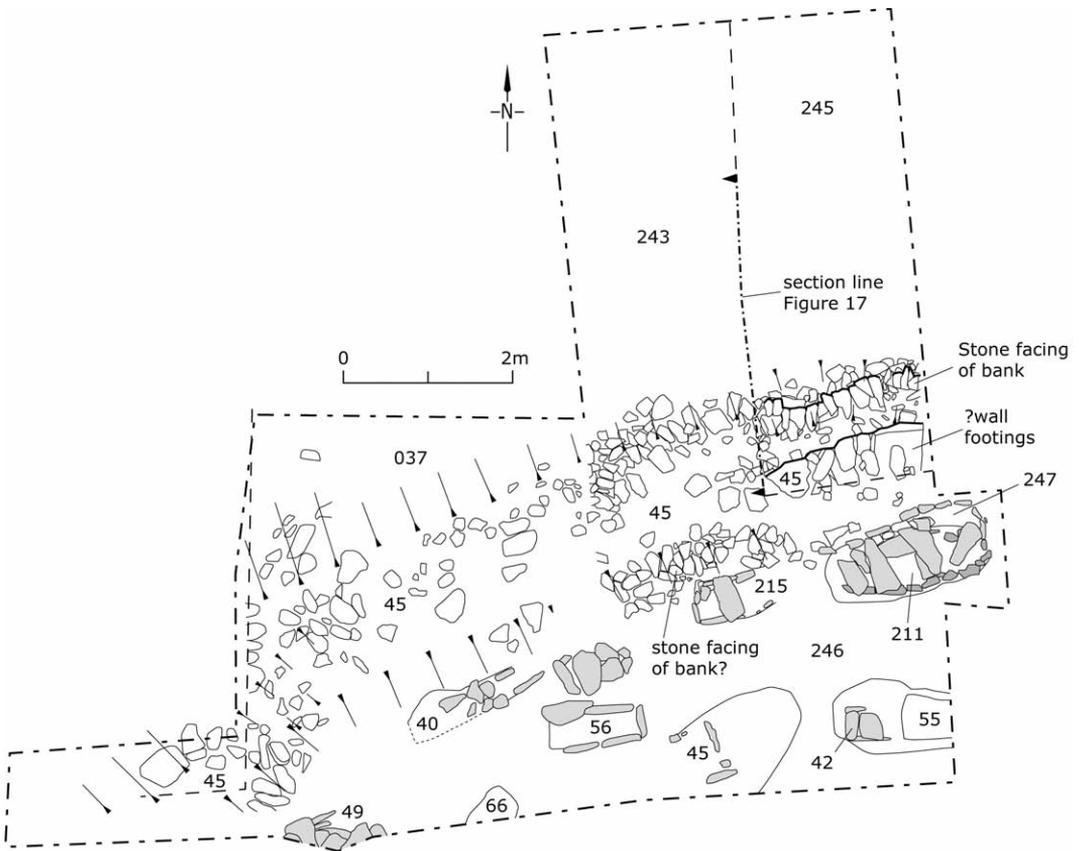


Fig. 18. West Angle Bay. Second phase cemetery enclosure boundary and tops of cist and other graves.



Fig. 19. West Angle Bay. Second phase boundary bank with emerging cist graves. Scale 2m.

facing north. A layer of charcoal (mostly oak) and charred plant remains had been spread over the backfill immediately below the lintel stones of this grave, and several small rounded quartz pebbles had been placed in the grave. Where bone survived it would seem that all other burials were extended, with heads to the west.

The cists were of local stone, presumably gathered from the beach below. All possessed side slabs, but there were no base slabs. Some had lintels; it is likely that ploughing has removed lintels from some others. One cist (56) was of markedly better construction than the rest, and of a finer grained stone. No evidence for the burial survived.

Bone survival was generally very poor, and therefore Ros Coard (2010) who reported on the remains was only able to undertake the most basic analysis.⁸ The results of her analysis are summarised in Table 10, and her observations presented in the following two paragraphs. It was not possible to calculate the exact number of individuals present in the assemblage, but a minimum of 25 individuals was identified. Age estimates were, where possible, based on degree of dental wear. In other cases, however, it could only be estimated from grave size. Nevertheless, a strikingly high proportion appear to have been infant and child burials, possibly double the number of adults (see Discussion).

Dental attrition in the West Angle Bay sample appears to be disproportionately severe, leading to over-estimates of age in the few samples where alternative methods of calculation were possible. It affected estimates for all ages and it may be that environmental conditions, for instance diet, account for the advanced dental wear. No pathologies were recorded.

Radiocarbon dates were obtained from two burials. A date of cal. AD 690–970 (Beta-208267) was obtained from non-adult burial 40, and a date of cal. AD 890–1120 (Beta-229575) from the adult in double burial 211 (Fig. 21).

Table 9. Summary of the character of the West Angle Bay burials

Burial No	Grave type	Orientation	Skeleton No.	Sex (if known)	Maturity	Condition of skeleton	In situ or not	Radiocarbon date range	Isotope sample
	Cliff edge	Cist grave		Male?	Adult over 40	Various bone fragments	recovered from foot of cliff	cal. AD 650–780	–
40	Cist grave	SW–NE	40	–	Juvenile (5 yrs ± 1 yr)	Cranium, mandible, some lone bones	Yes	cal. AD 690–970	–
42	Cist grave	E–W	42	–	Juvenile (2 yrs ± 8 mths)	Dentition	Yes	–	–
45	Cist grave	SW–NE	53	–	Adult (25–35)	Cranial frags and dentition	Yes	–	45
49	Cist grave	SW–NE	49	–	Adult (18–25+)	Dentition and mandible	Yes	–	–
55	Grave	E–W	–	–	Juvenile (on grave length)	Unexcavated	–	–	–
56	Cist grave	E–W	–	–	Juvenile (on cist length)	No bone survived	–	–	–
66	Cist grave	SW–NE	–	–	Juvenile (on cist width)	Unexcavated	–	–	–
211	Cist grave	E–W	210A 210a 210b	Female	Adult (25+) Neonate Juvenile (5–6 yrs)	Major bones survived 9 bones and a tooth 4 teeth	Yes Probably No	cal. AD 890–1120	211
213	Grave?	E–W	–	–	–	Unexcavated	–	–	–
215	Cist grave	E–W	215	–	Juvenile (6 yrs)	Decayed, dentition survived	Yes	–	–
217	Grave?	E–W	217	–	Juvenile (1 yr)	Femorae and dentition	Yes	–	–
245	Cist grave	E–W	–	–	Juvenile (on cist length)	Unexcavated	–	–	–
247	Cist grave	E–W	–	–	Adult (on cist length)	No bone survived	–	–	–
Area T13	stray bone	–	59	–	Adult (18–25+)	Dentition	No	–	stray bone
Area T13	stray bone	–	60	–	Juvenile (5 yrs ± 1 yr)	Skull and mandible	No	–	–
Area T13	stray bone	–	66	–	Juvenile (4 yrs ± 1 yr)	Dentition	No	–	–
Area T13	stray bone	–	68	–	?	Long bone frags.	No	–	–
Area T13	stray bone	–	202	–	?	Long bone frags.	No	–	–
Area T13	stray bone	–	203	–	Juvenile	Bone frags. and dentition	No	–	–
Area T13	stray bone	–	205	–	Juvenile (2 yrs)	Dentition and bone frags.	–	–	–
In grave 42	–	–	214	–	Juvenile – 1 year	Dentition and bone frags.	No	–	–
Area T13	stray bone	–	216	–	Adult?	Long bone and other frags.	No	–	–
Area T13	stray bone	–	220	–	Juvenile?	Long bone frags.	No	–	–

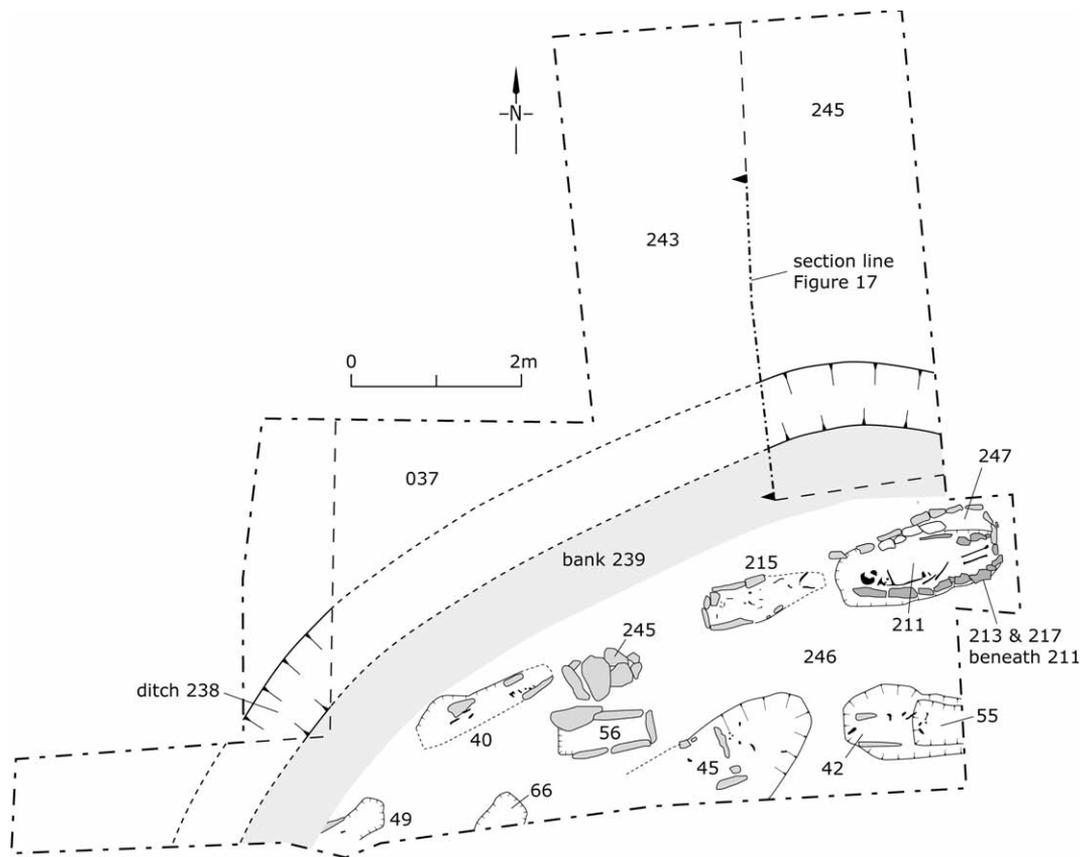


Fig. 20. West Angle Bay. First phase cemetery enclosure boundary and graves.

The remainder of the site (Fig. 15)

Two parallel ditches were revealed through geophysical survey. They run east–west, to the end of the promontory, from the south-west corner of the large rectangular enclosure, just north of the line of its southern boundary. Trenching showed that they lay *c.* 3m apart, were 1m wide and were 0.5m deep (Fig. 15, Trench 18), but no dating evidence was obtained. Their function is unknown, but it is possible that they may represent the remains of a ditched trackway, or a double ditch-and-bank field boundary. Plant remains from one of the ditches (235) possibly represents waste used as manure on the fields.

A further 19 small trial trenches were excavated across the field in which the cemetery lies (Fig. 15), but no further burials were encountered. Relict ridge-and-furrow cultivation is represented by north/south geophysical anomalies to the south-west of the enclosure.

Site sequence

The earliest radiocarbon date, cal. AD 540–650, was yielded by charcoal from a basal fill in the rectangular enclosure ditch, suggesting that it may be the earliest feature on the site. Slightly later dates, both cal. AD 610–690, were obtained from the backfill of the corn dryer/hearth in the enclosure annexe, and the upper fill of the annexe ditch, suggesting that it may have been contemporary with the large enclosure, and had become disused by the seventh century.

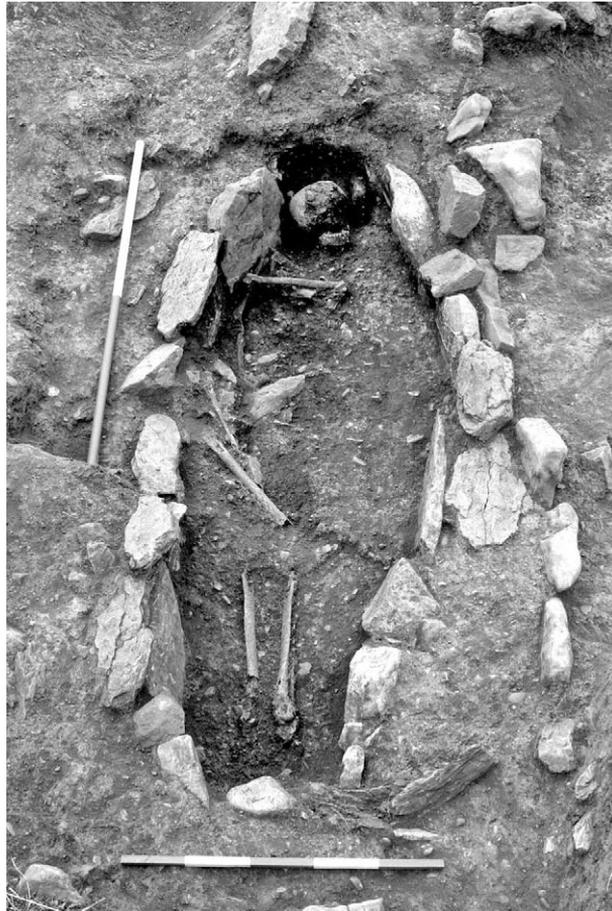


Fig. 21. West Angle Bay. Grave 211, with the earlier cist grave 247 to the right. Scales 1m and 0.5m.

The earliest burial lay outside the egg-shaped enclosure, but within the rectangular enclosure, on the cliff-edge. It was dated to cal. AD 650–780. This is a later date range than the above features, but it must be noted that the date from the corn dryer fill has a possible addition range of cal. AD 750–760, coincident with burial. The extent of burial outside the egg-shaped enclosure is unknown, but extensive trenching indicates that it is confined to the north-west corner of the rectangular enclosure.

It is probable that the rectangular enclosure and annexe contained an agricultural settlement, evidenced by the corn dryer and plant remains. Owing to limited dating evidence it is unknown whether this settlement preceded the cliff-edge burials, or whether the burials and settlement were contemporaneous.

A date from the enclosure ditch (cal. AD 660–870) and the earliest date from a burial (cal. AD 660–870) provide a broad date range for the establishment of the egg-shaped enclosure and the commencement of burial. Although the dates from the burials within the egg-shaped enclosure are generally later than the one outside it, there is a degree of overlap, and it is impossible to conclude whether burial on the cliff-edge had ceased by the time the egg-shaped cemetery enclosure had been established, or whether burial on the cliff-top and in the egg-shaped enclosure took place at the same time in the seventh/eighth century. It is equally uncertain whether the settlement and the egg-shaped cemetery enclosure co-existed. Burial within the

egg-shaped enclosure continued until cal. AD 890–1120, a date obtained from a stratigraphically late burial. While the limited sample must be taken into account, this indicates that the cemetery went out of use by the early twelfth century, and perhaps by the late ninth century.

RADIOCARBON DATES FROM WEST ANGLE BAY

The following radiocarbon dates have been calibrated using Radiocarbon Calibration Program Calib Rev 6.0.0 (<http://calib.qub.ac.uk/calib/>).

Beta-208267

Sample and context: human bone from skeleton 40 in grave 40, Trench 13.

Result BP: 1190±40 BP

Calibrated range at 2 sigma: cal. AD 690–700 and cal. AD 710–750 and cal. AD 760–900 and cal. AD 920–970

Beta-208268

Sample and context: human bone, from the second phase of the cemetery enclosure boundary bank 45 in Trench 13.

Result BP: 1160±40 BP

Calibrated range at 2 sigma: cal. AD 770–980

Beta-229574

Sample and context: charcoal from basal fill 209 of rectangular enclosure ditch 230 in Trench 15.

Result BP: 1460±40 BP

Calibrated range at 2 sigma: cal. AD 540–650

Beta-229575

Sample and context: human bone from skeleton 210A in grave 211, Trench 13.

Result BP: 1040±40 BP

Calibrated range at 2 sigma: cal. AD 890–1040 and cal. AD 1100–1120

Beta-229576

Sample and context: charcoal from the first phase of the cemetery enclosure boundary, fill 223 of ditch 238 in Trench 13.

Result BP: 1270±40 BP

Calibrated range at 2 sigma: cal. AD 660–830 and cal. AD 840–870

Beta-229577

Sample and context: human bone from cist grave on cliff edge.

Result BP: 1310±40 BP

Calibrated range at 2 sigma: cal. AD 650–780

SUERC-32876

Sample and context: Charcoal (*Fraxinus*) from fill 302, a deposition layer in ditch 304, Trench 21.

Result BP: 1370±30 BP

Calibrated range at 2 sigma: cal. AD 610–690

SUERC-32877

Sample and context: Charcoal (*Prunus*) from fill 303 from possible corn dryer 313 in Trench 21.

Result BP: 1365±30 BP

Calibrated range at 2 sigma: cal. AD 610–690 and cal. AD 750–760

CHARRED PLANT REMAINS AND CHARCOAL FROM WEST ANGLE BAY

By Astrid E. Caseldine and Catherine J. Griffiths

CHARRED PLANT REMAINS

The samples were processed at the University of Wales Trinity St David by either manual flotation or by flotation machine. In both cases the finest sieve used to collect the flot and the residue was 250µm. The

samples were sorted and identified using a Wild M5 microscope. Identification was by reference to standard texts (e.g. Schoch *et al.* 1988; Jacomet 2006) and a modern seed collection.

Results

The results are presented in Table 10. The nomenclature and most of the ecological information is based on Stace (1995).

The majority of the wheat (*Triticum* sp.) grain and chaff was poorly preserved and could not be assigned to an individual species, although some of the chaff could be placed in an emmer/spelt (*T. dicoccum/T. spelta*) category. Also, although there is considerable overlap in the grain morphology of different types of wheat, the shape of one grain tentatively suggested emmer wheat (*T. cf. dicoccum*), whilst the shape of two other grains indicated the presence of bread wheat (*T. aestivum*). Hulled barley (*Hordeum* sp.) was present but, although no twisted grains were identified, there was insufficient evidence to be certain whether it was two-row or six-row barley. The absence of well preserved oat (*Avena* sp.) chaff meant that it could not be determined whether the oat was wild or cultivated.

Discussion

Rectangular enclosure ditch 230

Comparatively little was recovered from the basal fill of the outer enclosure ditch (230), only one indeterminate cereal grain from context 229 but slightly more from context 209. The remains from the latter included emmer/spelt glume bases, oat awns and a few weed seeds and suggested crop processing waste. The weed seeds included stinking chamomile (*Anthemis cotula*), a weed typical of arable land and waste ground, and heath grass (*Danthonia decumbens*), which is commonly found on heaths on sandy or peaty soils. However, it has been suggested that heath grass was an arable weed as it has been found to be strongly associated with assemblages containing spelt chaff (Hillman 1981; Van der Veen 1992). Its eradication from arable fields today has been interpreted as a change in ploughing practice from ard ploughing to mouldboard ploughing (Hillman 1981; 1982). The presence of stinking chamomile might indicate the cultivation of heavier soils in the area. Ribwort plantain (*Plantago lanceolata*) was also present in the sample and this is found in a wide range of grassy habitats, as well as open, cultivated land. Other remains included a few rhizome fragments and a bone. The remains could represent waste dumped directly in the ditch from a domestic fire or midden waste that had been spread on the land as manure and had then fallen into the ditch. However, there were no mineralised remains which would have provided stronger evidence of midden waste.

Cemetery enclosure ditch 238

Only a small amount of charred material was found in the sample from the lower fill (223) of the cemetery ditch (238) but, as with enclosure ditch 230, there was some evidence for emmer/spelt wheat, a spikelet fork, and for oat, a floret base. Unfortunately the latter was too poorly preserved to determine whether it was from cultivated or wild oat. However, as well as wheat and oat, there was also evidence of barley being cultivated. Dock (*Rumex* sp.) and grass (Poaceae) seeds may indicate grassland/cultivated land and a gorse (*Ulex* sp.) spine suggests scrub growing in the area. Again the remains may represent waste from a fire that had been deliberately deposited in the ditch or remains that had been blown or washed into it.

The sample from the upper fill (221) produced greater quantities of oat and barley grains and bread wheat was also present. Although no floret bases were recovered in this sample, a possible bristle oat (cf. *Avena strigosa*) floret base and a bristle/common oat (*A. strigosa/A. sativa*) type floret base were recovered in the assessment sample from the ditch (Caseldine and Griffiths 2004). It is therefore probable that the oat represents a crop rather than a weed. The oat grains were generally quite small which might

Table 10. Charred plant remains from West Angle Bay

Trench	13	13	13	15	15	18	Ecology
Feature	Grave 211	Ditch 238	Ditch 238	Ditch 230	Ditch 230	Ditch 235	
Context	210	221	223	209	229	222	
Sample volume processed (litres)	27	37	10	21	9	8	
CEREAL REMAINS							
<i>Triticum cf. dicoccum</i> grain (emmer wheat)	1	–	–	–	–	–	C
<i>Triticum dicoccum/T. spelta</i> glume bases (Emmer/spelt wheat)	–	–	–	4	–	–	–
<i>Triticum dicoccum/T. spelta</i> spikelet forks	–	–	1	–	–	–	–
<i>Triticum aestivum</i> grain (bread wheat)	–	2	–	–	–	–	C
<i>Triticum</i> sp. grain (wheat)	5	3	2	–	–	1	–
<i>Triticum</i> sp. glume bases	1	–	–	1	–	1	–
<i>Triticum</i> sp. rachis	–	–	–	7	–	2	–
<i>Hordeum</i> sp. (Hulled) grain – straight (barley)	1	8	–	–	–	–	C
<i>Hordeum</i> sp. (Hulled) grain – indet.	–	3	–	–	–	–	–
<i>Hordeum</i> sp.	2	3	1	–	–	2	–
<i>Hordeum</i> sp. rachis	–	–	1	–	–	–	–
<i>Avena</i> sp. grain (oat)	4	20	–	–	–	4	C, D
<i>Avena</i> /Poaceae grain (oat/grass)	1	14	–	–	–	–	C, D, G
<i>Avena</i> sp. floret bases	–	–	1	–	–	–	–
<i>Avena</i> sp. awn frags	3	2	–	2	–	1	–
Cereal indet.	14	14	2	–	1	–	–
OTHER REMAINS							
<i>Corylus avellana</i> L. (hazel) nut frags	3	–	–	–	–	–	H, S, W
Chenopodiaceae (goosefoot family)	–	1	–	–	–	–	C, D, n
<i>Rumex</i> sp. (docks)	–	2	1	–	–	–	C, D, G
<i>Viola</i> sp. (violet)	1	–	–	–	–	–	C, D, Du, F, G, H, He, S, W
<i>Rubus</i> sp. (brambles)	1	–	–	–	–	–	D, Du, G, H, He, S, W
<i>Prunus spinosa</i> L. (blackthorn) – thorns	1	–	–	–	–	–	H, S, W
Rosaceae – thorns (rose family)	8	–	–	–	–	–	H, S, W
<i>Vicia hirsuta</i> (L.) Gray /V. tetrasperma (L.) Schreber (hairy tare/smooth tare)	–	1	–	–	–	–	D, G
cf. <i>Vicia</i> sp. (vetches)	1	–	–	–	–	–	–
<i>Medicago</i> type (medicks)	–	1	–	–	–	–	D, G
<i>Ulex europaeus</i> L. spines (gorse)	14	–	1	–	–	–	G, He, S
<i>Teucrium scorodonia</i> L. (wood sage)	1	–	–	–	–	–	Du, H, W
<i>Mentha arvensis/M. aquatica</i> L. (corn/water mint)	1	–	–	–	–	–	C, Gw, P, Wo,
<i>Plantago lanceolata</i> L. (ribwort plantain)	–	–	–	1	–	–	G, o
<i>Anthemis cotula</i> L. (stinking chamomile)	1	–	–	1	–	–	C, D
cf. <i>Anthemis cotula</i> L.	–	–	–	–	–	–	–
<i>Chrysanthemum segetum</i> L. (corn marigold)	–	–	–	–	–	1	C, D
Asteraceae (daisy family)	–	1	–	–	–	–	C, D, Du, F, G, H, S, Wo
Asteraceae/Apiaceae	–	–	–	1	–	–	–
<i>Arrhenatherum elatius</i> var. <i>bulbosum</i> (Willd.) (Onion couch grass) tuber	–	1	–	–	–	–	C, D, G, H
<i>Bromus</i> sp. (bromes)	–	1	–	–	–	–	C, D, G
<i>Danthonia decumbens</i> (L.) DC. (heath grass)	–	–	–	1	–	–	C, D, G, He
Poaceae (grass family)	1	1	1	–	–	–	C, D, G
Poaceae culm nodes	–	–	–	1	–	–	–
<i>Pteridium aquilinum</i> (L.) Kuhn (bracken) leaf frags	1	–	–	–	–	–	He, G, W
cf. fruit frags	–	–	–	–	–	1	–
Seeds indet.	14	3	1	–	–	–	–
Thorns indet.	2	2	–	–	–	–	H, W
Flowerheads indet.	1	1	–	–	–	–	–
Monocot. rhizome/stem frags	9	3	–	3	–	4	G
cf. Capsule frags	–	–	–	–	–	1	–
cf. Tree bud	–	1	–	–	–	–	H, W
Total no. of items	92	88	12	26	1	18	–
Bone frags	13	–	–	1	–	–	–

Ecology: C = cultivated; D = disturbed; Du = dunes; F = fens, marshes etc.; G = grassland; H = hedges; He = heath, moors etc.; P = ponds, ditches etc.; S = scrub; W = woods; n = nutrient-rich; o = open ground; w = wet/ damp

suggest bristle oat rather than common oat (*A. sativa*), but the grain could represent the secondary and tertiary florets of common oats or wild oats (*A. fatua*, *A. sterilis* = *A. ludoviciana*). Bristle or small oat has been widely cultivated in Wales, particularly in areas where conditions are unsuitable for common oat, where it is known as 'Ceirch Llwyd' (sand oat) or 'Blewgeirch' (black oat) (Hubbard 1968). It is also possible it could have been grown with barley as a mixed crop (drage), rather than as a single crop. Mixed crops were frequently sown in case of failure of one of the crops. Alternatively, the oat might have been a weed of the barley crop and deliberately allowed to grow in the fields and harvested with the barley. The cereal might have been used as fodder, for human consumption as bread or oatcakes, or for brewing. Barley is more salt-tolerant than other cereals and might have been a more reliable crop than bread wheat in this coastal area.

Other weed seeds of cultivation or grassland were scarce in the assemblage but included brome (*Bromus* sp.), goosefoot (*Chenopodiaceae*), and legumes such as medick (*Medicago*) type and hairy/smooth tare (*Vicia hirsuta/V. tetrasperma*). The distinctive corm-like swollen basal internode of onion couch grass (*Arrhenatherum elatius* var. *bulbosum*) was also present. As well as growing in a wide range of habitats including grassland, rough ground and maritime sand and shingle, onion couch grass is also found in arable land where the swollen internodes are an effective means of propagation (Hubbard 1968). However, *Arrhenatherum* grassland can be associated with the *Prunus spinosa*-*Rubus fruticosus* vegetation community (Rodwell 1991), which can occur in hedges as well as scrub, and blackthorn (*Prunus spinosa*) charcoal was recovered from this sample (Caseldine and Griffiths 2006). Wood charcoal was quite frequent in the sample and the remains suggest the deliberate dumping of waste from a domestic fire in the ditch.

Grave 211

The assemblage from grave fill 210 was also relatively rich in remains and similarly contained wheat, barley and oat but grain was relatively scarce, as were weed seeds. Of the wheat, there was some slight evidence for the presence of glume wheats, a glume base, and a possible emmer grain. However, most of the remains in the assemblage consisted of a range of material from woody plants, including gorse spines, a thorn of blackthorn, as well as other thorns, a bramble (*Rubus* sp.) seed and some hazelnut (*Corylus avellana*) shell fragments, all of which indicate the presence of scrub woodland or possibly hedges in the area. Wood charcoal was also relatively frequent in the sample and the bramble and hazelnut could have been collected along with the wood for a fire, although no hazel charcoal was recorded from this sample (Caseldine and Griffiths 2006). It is also possible that brambles and hazelnuts were being gathered as foodstuffs. This could indicate a continuation of the practice, dating from prehistoric times, of the utilisation of wild resources for food. Small fragments of bone in this sample were probably derived from the grave rather than associated with the charred remains.

Several of the weed seeds may also indicate woodland. The presence of wood sage (*Teucrium scorodonia*) may provide evidence both for woodland and the coastal location as it grows in woods and hedgerows and also on fixed shingle and sand dunes. Equally, while corn/water mint (*Mentha arvensis/M. aquatica*) may indicate cultivation, corn mint can be found in woodland clearings and certain species of violet (*Viola* sp.) also occur in woodland. Indeed the presence of wood sage, violet, bramble, gorse, hazel, bracken and blackthorn may suggest a scrub community similar to the *Prunus spinosa*-*Rubus fruticosus* scrub community (Rodwell 1991), although it is likely that other scrub communities were also present.

Parallel ditches

The remaining sample was from the fill (222) of one of the parallel ditches (235). This sample yielded only a few remains, mainly cereal. Again there was some evidence for wheat, including glume wheats, as

well as barley and oat being grown. The cornfield weed, corn marigold (*Chrysanthemum segetum*) was also present. The remains could represent waste which had been used as manure on the fields.

Crop husbandry during the early medieval period

Throughout the period of agricultural activity investigated at the site the frequency of plant remains suggests a relatively low level of cereal cultivation, but this may be a reflection of the contexts examined and an underestimate of activity. Although the evidence from the ditch of the rectangular enclosure is slight, comparison with the evidence from the other samples may indicate a change in crop husbandry in the area over time. Charcoal from context 209 in the ditch gave a date of cal. AD 540–650, while charred remains from context 223 from the cemetery enclosure ditch gave a date of cal. AD 660–870 and bone from grave 211 gave a date of cal. AD 890–1120. The assemblage from 209 differs from that from the other samples by the absence of barley, frequency of glume wheat chaff, and limited evidence for oat. There is also evidence from the upper fill 221 of the cemetery ditch for bread wheat. This possibly suggests a change in the principal crops from glume wheats to bread wheat, barley and oat. Hints of this change have been recorded at the end of the Roman period at other sites in West Wales, for example Llawhaden (Caseldine and Holden 1998) and Great Castle Head, Dale (Caseldine 2002). However, it appears that glume wheats, emmer/spelt, may have continued to be grown in the West Angle Bay area, although they could have been ‘weed’ contaminants. Alternatively, it is possible that the glume wheat evidence is residual and relates to an earlier, prehistoric phase at the site. Plant remains associated with Iron Age cultivation marks buried beneath sand deposits at the early medieval cemetery at Brownslade also included emmer/spelt, spelt, barley and oats, whilst evidence from a later shell midden suggested the cultivation of barley and oats, perhaps as drage (Carruthers this volume).

The evidence from West Angle Bay is consistent with that from other early medieval sites in Wales including Newton (Caseldine and Griffiths 2004), Pembrokeshire, where oats, barley and bread wheat were recorded, and Llanelen (Schlesinger and Walls 1995; Kissonock 1996) in northern Gower and Capel Maelog (Britnell 1990) in mid Wales where oats and barley were recovered. Similar results have also been found at sites on Anglesey where there was evidence for the cultivation of barley, oat and bread wheat as well as evidence for the continued cultivation of emmer and spelt during this period (Williams 1986; Smith 1987; Ciaraldi 2012)

Finally, although of later date, there is evidence in the Black Book of St David’s, dating to 1326, of the growing of drage and both great and small oats, presumably common and bristle oat, on the St David’s estates in Pembrokeshire (Jack 1988), indicating these crop husbandry practices continued during the medieval period

CHARCOAL

Charcoal from four contexts was examined. The charcoal was fractured to produce clean transverse, transverse longitudinal and radial longitudinal sections. A Leica DMR microscope with an incident light source was used to identify the charcoal. Identification was by reference to identification atlases (Schweingruber 1978; Schoch *et al.* 2004) and modern reference material. Nomenclature follows Stace (1995). The results are given in Table 11.

Discussion

The only fragment of charcoal identified from the enclosure ditch (210) was of blackthorn (*Prunus spinosa*). This was also found in the cemetery ditch (238) samples. Other woodland species represented

Table 11. Charcoal identifications from West Angle Bay

Trench	13	13	13	15	Total
Feature	Grave 211	Ditch 238	Ditch 238	Ditch 230	
Context	210	221	223	209	
<i>Betula</i> sp. (birch)	1	–	–	–	1
<i>Corylus avellana</i> L. (hazel)	–	–	3	–	3
<i>Quercus</i> spp. (oak)	13	11	1	–	25
<i>Prunus spinosa</i> L. (blackthorn)	–	1	2	1	4
<i>Prunus</i> spp. (cherry)	1	2	–	–	3
<i>Hedera helix</i> L. (ivy)	–	1	–	–	1
Total	15	15	6	1	36

in the cemetery ditch included wild cherry (*Prunus* spp.), hazel (*Corylus avellana*), oak (*Quercus* spp.) and ivy (*Hedera helix*) and birch (*Betula* sp.), oak and cherry in the grave (211) sample. Oak, hazel, birch and blackthorn were also identified in samples from the 2005 excavations (Caseldine and Griffiths 2006).

The charcoal evidence suggests the presence of oak woodland and is in agreement with the plant macrofossil evidence for the presence of scrub woodland, possibly similar to that of the *Prunus spinosa*-*Rubus fruticosus* scrub community (Rodwell 1991), in the area. Ivy frequently forms a ground carpet or patchy cover in scrub woodland as well as being found in oak woodland. Although the trees and shrubs may have been growing in separate stands of scrub or woodland, it is equally possible they may have been growing in hedges, perhaps associated with the bank and ditch of the cemetery.

Conclusions

The charred plant remains provide evidence of domestic/agricultural activity in the area of the cemetery at West Angle Bay. The crops grown were wheat, hulled barley and oats. There is possible evidence for a change in the main crops being grown over time. Some cultivation may have occurred on heavier soils. The results are similar to those from other early medieval sites in Wales. Other plant remains and the charcoal evidence indicate the presence of scrub woodland/hedges in the area.

STABLE ISOTOPE ANALYSIS OF HUMAN REMAINS: BROWNSLADE AND WEST ANGLE BAY

By Katie A. Hemer

The application of stable isotope analysis to human remains from cemetery sites such as Brownslade and West Angle Bay offers an excellent opportunity to gain insight into the communities who lived in Wales during the early medieval period. In an archaeological context, the purpose of stable isotope analysis is twofold; firstly, to identify an individual's place of childhood residence through strontium and oxygen isotope analysis, and secondly to identify the primary source of protein consumed during life by using carbon and nitrogen isotope analysis. Skeletons from Brownslade and West Angle Bay were subjected to multiple isotopic analyses as part of the author's doctoral research (Hemer 2010), the results of which are presented and discussed here.

Isotope analysis of human mobility

Strontium and oxygen isotope analysis is widely applied to the study of past population migration, and the principles of strontium and oxygen isotope analysis are discussed at length elsewhere (e.g. Montgomery and Evans 2006; Chenery *et al.* 2010; Evans *et al.* 2010). However, to summarise, during the formation of permanent second mandibular molar crowns—between 3 and 7 years of age (Hillson 1996)—strontium and oxygen isotopes from food and water are incorporated into the tooth enamel. Strontium and oxygen isotopes reflect local geological and climatic conditions respectively and therefore provide an indication of whether an individual was local to his or her place of burial as a child (Budd *et al.* 2004).

Ten skeletons from Brownslade and three skeletons from West Angle Bay were sampled for strontium and oxygen isotope analysis (Table 12). Enamel from the second molar crowns was prepared according to the methods of Montgomery (2002) and O'Neil *et al.* (1994). The chemical analysis of the enamel samples was undertaken at the NERC Isotope Geosciences Laboratory (NIGL), Keyworth, following the methods outlined in Evans *et al.* (2006).

Population mobility and origins

The strontium isotope values for the individuals sampled from Brownslade and West Angle Bay range between 0.7092 (Brownslade 530, 538)—which is the same composition as seawater (0.7092)—and 0.7117 (Brownslade 511) (Fig. 22). All strontium values can be accommodated within the biosphere of Wales (Evans *et al.* 2010). In fact, most of the data are consistent with biosphere values recorded from coastal areas underlain by Carboniferous Limestone as is the case at Brownslade, and Palaeozoic mudstones which occur over much of south and central Wales (Evans *et al.* 2010). Whilst the strontium isotope values indicate a Welsh/Welsh borders origin for these individuals, this is not an homogeneous group of people, and the strontium concentrations indicate differences in agricultural or dietary habits which may relate to place of origin.

The majority of the sample has strontium concentrations between 40ppm and 111ppm, whilst two outliers have values above 150ppm (Brownslade 514, 530). These two outliers plot towards the field of data typical of individuals from regions of machair land, much of which is found on the north-west coast of Scotland and parts of north-west Ireland where seaweed is used as a fertiliser (Montgomery *et al.* 2007; Gaynor 2006). These elevated strontium concentrations (>100ppm) may therefore indicate the use of seaweed as a fertilizer, or alternatively, the consumption of a seaweed-based produce. The discovery of an edible seaweed species (*Fucus* sp.) at Brownslade, and the strontium concentrations provide further support to the suggestion that seaweed was exploited in the Pembrokeshire region during this time (Carruthers this article).

The phosphate oxygen isotope data for the enamel samples from Brownslade and West Angle Bay ranges from $\delta^{18}\text{O}_p = 17.7\text{‰}$ to 19.3‰ . This data equates to drinking water values ($\delta^{18}\text{O}_{dw}$) ranging from -3.3‰ to -6.6‰ when converted using the regression equation of Levinson *et al.* (1987) modified by Chenery *et al.* (2010) (Fig. 22). The conversion of $\delta^{18}\text{O}_p$ values to $\delta^{18}\text{O}_{dw}$ values using regression equations has recently come under scrutiny due to the large errors noted for some calculated $\delta^{18}\text{O}_{dw}$ values (Pollard *et al.* 2011). As such, some authors (e.g. Müldner *et al.* 2010; Pollard *et al.* 2011) recommend making geographical correlations on the basis of $\delta^{18}\text{O}_p$ values alone. A significant number of individuals within the dataset have elevated $\delta^{18}\text{O}_p$ values (>18.7‰) which produces a population mean for these data that is significantly higher than currently defined for the west coast of Britain (Evans *et al.* 2012). Consequently, it is necessary to consider whether there were a number of individuals from outside the UK living in Pembrokeshire, or whether other factors may be responsible for these elevated oxygen values.

Table 12. Results of stable isotope analysis from Brownslade and West Angle Bay

		Strontium and oxygen isotope results						Carbon and Nitrogen isotope results								
Site and skeleton no.	Sex	Age	Sample	$\delta^{18}\text{O}_{\text{SMOW}}$	1 s.d.	$\delta^{18}\text{O}_{\text{dw}}$	1 s.d.	$^{87}\text{Sr}/^{86}\text{Sr}$	Sr ppm	Sample	$\delta^{13}\text{C}_{\text{VPDB}}$	1 s.d.	$\delta^{15}\text{N}_{\text{AIR}}$	1 s.d.	C:N	%Coll
Brownslade																
502A	M	>45	M2	18.6	± 0.1	-4.7	± 0.2	0.710237	74.7	Rib	-20.5	± 0.1	10.9	0.0	3.5	7.8
508	F	25-35	M2	18.6	± 0.1	-5.0	± 0.1	0.709316	102	Rib	-20.4	± 0.2	10.4	0.0	3.5	9.2
511A	F	25-35	M2	18.6	± 0.1	-4.7	± 0.3	0.711701	86.5	Rib	-21.2	± 0.1	10.3	0.0	3.5	11.5
514	U	13-17	M2	18.9	± 0.1	-4.1	± 0.1	0.710569	151	Rib	-20.7	0.0	10.7	0.0	3.5	5.2
517	M	>45	M2	18.9	± 0.1	-4.2	± 0.2	0.709380	40	Rib	-20.3	± 0.1	10.9	0.0	3.5	9.4
528A	M	18-25	M2	19.3	± 0.1	-3.3	± 0.2	0.711251	105	Rib	-20.4	± 0.1	11.0	± 0.1	3.5	10.7
530	M	25-35	M2	17.7	± 0.1	-6.6	± 0.1	0.709266	187	Rib	-20.1	± 0.1	10.8	± 0.1	3.4	17.2
532	M	>45	M2	18.9	± 0.2	-4.5	± 0.3	0.710257	105	Rib	-20.1	0.0	10.5	± 0.2	3.4	6.9
535	F	18-25	M2	18.0	0.0	-4.5	0.0	0.710239	110	Rib	-20.1	± 0.1	10.3	0.0	3.4	8.5
538	F	25-35	M2	18.8	± 0.1	-4.3	± 0.2	0.709286	111	Rib	-20.0	0.0	10.4	± 0.1	3.4	23.7
West Angle Bay																
53	U	25-35	M2	18.5	0.0	-5.0	0.0	0.709954	88.9	Dentine	-19.6	± 0.1	11.7	± 0.1	2.8	16.2
59	U	18-25	M2	18.1	0.0	-5.8	± 0.1	0.710662	89.2	Dentine	-20.6	± 0.1	12.3	± 0.1	3.0	3.2
210	F	18-25	M2	18.6	± 0.1	-4.8	± 0.2	0.709497	62.6	Dentine	-19.8	± 0.1	11.9	± 0.1	2.8	12.9

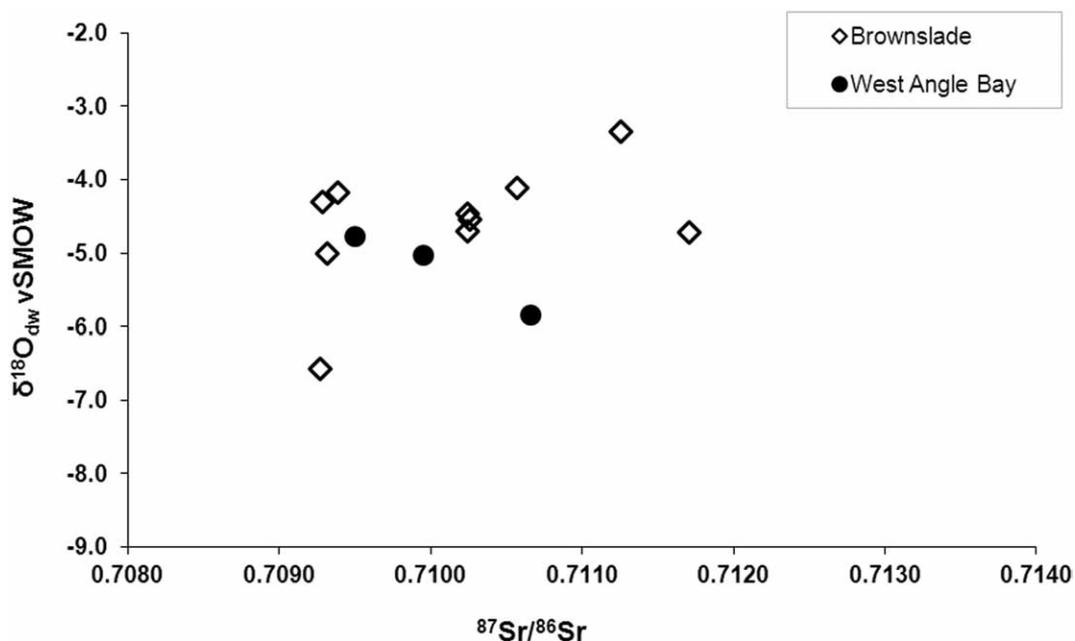


Fig. 22. $^{87}\text{Sr}/^{86}\text{Sr}$ vs. $\delta^{18}\text{O}_{\text{dw}}$ of the Brownslade and West Angle Bay tooth enamel samples.

The correlation between oxygen isotope values from tooth enamel and geographic areas is based on the premise that in the past, populations would have relied on locally available sources of rainwater or groundwater, the isotopic composition of which would depend on local climatic conditions (Budd *et al.* 2003). However, $\delta^{18}\text{O}$ values can be modified by various processes including; a significant consumption of water that has been enriched through natural evaporation (e.g. water from lakes), anthropogenically induced evaporation (e.g. brewing or stewing) or metabolic processes (e.g. milk) (Brettell *et al.* 2012; Evans *et al.* 2012). Whilst all are possibilities, it is important to note that there is no evidence for evaporatively enriched natural drinking water sources in this part of Wales (Darling 2004), nor was the population solely reliant on a pastoral economy which would lead to an unusually high intake of milk during childhood. The isotopic study of some early Anglo Saxon populations from England—including West Heslerton (Budd *et al.* 2003) and Wasperton (Montgomery *et al.* 2009)—has identified individuals with more positive oxygen values than predicted for their region of dwelling/burial. Whilst originally the data were taken as evidence for individuals from a warmer, non-UK climate, it has now been proposed that the regular consumption of beer and the use of the ‘potage’ cooking method might contribute significantly to the intake of ^{18}O enriched water, and consequently may lead to a misinterpretation of the data (Brettell *et al.* 2012). This possibility has to be acknowledged in light of the individuals with elevated oxygen values from Brownslade. However, it remains possible that within this study sample, there may have been those who grew up in areas with drinking water values between -5‰ and -3‰ . Such values are uncommon across much of Europe; however, the extreme western coast of Ireland and north-west Scotland is contoured for values between -5‰ and -4.5‰ (Darling *et al.* 2003; Darling 2004), whilst other compatible regions $>-4.5\text{‰}$ include the coastal regions of the Mediterranean Basin (Chenery *et al.* 2010; Evans *et al.* 2012). Given the evidence for continued trade and contact between south-west Britain and the Mediterranean until the early seventh century (Fulford 1989; Campbell 2007), it is necessary to

entertain the possibility that individuals from warmer climates may have been living in south Wales at this time

Palaeodietary reconstruction

Collagen from bone and dentine is routinely sampled for carbon and nitrogen isotope analysis, as values provide an indication of the primary source of protein consumed during the last five to ten years of life (Ambrose 1990; Sealy *et al.* 1995; Hedges *et al.* 2007; Jørkov *et al.* 2009). Carbon isotope values ($\delta^{13}\text{C}$) are used to distinguish between the consumption of marine and terrestrial protein (Barrett and Richards 2004), whilst nitrogen isotope values ($\delta^{15}\text{N}$) indicate the consumption of an animal- or plant-protein based diet (Ambrose 1990). Thus, carbon and nitrogen isotope analysis provides a useful tool for the palaeodietary reconstruction.

Collagen was analysed from rib bone fragments from the ten skeletons from Brownslade, whilst the absence of suitable bone from the three West Angle Bay skeletons meant that it was necessary to extract dentinal collagen from the second molar crowns (Table 12). Samples were prepared and analysed at NIGL, Keyworth. Collagen was extracted following the method of Longin (1971) modified by Brown *et al.* (1988), and the $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values were calibrated against internal standards and certified reference material (Hemer 2010).

Palaeodietary results

The C:N ratios and collagen yields indicate that the bone samples from Brownslade produced suitably preserved collagen (DeNiro 1985; Van Klinken 1999; Brock *et al.* 2010), whilst $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values indicate an overall reliance upon terrestrial resources (Table 12; Fig. 23). The dentinal collagen sampled

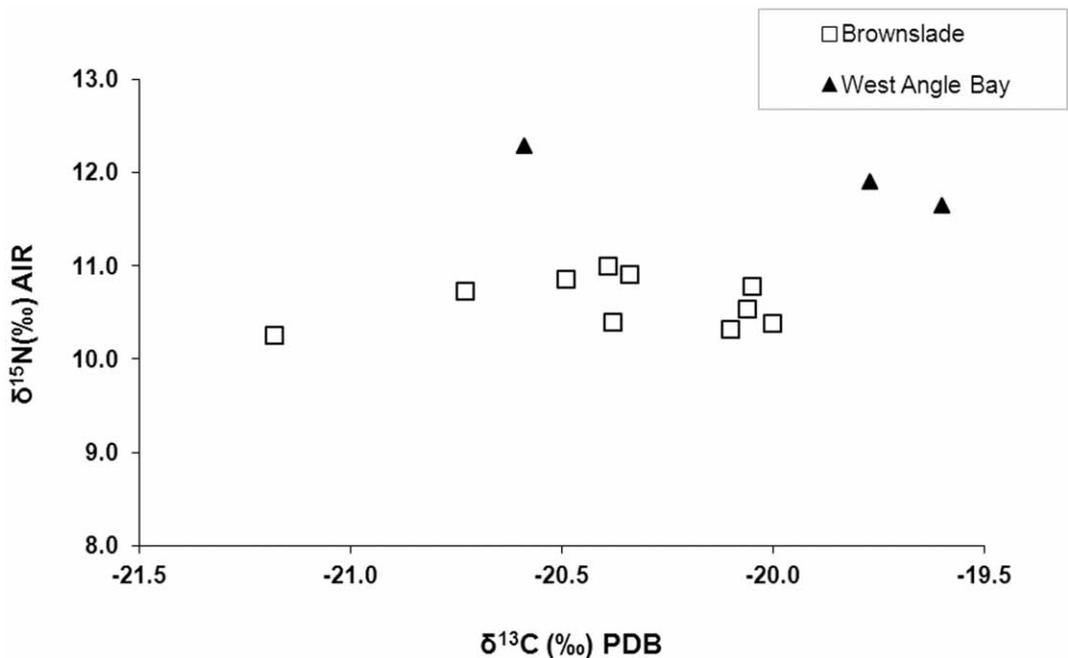


Fig. 23. $\delta^{13}\text{C}$ vs. $\delta^{15}\text{N}$ of the Brownslade and West Angle Bay bone and dentine (M2) collagen samples.

from West Angle Bay yielded more positive $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values than those from Brownslade, however as two samples from West Angle Bay had low C:N ratios, it is possible that taphonomic degradation may be a causative factor. Overall, however, there is no indication that marine protein made a significant contribution to the diets of those sampled from Brownslade or West Angle Bay. Those individuals with elevated $\delta^{15}\text{N}$ values ($> +10\%$) may have consumed omnivorous protein (e.g. pig, fowl) or other sources of protein enriched in $\delta^{15}\text{N}$ such as suckling piglets, manured cereal crops or freshwater fish (Hedges and Reynard 2007; Bogaard *et al.* 2007).

Discussion of the isotope analysis of human remains

The strontium and oxygen isotope analysis of the Brownslade and West Angle Bay study-sample identified a number of individuals who may not have been local to the Pembrokeshire region. Whilst this study acknowledges a variety of possible factors to explain the elevated oxygen values, it also recognises the distinct possibility that individuals from the extreme western coasts of Ireland, north-west Scotland or even the Mediterranean Basin may have been living amongst the communities in south-west Wales. This possibility certainly receives support from the historical and archaeological record. The ogam alphabet is thought to have its origins in Ireland (Woolf 2007), but was adopted as a form of funerary commemoration in Wales during the fifth to seventh centuries (Edwards 2001). The greatest concentration of ogam inscribed stone monuments occurs in the kingdom of Dyfed (i.e. modern-day Pembrokeshire) (Edwards 2001), thus as MacManus (1991, 45–7, cited in Wooding 1996, 37–8) notes:

the distribution [of ogam stones] in Britain corresponds more or less in frequency to that of the respective areas in Ireland from which the colonists who brought it across the Irish sea probably set forth.

The distribution of ogam stones may therefore represent a localized zone of contact focused on south-west Wales and southern Ireland dating from the early fifth century, and this also provides support to the historical accounts for an Irish presence in Pembrokeshire at this time (Ó Cróinín 1995, 18). The isotopic results from the current study may lend further evidence in support of contact across the Irish Sea at a time when the two cemeteries were in use.

The possibility of long distance contact and migration also receives support from the archaeological and historical record, as imported pottery from the Mediterranean and Continental Europe has been recovered from a number of sites in Wales (Arnold and Davies 2000, 172). For example, eastern Mediterranean pottery recovered from high status settlements such as Dinas Powys, Hen Gastell and Longbury bank indicate a floruit in trade with Byzantium between the late-fifth to mid-seventh centuries (Thomas 1959; Fulford 1989; Campbell 2007; Hemer 2010). It is thought that the eastern Mediterranean amphorae found in Wales contained exotic foodstuffs including wine, olive oil, madder and honey (Fulford 1989). These commodities may have been imported by the local elite who made a strategic attempt to legitimise their status through the appropriation of a Roman past (Hemer 2010, 182). The decrease in the importation of pottery after the mid sixth century has led to the suggestion that trade with the Byzantine Empire had come to an end following a series of epidemic plagues (Campbell 2007, 132). However, given the possibility of individuals of Mediterranean origin at Brownslade during the seventh and eighth centuries, the connections established centuries earlier may have survived longer than previously thought.

DISCUSSION

Brownslade: pre-cemetery features (By Ken Murphy)

Criss-cross cultivation marks (probably ard marks) indicate agricultural use of the area in the eighth to the fourth centuries BC. Associated plant remains indicated cultivation of emmer wheat, spelt wheat and barley, while a cow-tooth suggested a pastoral element to the economy. A buried soil overlay these remains, into which was incised a second set of criss-cross cultivation marks, again associated with cereal cultivation and dating to the fourth to first centuries BC. This sequence is remarkably similar to that found at sites SWEii and SHW at Stackpole Warren (Benson *et al* 1990, 206–8, figs. 28–30), nine kilometres to the south-east of Brownslade, where a buried soil overlay criss-cross cultivation marks and was cut through by one-way cultivation marks. A third-century BC to first-century AD radiocarbon date was obtained from charcoal overlying the upper set of marks. Although only revealed in relatively small excavation trenches, the evidence from Brownslade and Stackpole indicates the potential for well-preserved prehistoric archaeology beneath the windblown sands of south Pembrokeshire. Indeed, several hundred hectares of prehistoric landscape could lie beneath these sands.

Sand incursion along the south Wales coast is generally considered to have started in the Early Bronze Age (Higgins 1933), but local conditions largely governed the rate of incursion (*ibid.* 1990, 238–40) and some areas remained clear whilst neighbouring areas were besanded. Incursion at Brownslade begun no earlier than the mid-fourth to the first centuries BC, with partial stabilisation of the dunes by *c.* AD 500; as the site of the barrow lies towards the eastern edge of the burrows it is likely to have been one of the last areas covered.

Early medieval cemeteries at Brownslade and West Angle Bay (By Neil Ludow)

Early medieval cemeteries are highly diverse with few characteristics common to all, even on a regional level. Size, organisation, status, burial rite and grave form can vary widely. Brownslade and West Angle Bay are two very different sites, though broadly co-existing within only a few kilometres of each other.

The rite of extended, oriented inhumation was adopted in Britain during the second century AD and became widespread during the late Roman period. It is seen at the fourth-century cemetery at Poundbury, Dorset (Farwell and Molleson 1993) and, along with Christianity itself, was adopted in Ireland early in the post-Roman period (O'Brien 1992). However, British post-Roman cemeteries, while predominantly oriented and generally lacking grave goods, are often not obviously Christian (Rahtz 1977, 55). Relatively few, moreover, have been securely dated, few are accompanied by dateable artefacts, while radiocarbon dating is not always reliable (Petts 2002, 27).

This discussion is therefore limited to datable, post-Roman cemeteries within the 'British' or 'Celtic' regions of the British Isles, that is, those areas that were not subject to Anglo-Saxon rule and burial practice: Wales, Ireland, the Isle of Man, Cornwall and, during the early part of the period at least, Scotland and the west of England. It examines Brownslade and West Angle Bay, along with other west Wales cemeteries, in comparison with excavated sites in Wales,⁹ Cornwall,¹⁰ South-West England,¹¹ Scotland,¹² and the Isle of Man.¹³

Extended graves, wholly or partially lined with stones or slabs—termed 'long-cists', to distinguish them from the non-extended cists of the later prehistoric period—while a characteristic feature of early medieval burial in many regions of western Britain, are part of a wider tradition of stone-furnishing seen in Romanised regions throughout Europe, and were recorded at Poundbury. In Wales, they are suggested to be a post-Roman introduction (Petts 2002, 57) and their use continued into the medieval period and beyond (e.g. Ludlow 2000; Dalland 1992, 203).

Long-cists appear to be concentrated in the coastal areas of west and north-west Britain, in Ireland, and in eastern Scotland. Brownslade and West Angle Bay belong to a widespread tradition of long-cist burial

within west Wales, particularly within modern Pembrokeshire where cists are found in all known cemeteries of the period. They are predominantly coastal, with marked concentrations in north Pembrokeshire and around the west end of Milford Haven (James 1987, 64–5).

In all, 38 burial sites with probable early medieval origins, mainly identified from the presence of cists, have been recognised in south-west Wales (Ludlow 2003b). Of these, seven Pembrokeshire sites, including Brownslade and West Angle Bay have produced early medieval radiocarbon dates. The other dated sites are: Caer Bayvil, cal. AD 650–890 (James 1987; Petts 2000, 301); Llanychlwydog churchyard, cal. AD 810–1160 (Murphy 1987; Petts 2000, 304); Longoar Bay, seventh/ninth century (Ludlow 2005b); Croesgoch, cal. AD 370–600 (Ludlow 2003a); St Brides, cal. AD 880–1020 (Ludlow 2005b). In addition, Gogerddan, in Ceredigion, produced a single date of cal. AD 340–620 (Murphy 1992, 17; Petts 2000, 304).

Three other Pembrokeshire cist cemeteries were subject to limited investigation in the 1920s and have not been radiocarbon dated—St Justinian's Chapel, St David's (Boake 1926), St Patrick's Chapel, St David's (Badger and Green 1925), and Kilpaison, Rhoscrowdder (Fox 1926).

The radiocarbon dates indicate that the Brownslade and West Angle Bay cemeteries were long-lived, ranging from the sixth to the eleventh century AD at Brownslade, and from the mid seventh to the early twelfth century AD at Angle. However, it is likely that burial at both sites occupied a somewhat shorter time-span than the dates suggest. At neither site is the total number of burials known. Little intercutting of graves was observed at Brownslade in the recent excavations, but superimposed burials were recorded in the 1880s; the total number of burials is therefore impossible to estimate. However, the southern limit of burial seems to have been identified.

West Angle Bay is more complex than Brownslade, with two foci, but with a concentration of burials in the egg-shaped enclosure. Rather less than 5 per cent of this enclosure was investigated, within which burial was dense and intercut, suggesting that it could contain a large number of graves. An equally unknown number—at least four—lie on the cliff-edge, where burial may have occupied a wider area but is, on current evidence, apparently confined to the north-west corner of the rectangular enclosure. An unknown number have been lost to coastal erosion.

Cemetery size is similarly unknown at most other west Wales sites. However, apparent throughout Britain, including Anglo-Saxon England, is the distinction between small cemeteries of up to 30 individuals, and larger cemeteries of up to 250 (Longley 2001; O'Brien 1999). The latter are very much in the minority and were normally under ecclesiastical control. Nevertheless, it is possible the 'secular' cemetery at Caer Bayvil may have contained thousands of burials. No other undeveloped cemetery in Wales approaches this size; the large cemetery at Llandough, Glamorgan, in use from the seventh century through to the tenth/eleventh century, is monastic and therefore of a significantly different nature. Current evidence suggests that in Britain, only the 'secular' cemetery at Cannington was of comparable size, with 1500–5500 burials spanning the late Roman period to the late seventh/eighth century.

Fully-slabbed cists, with lintels, represent the maximum development of a tradition that can include partial slabbing and 'token' stone lining. All types can occur together at the same site, together with simple dug graves which, in general, were probably more prevalent. The significance of stone lining is not fully understood; it appears to have been employed regardless of age, sex or status.

A little over half of the excavated burials at Brownslade were dug graves but, as much of the loose, badger-disturbed bone may belong to further, unexcavated dug graves, the ratio may be much higher. The cist graves mainly comprised both basal- and side-slabs, while four were definite lintel-cists; later disturbance made clear identification difficult. In contrast, most of the excavated burials at West Angle Bay were cists, and only one dug grave was identified. None showed basal slabs but some, possibly all, were lintelled.

This mix of different cist forms, in combination with dug graves, is typical of south-west Wales and may represent a regional tradition, wherein some of the grave-types found elsewhere are either uncommon or absent. For instance, lintels normally lie on the side-slabs rather than between them, and never directly on the body as in some Irish sites. Semi-cisted graves, with the incomplete stone lining so characteristic of the west of England and certain Irish cemeteries, were seen only at Caer Bayvil and Llanychlwydog. Additional stone furnishings, such as head- or foot-support stones, have yet to be identified. No cists appear to be tapered as in Cornwall, Ireland and the Isle of Man. Nor is there any evidence for the use of timber elements within cists, either as lintels or side-posts, as seen in north-west Wales, Ireland and Scotland. However, all 22 graves at Gogerddan, in Ceredigion, were dug graves, nine of them showing evidence for timber coffins; other attributes similarly suggest that Gogerddan may belong to a different regional tradition from Pembrokeshire.

Bone preservation was excellent at Brownslade, but very poor at West Angle Bay. Nevertheless it was determined that all ages and both sexes were present at both sites, neither gender markedly predominating. Both sexes were also present at Longoar Bay. This appears to be the norm in cemeteries throughout the British Isles, including monastic cemeteries, and so does not by itself necessarily imply 'kin' burial of the immediate community. Neither is any significant variation in the burial rite according to age, or sex, normally observed in Britain, but the small sample of demonstrable lintel cists at Brownslade were predominantly adult burials.

Non-adults dominated the egg-shaped enclosure at West Angle Bay, where they were mostly cisted. The same age bias was also seen at Capel Eithin, but is otherwise unknown in Britain. It is possible that part of the West Angle Bay enclosure was set aside for the burial of children and infants; while such age-related zoning is uncommon, it was observed at Mawgan Porth where the child burials occupied a separate area of the cemetery. It may however indicate that non-adult burial represented the final use of the Angle enclosure (Page 2011), perhaps after the main burial phase had ceased. In this respect the presence of the adult/neonate burial is interesting (see below); perhaps the neonate 'permitted' the burial of the adult in the enclosure. Such later use of cemeteries for non-adult burial was a fairly widespread, if uncommon tradition, also seen at Caer Bayvil, and possibly Gogerddan (where infants appeared to be absent from the main burial phase), and at Llandough and Caerwent Eastgate in south-east Wales.

No pathologies were recorded from West Angle Bay. The Brownslade assemblage showed a 'normal' range for the period; *cribra orbitalia* and enamel hyperplasia, for example, are characteristic to burials across the British Isles. Achondroplasia, and occupational pathologies such as iliac flaring, have however yet to be identified at any other site in the British Isles. No unusual pathologies were noted during analysis of two individuals from Longoar Bay.

The double burials seen at Brownslade are practically unknown elsewhere in Wales. Multiple burials are, in general, uncommon in Britain, with the exception of south-west England (outside Cornwall) where they appear to be the rule, representing 58% of burials at Cannington. They have also been recorded in Scotland. The ninth/eleventh century burial at West Angle Bay, of an adult female and neonate, is noteworthy and may be paralleled in an earlier, fifth/seventh century burial at Filton, Gloucestershire, where it possibly represented mother and child. However, the posture of the West Angle Bay burial, with the adult on her left side, makes it unique in an early medieval context.

One of the Brownslade double burials comprised two infants and is again paralleled at Filton; another contained an infant with a juvenile. Few other anomalous burials were seen, but one of two flexed burials at Brownslade was cisted, containing the juvenile female with achondroplasia (see above), interred on her side. A burial with a similar disorder again occurred at Filton, in a 'special grave'. All the above attributes are otherwise unknown in the British Isles where, outside of Ireland, anomalous postures are in any case

infrequent and may belong to pre-Christian contexts. However, a flexed burial was also recorded in the sixth/ninth century cemetery at Tywyn-y-capel.

Graves that are clearly distinguished, or 'special graves', have been identified at a number of British cemeteries and are normally characterised by some form of superstructure. In west Wales, they have so far only been recognised at Gogerddan, where they occupied rectangular, timber structures very much like those being increasingly recognised in north-west Wales (Longley 2001, 111–12), and at Stoneage Barton, Somerset, where the fifth/seventh-century date range was similar.

While neither Brownslade nor West Angle Bay exhibit any special graves, there were some variations in furnishing. For instance the cist of grave 56 at West Angle Bay was of markedly finer construction than the rest. Group II early medieval inscribed stones have been observed as lintel-stones at Longoar Bay and St Patrick's Chapel, Pembrokeshire, and at Arfryn, Anglesey. The cross-carved stone retrieved from Brownslade in the nineteenth century may similarly have formed part of a cist (Edwards 2007, 514–5). Though clearly not a memorial in the manner of the commemorative Group I early medieval inscribed stone recorded at, for example, Dyffryn Bern, Ceredigion (see below), the distinction may not always have been clear-cut and so it may instead have been a grave-marker. The plain marker from the recent Brownslade excavations was associated with a dug-grave of possible higher status (the individual buried was diagnosed with Diffuse Idiopathic Skeletal Hyperostosis), but the shifting dune landscape suggests that more markers, or at least mounds, may formerly have been present, as in the dune site at Tywyn-y-capel. Markers (as distinct from memorials) are otherwise unknown in south-west Wales, although undated 'headstones' were recorded at the cist cemetery on Ramsey Island, Pembrokeshire (James 2007, 50). A headstone was also present at Capel Eithin. Further afield, possible stone markers have also been recorded at Llandough, at St Patrick's Isle, Isle of Man, and were suggested at Brean Down; postholes, possibly for grave markers, were recorded at Tintagel churchyard. Stone cairns were employed at a number of Scottish sites, mainly however in areas of Pictish influence.

The pagan tradition of grave goods was only gradually abandoned in Britain. Nevertheless, their use in Christian contexts appears to be more-or-less confined to western England (outside Cornwall) and south-east Wales, where they are in the Romano-British tradition and were widely used; there also is also a significant presence in Ireland. However, a Romano-British brooch in the buried soil at Llanylchwydog, Pembrokeshire was thought perhaps to have been derived from a grave fill. No grave goods were recorded at Brownslade, or at West Angle Bay where, however, grave 211 (see above) contained a scatter of white quartz pebbles. This is a widespread phenomenon in British cemeteries, seen as far apart as Cornwall and north-east Wales. The significance (and origin) of the charcoal in grave 211 at West Angle Bay is unknown, but may be linked to the unusual nature of the burial (female and neonate). However, charcoal has been recorded at numerous Anglo-Saxon sites, and has been variously interpreted as consecrating the grave, as associated with status, or a more functionally as an absorbent material (Holloway 2010).

Grave 524 at Brownslade consisted of a stone-lined pit containing the disarticulated, and mostly partial, remains of four juveniles and an adult female. It is possible that they were deposited following the 1880s' excavation or some other unrecorded disturbance on the site. If contemporaneous with the cemetery, they represent an unusual burial rite, but perhaps comparable with Bardsey Island, off the north Wales coast, where a communal grave contained the remains of a 10/12 year-old and four 6/8 year-olds (Arnold 2001).

Pre-existing funerary and ritual sites were frequently used for early medieval burial in a tradition that also continued from the Romano-British period (Murphy and Williams 1992, 30–35). In fact 25% of all burial sites, Anglo-Saxon and British, have been identified as re-used earlier monuments (Williams 1998, 90–108), round barrows forming the majority.

Brownslade may reuse an earlier burial mound, though its date is uncertain. The cist-burial described by Laws, and the accompanying pottery, may be Romano-British (although this is by no means certain, and the pottery is now lost); cf. the third-century cemetery near Caerleon which contained cists and a burial similarly accompanied by cremated bone (Arnold and Davies 2000, 137). Another parallel may be furnished by Dyffryn Bern, Ceredigion, where a commemorative Group I early medieval inscribed stone stood on the summit of a stone cairn within which was a Romano-British cremation urn (Edwards 2007, 184–88); it appears that a Bronze Age cairn was reused for the Roman burial, and reused again for the early medieval inscribed stone although no accompanying burial was recognised. Laws' assertion that the Brownslade cist represented the primary burial was guesswork only, while it is also possible that the pottery was incorrectly described as wheel-turned; it may have been Bronze Age. Reuse of Bronze Age funerary and ritual monuments has been recognized elsewhere in west Wales. At Gogerddan, the early medieval burials lay next to a standing stone and close to a large round barrow and other funerary sites. The round barrow at Kilpaison, which also lies within wind-blown sand, contained a single extended, oriented long-cist burial, which may date from very early in the post-Roman period; isolated single burials are also a feature of the Irish and Scottish landscapes (Alcock 1992; O'Brien 1992).

The West Angle Bay cemetery contained two burial groups, either co-existent or separated in time, while more may exist. Polyfocal sites have been recognised elsewhere, for instance at Cannington, and at Capel Eithin where six burial groups were recognised, in two distinct traditions with separate nuclei.

The size of the excavation in the egg-shaped enclosure at West Angle Bay precluded recognition of any spatial organisation. The Brownslade graves possibly lay in two clusters, as at Capel Eithin, and Cannington where burial may have been in family groups. Filton was similarly 'zoned' into nine groups, which may have been chronological, as at Henley Wood (second/eighth century), and the Cat Stane (fifth/eighth century). Clusters were also recognised at Longniddry (fifth/eighth century).

The Brownslade graves may also have occupied crude rows, as at Caer Bayvil and Gogerddan, and in the predominant pattern throughout the British Isles at those sites where spatial organisation is apparent. As at Tanderwen, they presumably focussed on the barrow, but this is not reflected in their organisation.

Many cemeteries remained unenclosed until their abandonment, as at Brownslade, but others were defined by a boundary, usually a bank and/or ditch, at some stage of their development, as at West Angle Bay. However, we cannot always be sure whether or not enclosure took place—the vast majority have not been fully excavated and even when they have, boundaries may have been missed. Some sites reused earlier enclosures—Caer Bayvil is probably an Iron Age defended enclosure, Arfryn occupies a Bronze Age settlement enclosure, and it has been suggested that many circular churchyards may represent reused Iron Age defended enclosures, acquired as kin burial grounds through gift from a local chief (James 1994, 405).

The majority of non-monastic cemeteries in post-Roman Britain appear to have been established by the communities that they served, without direction from the church. As burial was increasingly brought under formal ecclesiastical control, during the eighth/ninth century, some cemeteries were retained—and ultimately 'developed' with church or chapel buildings—while others were abandoned. Wales, particularly the south-west, Cornwall, and the Isle of Man all show evidence for the development of non-monastic sites, a process which appears to be exceptional in western Britain before the eleventh century; there is little evidence for non-monastic development in Scotland, it appears to be rare in Ireland, while no excavated British cemetery in the West Country appears ever to have been taken under ecclesiastical control. However, like enclosure, the development of a site may not always be recognised in the archaeological record.

Where dated, *de novo* early medieval cemetery enclosures in Britain appear also to have been largely monastic. Where undertaken at non-monastic sites, moreover, enclosure appears usually to have been

usually accompanied by development, for instance at Capel Maelog, where the enclosure may be contemporary with the construction of the church (Britnell 1990, 83–4), and at Tywyn-y-capel. So it may be that enclosure, like development, is indicative of ecclesiastical control—not necessarily monastic—and that it normally accompanied, or led to, development.

While burial at West Angle Bay may have begun in a ‘secular’ context, the egg-shaped enclosure therefore suggests the later imposition of formal ecclesiastical control; on current evidence, it appears to have been secondary, and established as a *de novo* cemetery enclosure. It is comparable in both shape and size with some of the smaller churchyards of the region and, for instance, the vestigial banks around the later chapels at St Justinian’s, St Non’s and St Patrick’s, Pembrokeshire while, like them, it may also have been developed.

Undated graves have been recorded beneath St Patrick’s Chapel, and early burial at St Non’s is suggested by undated cists and *in situ* early medieval inscribed stone (Edwards 2007, 449–50). Both chapels occupy the large parish of St David’s, in which the cathedral was also the parish church, so their burial rights may have been retained into the later Middle Ages culminating with the erection of masonry chapels in the fourteenth/fifteenth centuries. Under normal circumstances, however, parish churches had assumed sole burial rights by the mid twelfth century, and indeed the latest excavated burial at West Angle Bay is early twelfth-century at the latest.

The geophysical anomaly in the West Angle Bay enclosure may represent a chapel building. If timber, then it may have been contemporary with burial. If, however, as seems more likely, it represents a masonry chapel (possibly replacing a timber structure), then it may have been erected many years, possibly centuries after the cemetery was abandoned; masonry chapels in Pembrokeshire are characteristic of the late medieval period, while bonded masonry earlier than the Anglo-Norman conquest has yet to be conclusively demonstrated in Wales.

No enclosure was recognised at Brownslade, or a boundary of any form, while evidence for a church or chapel is equivocal. Similarly, tradition locates chapels at Croesgoch and Longoar Bay, but neither has been proven.

The size of a cemetery-using community may be estimated using the number of burials (Henshall 1955–56; Longley 2001). David Longley (*op. cit.*) suggests that a community of 18 people, representing three or four farms, might ordinarily see burial at the rate of 50 every 100 years. On this basis, he suggested that the 102 burials at Capel Eithin represented burial over 200 years, by a community of 17. It is unfortunate that we have no clear idea of the number of burials at either Brownslade or Angle. On the available evidence it would seem that Brownslade was less intensively used than Angle, and perhaps over a longer period of time, suggesting it served a smaller community.

But where were the communities? In Ireland, dual domestic/cemetery enclosures are widespread, and may be represented at Angle. However, they have yet to be recognised in the rest of Britain where, with the possible exception of Mawgan Porth, and Caerwent which served continuing settlement within the Roman town, no cemetery-using settlements have clearly been identified. Indeed, it has been suggested that cemeteries were, in general, isolated features in the landscape of early medieval Britain, and deliberately located away from settlements. However, the possibility exists that settlements lie just beyond them, but have yet to be recognised.

It is probable that the large rectangular enclosure at West Angle Bay indicates settlement, possibly before burial commenced. The hearth/corn dryer is one of a number that have been recently recognised in early medieval contexts in Pembrokeshire, as for example at South Hook where a domestic settlement, associated with iron-smelting furnaces, quernstones and corn dryers, has been dated to the ninth/eleventh century (Crane and Murphy 2010), and Newton, a few kilometres to the east (Crane 2004). A similar enclosure at Capel Maelog likewise appeared to have been the primary feature of the site (fourth/fifth

century). It is thought to have become disused prior to the establishment of the cemetery, which however was referenced on it (Britnell 1990, 82–3). Domestic activity may similarly have ceased before burial at West Angle Bay. The quernstones and fragment of a bone comb from Brownslade are indicative of settlement nearby, though none has been identified. However, sixth/seventh-century E-ware (probably originating from west or north-west France), and metalwork of similar date, have been found about one kilometre to the west, in Linney Burrows, and were perhaps derived from a high-status, undefended site, similar to Longbury Bank, near Tenby, Pembrokeshire (Campbell and Lane 1993, 66, 70). The evidence for metalworking at Brownslade cannot be dated, but similar activity was suggested on or near the cemetery at Cannington, Somerset (Rahtz *et al.* 2000), and possibly at Filton (Cullen *et al.* 2005)

Of interest is the coastal promontory fort recently recognised just beyond the West Angle Bay site. A similar association exists between the promontory fort at Great Castle Head, Pembrokeshire, and the Longoar Bay cemetery. Occupation at a number of similar forts in Pembrokeshire extended into the late Roman period and, elsewhere in west Wales, is suggested to have continued into the early medieval period, for example at Coygan Camp, Carmarthenshire (Edwards and Lane 1988, 45–6).

Wales was introduced to Christianity during the fourth century. It had persisted into the post-Roman period in the Romanised south-east, and is thought to have spread westwards during the fifth century (cf. Arnold and Davies 2000, 132, 181). The evidence suggests that in west Wales, dated burial sites have their *floruit* from the fifth century onwards and may therefore be almost exclusively a product of Christianity.

Burial practice at Brownslade and West Angle Bay can be regarded as typical of south-west Wales. Its closest cultural links appear to be with Cornwall and south-west England. As in Cornwall, Pembrokeshire cists have a pronounced western, and coastal distribution. This has been regarded as significant in relation to the documented fourth/fifth-century settlement of both areas by the *Déisi* from the Waterford district, and the *Uí Líatháin* from Cork (James 1987; O'Brien 1999; Ó Cróinín 1995, 18). It also overlaps with the distribution of fifth/seventh-century ogam inscriptions, and/or stones with Irish names (O'Brien 1999, 27).

However, this coastal bias may largely be due to the availability of suitable stone (see Preston-Jones 1984, 169–177). While a number of Cornish early medieval inscribed stones also feature Irish inscriptions (O'Brien 1999, 27), cist burial here is likewise attributed to the persistence of Romano-British tradition (Preston-Jones *op. cit.*), exemplified by the presence of Roman-period long-cists on the Isles of Scilly (Ashbee 1955, 1–25). Cist burial in Scotland—where it is concentrated within 'British' Gododdin, and has been observed in possible Roman-period contexts (Proudfoot 1996, 443)—appears similarly to be a continuation of existing practice.

Cist burial in Ireland, adopted in the immediate post-Roman period, is therefore thought to result from influence from Britain (O'Brien 1992; 1999), while it is generally agreed that Christianity itself was introduced to Ireland through contact with Wales and Cornwall (*ibid.*). Cist distribution, moreover, is concentrated in east central Ireland, rather than on the Irish Sea coast. And Irish burial was undertaken in a very different environment from that within Britain, its defining characteristics being the continued use of ancestral, pagan cemeteries and/or burial within domestic settlement sites.

ACKNOWLEDGEMENTS

Gwilym Hughes, Neil Ludlow, Pete Crane and Polly Groom supervised the Brownslade excavations and were assisted by other staff from the Dyfed Archaeological Trust, by volunteers and by students of the Department of Archaeology, University of Cardiff. The excavations were funded by MoD Defence

Estates. Many thanks are due to MoD and Defence Estate staff for enabling the smooth running of the excavation, notably: Lt Colonel Rogers (Estate Commandant), Nicky Rogers and Lisa Payne (MoD Defence Estates), Martin Brown (Archaeological Advisor for Defence Estates) and Roger Woods and John Prior (Landmarc Support Services Ltd).

Cadw grant-aided the West Angle Bay excavations with additional support from the Pembrokeshire Coast National Park Authority, PLANED and Cardiff University. Neil Ludlow and Duncan Schlee supervised the excavations with the assistance of other Dyfed Archaeological Trust staff and of Polly Groom, the Pembrokeshire Coast National Park Archaeologist. Local volunteers and students from the Department of Archaeology, University of Cardiff undertook a much of the fieldwork. Many thanks are due to John Allen-Mirehouse for allowing the excavations to take place.

Ros Coard and Alison Sables, who undertook the Brownslade bone analysis, would like to thank to Professor Andrew T. Chamberlain for comments and notes on the pathology of the Brownslade population.

Hubert Wilson of Dyfed Archaeological Trust undertook site surveying and produced the illustrations for this report. Katie Hemer carried out the isotopic analysis on the bones as part of her PhD research (funded by AHRC and NERC) and kindly wrote the summaries of her work incorporated in this paper. John Davies kindly identified the geology of the Brownslade quernstones.

Polly Groom, Neil Ludlow and Ken Murphy edited the interim reports of the excavations and produced this final paper.

NOTES

1. All of or formerly of the School of Archaeology, History and Anthropology, University of Wales Trinity St David, Lampeter, Ceredigion SA48 7ED.
2. Department of Archaeology, University of Sheffield, Western Bank, Sheffield S10 2TN.
3. 20 Lytton Rd., Clarendon Park, Leicester LE2 1WJ.
4. GeoArch, Unit 6, Western Industrial Estate, Caerphilly, CF83 1BQ.
5. Sawmills House, Castellau, Llantrisant, Mid Glamorgan CF72 8LQ.
6. Department of Archaeology, University of Reading, Whiteknights, PO Box 217, Reading, Berkshire RG6 6AH.
7. A combined report by K Hemer on the Brownslade and West Angle Bay isotope analysis is provided below.
8. See note 7.
9. Arfryn, (Hedges forthcoming; see White 1971–2); Bardsey, Gwynedd (Arnold 2001); Capel Eithin, Anglesey (White and Smith 1999); Tywyn-y-capel, Anglesey (Davidson 2009); Tanderwen, Denbighshire (Brassil *et al.* 1991); Capel Maelog, Powys (Britnell 1990); Four Crosses, Powys (Warrilow *et al.* 1986); Pennant Melangell, Powys (Britnell 1994); Atlantic Trading Estate, Glamorgan (Newman 1985; Newman and Parkin 1986; Price 1987); Llandough, Glamorgan (Holbrook and Thomas 2005); Caerwent Eastgate, Monmouthshire (Campbell and MacDonald 1993).
10. Mawgan Porth (Ashbee 1997); Tintagel churchyard (Nowakowski and Thomas 1990; 1992).
11. Brean Down (Bell 1990); Cannington (Rahtz *et al.* 2000); Henley Wood (Watts and Leach 1996); Stoneage Barton (Webster and Brunning 2004); Filton (Cullen *et al.* 2005).
12. Cat Stane, Midlothian (Cowie 1978); Hallow Hill, Fife (Proudfoot 1996); Lasswade, Midlothian (Henshall 1955–56); Longniddry, East Lothian (Dalland 1992).
13. St Patrick's Isle (O'Brien 1999, 31).

BIBLIOGRAPHY

- Alcock, L., 1963. *Dinas Powys* (Cardiff: University of Wales Press).
- Alcock, E., 1992. 'Burials and cemeteries in Scotland', in Edwards and Lane 1992 (eds), 125–9.
- Ambrose, S. H., 1990. 'Preparation and characterization of bone and tooth collagen for isotopic analysis', *Journal of Archaeological Science* 17, 431–51.
- Arnold, C. J., 2001. 'Excavation of 'Ty Newydd', Ynys Enlli (Bardsey Island), Gwynedd', *Archaeologia Cambrensis* 147, 96–132.
- Arnold, C. J. and Davies, J. L., 2000. *Roman and Early Medieval Wales* (Stroud: Sutton Publishing).
- Ashbee, P., 1955. 'The excavation of a cist-grave cemetery and associated structures near Hughtown, St Mary's, Isles of Scilly, 1949–50', *Archaeological Journal* 111, 1–25.
- 1997. 'The burial ground', in R. J. Taylor, *Mawgan Porth: A settlement of the late Saxon period on the north Cornish coast, excavations 1949–52, 1954 and 1974*, English Heritage Archaeological Report 13.
- Ashley-Montagu, M. F., 1937. 'The medio-frontal suture and the problem of metopism in Primates', *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 67, 157–201.
- Aufdehde, A. C. and Rodríguez-Martín, C., 1998. *The Cambridge Encyclopaedia of Human Palaeopathology* (Cambridge: Cambridge University Press).
- Badger, A. B., and Green, F., 1925. 'The chapel traditionally attributed to St Patrick, Whitesand Bay, Pembrokeshire', *Archaeologia Cambrensis* 80, 87–120.
- Barrett, J. H. and Richards, M., 2004. 'Identity, gender, religion and economy: new isotope and radiocarbon evidence for marine resource intensification in early historic Scotland', *European Journal of Archaeology* 73, 249–71.
- Bass, W. M., 1995. *Human Osteology: a laboratory and field manual*, Special Publication No. 2 (Columbia: Missouri Archaeology Society).
- Bell, M., 1990. *Brean Down excavations 1983–1987* (London: English Heritage).
- Benson, D. G., Evans, J. G., and Williams, G. H., 1990. 'Excavations at Stackpole Warren, Dyfed', *Proceedings of the Prehistoric Society* 56, 179–246.
- Boake, E. J., 1926. 'Report on the excavation of the chapel of St Justinian, St David's', *Archaeologia Cambrensis* 81, 381–94.
- Bogaard, A., Heaton, T. H. E., Poulton, P. and Merbach, I., 2007. 'The impact of manuring on nitrogen isotope ratios in cereals: archaeological implications for reconstruction of diet and crop management practices', *Journal of Archaeological Science* 34, 335–43.
- Brassil, K. S., Owen, W. G. and Britnell, W. J., 1991. 'Prehistoric and early medieval cemeteries at Tandderwen, near Denbigh, Clwyd', *Archaeological Journal* 148, 46–97.
- Brettell, R., Montgomery, J. and Evans, J. 2012. 'Brewing and stewing: the effect of culturally mediated behaviour on the oxygen isotope composition of ingested fluids and the implications for human provenance studies', *Journal of Analytical Atomic Spectroscopy* 27 (5), 778–85 (DOI: 10.1039/C2JA10335D).
- Britnell, W. J., 1990. 'Excavations at the early medieval church of Capel Maelog, Llandrindod Wells, Powys, 1986–87', *Medieval Archaeology* 34, 27–96.
- 1994. 'Excavation and recording at Pennant Melangell Church', *Montgomeryshire Collections* 82, 41–102.
- Brock, F., Higham, T. and Bronk Ramsey, C., 2010. 'Pre-screening techniques for identification of samples suitable for radiocarbon dating of poorly preserved bones', *Journal of Archaeological Science* 37, 855–65.

- Brown, T. A., Nelson, D. E., Vogel, J. S. and Southon, J. R., 1988. 'Improved collagen extraction by modified Longin method', *Radiocarbon* 30, 171–7.
- Budd, P., Chenery, C., Montgomery, J., Evans, J. A. and Powlesland, D., 2003. 'Anglo-Saxon residential mobility at West Heslerton, North Yorkshire, UK from combined O- and Sr-isotope analysis', in J. G. Holland and S. D. Tanner (eds), *Plasma Source Mass Spectrometry: theory and applications* (Cambridge: Royal Society of Chemistry), 195–208.
- Budd, P., Millard, A., Chenery, C., Lucy, S. and Roberts, C., 2004. 'Investigating population movement by stable isotope analysis: a report from Britain', *Antiquity* 78 (299), 127–141.
- Campbell, E., 2007. *Continental and Mediterranean Imports to Atlantic Britain and Ireland, AD 400–800* CBA Research Report 157 (York: Council for British Archaeology).
- Campbell, E., and Lane, A., 1993. 'Excavation at Longbury Bank, Dyfed, and early medieval settlement in South Wales', *Medieval Archaeology* 37, 15–77.
- Campbell, E., and MacDonald, P., 1993. 'Excavations at Caerwent Vicarage Orchard Garden 1973: an extra-mural post-Roman cemetery', *Archaeologia Cambrensis* 142, 74–98.
- Carruthers, W. J., 2000. 'The mineralised plant remains', in A. J. Lawson and C. J. Gingell, *Potterne 1982–5: animal husbandry in later prehistoric Wiltshire*, Wessex Archaeological Report 17, 72–84, 91–95.
- 2010a. 'The plant remains', in C. Harding, E. Marlow-Mann and S. Wrathmell, *The Post-Medieval Farm and Vicarage Sites. Wharram: a study of settlement on the Yorkshire Wolds, XII*, York University Archaeological Publications 14, 287–313.
- 2010b. 'Charred plant remains', in Crane and Murphy 2010, 163–81.
- Caseldine, A. E., 2002. 'Environmental and archaeobotanical evidence', in P. Crane, 'Iron Age promontory fort to medieval castle? Excavations at Great Castle Head, Dale, Pembrokeshire 1999', *Archaeologia Cambrensis* 148, 118–28.
- Caseldine, A. E., and Griffiths, C. G., 2004. 'Palaeo-environmental evidence from the corn drying kilns', in P. Crane, 'Excavations at Newton, Llanstadwell, Pembrokeshire', *Archaeology in Wales* 44, 14–17.
- 2006. 'The charred plant remains from the cemeteries. Excavations at West Angle, Pembrokeshire', unpublished report prepared for Dyfed Archaeological Trust.
- Caseldine, A. E., and Holden, T. G., 1998. 'The carbonised plant remains', in G. Williams and H. Mytum, *Llawhaden, Dyfed: excavations on a group of small defended enclosures, 1980–4*, British Archaeological Reports, British Series 275 (Oxford), 105–17.
- Chenery, C., Müldner, G., Evans, J., Eckardt, H. and Lewis, M., 2010. 'Strontium and stable isotope evidence for diet and mobility in Roman Gloucester, UK', *Journal of Archaeological Science* 37, 150–63.
- Ciaraldi, M., 2012. 'Charred plant remains', in R. Cuttler, A. Davidson and G. Hughes, *A Corridor Through Time: the Archaeology of the A55 Anglesey Road Scheme* (Oxbow Books: Oxford), 222–42.
- Coard, R., 2003. 'Unstratified Human remains from Brownslade Barrow, Castlemartin, Pems', unpublished report prepared for Dyfed Archaeological Trust and Defence Estates.
- 2006. 'Interim report of the animal remains from Brownslade Barrow, (56592), Castlemartin Range, South Pembrokeshire', unpublished report prepared for Dyfed Archaeological Trust and Defence Estates.
- 2010. 'A report of the West Angle Bay human skeletal remains', unpublished report for Dyfed Archaeological Trust by the School of Archaeology History and Anthropology, University of Wales, Trinity Saint David.

- Coard, R. and Sables, A., 2006. 'Human skeletal remains assessment report. Brownslade Barrow, (56592) Castlemartin, Pembrokeshire', unpublished report prepared for Dyfed Archaeological Trust and Defence Estates.
- 2007. 'Technical summary of the human skeletal remains, Brownslade Barrow, (56592), Castlemartin, Pembrokeshire, Wales', unpublished report prepared for Dyfed Archaeological Trust and Defence Estates.
- Cowie, T., 1978. 'Excavations at the Catstane, Midlothian', *Proceedings of the Society of Antiquaries of Scotland* 109, 166–201.
- Crane, P., 2004. 'Excavations at Newton, Llanstadwell, Pembrokeshire', *Archaeology in Wales* 44, 3–31.
- Crane, P., and Murphy, K., 2010. 'An early medieval settlement, iron smelting site and crop processing complex at the South Hook, Herbranston, Pembrokeshire', *Archaeologia Cambrensis* 159, 117–95.
- Cullen, K., Holbrook, N., Watts, M., Caffell, A. and Holst, M., 2005. 'A post-Roman cemetery at Hewlett Packard, Filton, South Gloucestershire: Excavations in 2005', unpublished report, Cotswold Archaeology.
- Dalland, M., 1992. 'Long cist burials at Four Winds, Longniddry, East Lothian', *Proceedings of the Society of Antiquaries of Scotland*, 122, 197–206.
- Darling, W. G., 2004. 'Hydrological factors in the interpretation of stable isotopic proxy data present and past: a European perspective', *Quaternary Science Reviews* 23, 743–70.
- Darling, W. G., Bath, A. H. and Talbot, J. C., 2003. 'The O & H stable isotopic composition of fresh waters in the British Isles 2: Surface waters and groundwater', *Hydrology and Earth System Sciences* 7, 183–95.
- Davidson, A., 2009. 'Excavations at Tywyn y Capel, Trearddur Bay, Anglesey, 1997 and 2002–03', *Archaeologia Cambrensis* 158, 167–223.
- Davies, J. C. (ed.), 1946. *Episcopal Acts relating to the Welsh Dioceses 1066–1272*, Vol. 1 (Cardiff: Historical Society of the Church in Wales).
- Davies, V., 2008. 'Activity pattern reconstruction and a socio-economic interpretation of a sample of the sub-Roman population, of Brownslade, Pembrokeshire', unpublished BA dissertation, University of Wales, Lampeter.
- DeNiro, M. J., 1985. 'Postmortem preservation and alteration of in vivo bone collagen isotope ratios in relation to palaeodietary reconstruction', *Nature* 317, 806–9.
- Edwards, N., 2001. 'Early Medieval inscribed stones and stone sculpture in Wales: context and function', *Medieval Archaeology* 45, 15–39.
- Edwards, N., 2007. *A Corpus of Early Medieval Inscribed Stones and Stone Sculpture in Wales, Vol. 2, South-West Wales* (Cardiff: University of Wales Press).
- Edwards, N. and Lane, A., 1988. *Early Medieval Settlements in Wales AD 400–1100* (Bangor and Cardiff: University of Wales).
- Edwards, N. and Lane, A. (eds.), 1992. *The Early Church in Wales and the West*, Oxbow Monograph 16 (Oxford).
- Edwards, N., Lane, A., Bapty, I., and Redknap, M., 2005. 'Early medieval Wales: a framework for archaeological research', *Archaeology in Wales* 45, 33–46.
- Evans, J., Chenery, C.A., Fitzpatrick, A.P., 2006. 'Bronze Age childhood migration of individuals near Stonehenge, revealed by strontium and oxygen isotopes tooth enamel analysis', *Archaeometry* 48, 309–321.
- Evans, J. A., Chenery, C. A., Montgomery, J., 2012. 'Summary of strontium and oxygen isotope variation in archaeological human tooth enamel excavated from Britain', *Journal of Analytical Atomic Spectrometry* 27 (5), 754–64 (DOI: 10.1039/C2JA10362A).

- Evans, J. A., Montgomery, J., Wildman, G. and Boulton, N., 2010. 'Spatial variation in biosphere $^{87}\text{Sr}/^{86}\text{Sr}$ in Britain', *Journal of the Geological Society* 167, 1–4.
- Evans, J. G., 1972. *Land Snails in Archaeology* (London and New York: Seminar Press).
- Farwell, D. E. and Molleson, T. I. (eds.), 1993. *Poundbury, Volume Two: the Cemeteries*, Dorset Natural History and Archaeological Society Monograph Series 11 (Dorchester).
- Fenton, R., 1811. *A Historical Tour through Pembrokeshire* (London).
- Fox, C., 1926. 'A Bronze Age barrow on Kilpaison Burrows, Rhoscrowther, Pembrokeshire', *Archaeologia Cambrensis* 81, 1–25.
- Fulford, M., 1989. 'Byzantium and Britain: a Mediterranean perspective on post-Roman Mediterranean imports in western Britain and Ireland', *Medieval Archaeology* 33, 1–6.
- Gaynor, K., 2006. 'The vegetation of Irish Machair', *Biology and Environment: Proceedings of the Royal Irish Academy* 106 (3), 311–21.
- Gilchrist, R., and Sloane, B., 2005. *Requiem: the medieval monastic cemetery in Britain* (London: MoLAS and English Heritage).
- Hawkey, D., and Merbs, C., 1995. 'Activity-induced musculoskeletal stress markers (MSM) and subsistence strategy changes among ancient Hudson Bay Eskimos', *International Journal of Osteoarchaeology* 5, 324–38.
- Heard, H., 2006. 'West Angle Bay, Pembrokeshire', unpublished report, Stratascan.
- Hedges, J., forthcoming. 'The excavation of an enclosed settlement of the Middle Bronze Age and an early medieval cemetery at Arfryn, Bodedern, Anglesey'.
- Hedges, R. E. M and Reynard, L. M., 2007. 'Nitrogen isotopes and the trophic level of humans in archaeology', *Journal of Archaeological Science* 34, 1240–51.
- Hemer, K. A., 2007. 'A biocultural approach to health and diet in early medieval Wales', unpublished MA thesis, Department of Archaeology, University of Sheffield.
- 2010. 'In the realm of saints: a reconstruction of life and death in early medieval Wales and the Isle of Man', unpublished PhD thesis, University of Sheffield.
- Henshall, A., 1955–56. 'A long cist cemetery at Parkburn Sand Pit, Lasswade, Midlothian', *Proceedings of the Society of Antiquaries of Scotland* 89, 252–83.
- Higgins, L. S., 1933. 'An investigation into the problem of the sand dune areas on the south Wales coast', *Archaeologia Cambrensis* 88, 26–67.
- Hillman, G., 1981. 'Reconstructing crop husbandry practices from charred remains of crops', in R. Mercer (ed.), *Farming Practice in British Prehistory* (Edinburgh: Edinburgh University Press), 123–62.
- 1982. 'Crop husbandry at the medieval farmstead, Cefn Graeanog: reconstructions from charred plant remains', in R. S. Kelly, 'The excavation of a medieval farmstead at Cefn Graeanog, Clynnog, Gwynedd', *Bulletin of the Board of Celtic Studies* 29, 901–07.
- Hillson, S., 1996. *Dental Anthropology* (3rd edn, Cambridge: Cambridge University Press).
- Holbrook, N., and Thomas, A., 2005. 'An early medieval monastic cemetery at Llandough, Glamorgan: excavations in 1994', *Medieval Archaeology* 49, 1–92.
- Holloway, J., 2010. 'Material symbolism and death: charcoal burial in later Anglo-Saxon England', in J. Buckberry and A. Cherryson (eds), *Burial in Later Anglo-Saxon England c. 650–1100 AD* (Oxford: Oxbow Books), 83–92.
- Hubbard, C. E., 1968. *Grasses* (2nd edn, Harmondsworth: Penguin Books).
- Hughes, G., Ludlow, N., Groom, P., and Crane, P., 2007. 'Brownslade Barrow, Castlemartin, Pembrokeshire: archaeological survey and excavation 2002–2006 – phase 4: interim report', unpublished report, Dyfed Archaeological Trust.

- Jack, R. I., 1988. 'Wales and the Marches', in H. E. Hallam (ed.), *The Agrarian History of England and Wales: Volume II, 1042–1350* (Cambridge: Cambridge University Press), 412–96.
- Jacomets, S., 1987. *Prehistorische getreidefunde* (Basel: Botanisches Institute der Universität).
- 2006. *Identification of Cereal Remains from Archaeological Sites*, Archaeobotany Laboratory, IPAS, Basel University (Basel).
- James, H., 1987. 'Excavations at Caer, Bayvil, 1979', *Archaeologia Cambrensis* 136, 51–76.
- 1994. 'The archaeology of early Christianity in Cardiganshire', in J. L. Davies and D. P. Kirby (eds), *Cardiganshire County History, Volume 1, From the earliest of times to the coming of the Normans*, 397–406 (Cardiff).
- 2007. 'The geography of the cult of St David: a study of dedication patterns in the medieval diocese', in J. W. Evans and J. M. Wooding (eds) *St David of Wales: Cult, Church and Nation* (Woodbridge: Boydell and Brewer), 41–83.
- Jørkov, M. L. S., Heinemeier, J. and Lynnerup, N., 2009. 'The petrous bone – a new sampling site for identifying early dietary patterns in stable isotopic studies', *American Journal of Physical Anthropology* 138, 199–209.
- Kissock, J., 1996. 'An early church and medieval farmstead site: excavations at Llanellen, Gower', *Archaeological Journal* 153, 104–47.
- 1997. '“God made nature and men made towns”: post-conquest and pre-conquest villages in Pembrokeshire', in N Edwards (ed.), *Landscape and Settlement in Medieval Wales*, Oxbow Monograph 81 (Oxford), 123–37.
- Laws, E., 1882. 'A lost church', *Archaeologia Cambrensis*, 4th ser., 13, 49, 51–8.
- 1888. *Little England beyond Wales* (London).
- Loe, L., and Robson-Brown, K., 2005. 'Summary report on the human skeletons', in Holbrook and Thomas 2005 (eds), 1–92.
- Longin, R., 1971. 'New method of collagen extraction for radiocarbon dating', *Nature* 230, 241–2.
- Longley, D., 2001. 'Early medieval cemetery', in F Lynch and C. Musson, 'A prehistoric and early medieval complex at Llandegai, near Bangor, North Wales: Excavations directed by C. Houlder 1966–67', *Archaeologia Cambrensis* 150, 17–142.
- Ludlow, N., 2000. 'St Cristiolus' churchyard, Eglwysrwr, Pembrokeshire: a post-conquest cist cemetery, *Archaeologia Cambrensis* 149, 20–48.
- 2002. 'Brownslade Barrow, Castlemartin, Pembrokeshire: topographic and geophysical survey, April-May 2002', unpublished report, Dyfed Archaeological Trust.
- 2003a. 'The early medieval ecclesiastical sites project: Pembrokeshire', unpublished report, Dyfed Archaeological Trust.
- 2003b. 'Brownslade Barrow, Castlemartin, Pembrokeshire: archaeological evaluation, April-May 2003', unpublished report, Dyfed Archaeological Trust.
- 2004a. 'The early medieval ecclesiastical sites project: Carmarthenshire', unpublished report, Dyfed Archaeological Trust.
- 2004b. 'The early medieval ecclesiastical sites project: Ceredigion', unpublished report, Dyfed Archaeological Trust.
- 2005a. 'The Pembrokeshire Cemeteries Project, 2005', unpublished report, Dyfed Archaeological Trust Report No. 2005/128.
- 2005b. 'Longoar Bay, St Ishmael's, Pembrokeshire: Archaeological Evaluation, 2005', unpublished report, Dyfed Archaeological Trust Report No. 2005/24.
- Mabey, R., 1972. *Food for Free* (London: Collins).
- MacManus, D., 1991. *A Guide to Ogham* (Maynooth: An Sagart).

- Mason, S. and Hather, J., 2000. 'Parenchymatous plant remains', in S. Mithen, *Hunter-Gatherer Landscape Archaeology. The Southern Hebrides Mesolithic Project 1988–98. Vol. 2: Archaeological fieldwork on Colonsay, computer modelling, experimental archaeology, and final interpretations*, McDonald Institute Monograph, 415–25.
- Moffett, L., 1991. 'Plant economy at Burton Dassett, a deserted medieval village in south Warwickshire', Ancient Monuments Laboratory Report 111/91 (English Heritage).
- Montgomery, J., 2002. 'Lead and strontium isotope compositions of human dental tissues as an indicator of ancient exposure and population dynamics', unpublished PhD thesis, University of Bradford.
- Montgomery, J. and Evans, J.A., 2006. 'Immigrants on the Isle of Lewis—combining traditional funerary and modern isotope evidence to investigate social differentiation, migration and dietary change in the Outer Hebrides of Scotland', in R. Gowland and C. Knüsel (eds), *Social Archaeology of Funerary Remains* (Oxford: Oxbow), 122–42.
- Montgomery, J., Evans, J. A. and Chenery, C., 2009. 'Oxygen and strontium isotopes', in M. O. H. Carver, H. Hills and J. Scheschkewitz (eds), *Wasperton: A Roman, British and Anglo-Saxon Community in Central England* (Woodbridge: Boydell Press), 46–7.
- Montgomery, J., Evans, J. A. and Cooper, R. E., 2007. 'Resolving archaeological populations with Sr-isotope mixing models', *Applied Geochemistry* 22, 1502–14.
- Müldner G., Chenery C. and Eckardt, H., 2010. 'The 'Headless Romans': multi-isotope investigations of an unusual burial ground from Roman Britain', *Journal of Archaeological Science* 38, 280–90.
- Murphy, K., 1987. 'Excavations at Llanychlydog Church, Dyfed', *Archaeologia Cambrensis* 136, 77–93.
- 1992. 'Plas Gogerddan, Dyfed: A multi-period burial and ritual site', *Archaeological Journal* 149, 1–38.
- Murphy, K., and Williams, G., 1992. 'Gazetteer of Iron Age burials in Wales', in Murphy 1992, 30–5.
- Newman, R., 1985. 'Atlantic Trading Estate, Barry', *Archaeology in Wales* 25, 37–8.
- Newman, R., and Parkin, L., 1986. 'Atlantic Trading Estate, Barry', *Archaeology in Wales* 26, 55.
- Nowakowski, J. A. and Thomas, C., 1990. *Excavations at Tintagel Parish Churchyard, Cornwall, Spring 1990* (Cornwall Archaeological Unit/Institute of Cornish Studies).
- 1992. 'Tintagel churchyard excavations 1991', *Cornish Archaeology* 31, 131–4.
- O'Brien, E., 1992. 'Pagan and Christian burial in Ireland during the first millennium AD: continuity and change', in Edwards and Lane 1992 (eds), 130–7.
- 1999. *Post-Roman Britain to Anglo-Saxon England: Burial Practices Reviewed*, British Archaeological Reports, British Series 289 (Oxford).
- Ó Cróinín, D., 1995. *Early Medieval Ireland 400–1200* (New York: Longman).
- O'Neil, J. R., Roe, L. J., Reinhard, E. and Blake, R. E., 1994. 'A rapid and precise method of oxygen isotope analysis of biogenic phosphate', *Israel Journal of Earth Science* 43, 203–12.
- Page, M. R., 2011. 'Ble mae'r babanod? (Where are the babies?): infant burial in early medieval Wales', in M. Lally and A. Moore (eds), *(Re)Thinking Little Ancestors: New Perspectives on the Archaeology of Infancy and Childhood*, British Archaeological Reports, International Series 2271 (Oxford), 100–9.
- Petts, D. A., 2000. 'Burial and religion in sub-Roman and early medieval Britain, AD 400–800', unpublished PhD thesis, Reading University.
- 2002. 'Burials and boundaries in early medieval western Britain', in S Lucy and A. Reynolds (eds), *Burial in Early Medieval England and Wales*, Society for Medieval Archaeology Monograph 17.
- Pollard, A. M., Pellegrini, M. and Lee-Thorpe, J. A., 2011. 'Technical note: some observations on the conversion of dental enamel $^{18}\text{O}_\text{p}$ Values to $^{18}\text{O}_\text{w}$ to determine human mobility', *American Journal of Physical Anthropology* 145, 499–504.

- Preston-Jones, A., 1984. 'The excavation of a long-cist cemetery at Carnanton, St Mawgan, 1943', *Cornish Archaeology* 23, 157–77.
- Price, C., 1987. 'Atlantic Trading Estate, Barry', *Archaeology in Wales* 27, 60–1.
- Proudfoot, E., 1996. 'Excavations at the long cist cemetery on the Hallow Hill, St Andrews, Fife, 1975–7', *Proceedings of the Society of Antiquaries of Scotland* 126, 387–454.
- Rahtz, P., 1977. 'Late Roman cemeteries and beyond', in R. Reece (ed.), *Burial in the Roman World*, CBA Research Report 22 (London: Council for British Archaeology), 53–64
- Rahtz, P., Hirst, S., and Wright, S., 2000. *Cannington Cemetery*, Britannia Monograph Series 17 (London).
- Redknap, M., 2000. *Vikings in Wales. An archaeological quest* (Cardiff: National Museum of Wales).
- Redknap, M., and Horák, J., 2004. 'The quernstone', in P. Crane, 'Excavations at Newton, Llanstadwell, Pembrokeshire', *Archaeology in Wales* 44, 14.
- 2010. 'Prehistoric and early medieval worked stone', in Crane and Murphy 2010, 152–8.
- RCAHMW 1925. *An Inventory of the Ancient Monuments of Wales and Monmouthshire VII. County of Pembroke*, Royal Commission on the Ancient and Historical Monuments and Constructions of Wales and Monmouthshire (London: HMSO).
- Roberts, C. A., and Cox, M., 2003. *Health and Disease in Britain: prehistory to the present* (Gloucester: Sutton Publishing).
- Rodwell, J. S., 1991. *British Plant Communities. Volume 1, Woodlands and Scrub* (Cambridge: Cambridge University Press).
- Scheuer, L., and Black, S., 2000. *Developmental Juvenile Osteology* (London: Academic Press).
- Schlee, D., 2006. 'The Pembrokeshire cemeteries project, West Angle Bay interim report', unpublished report, Dyfed Archaeological Trust Report No. 2006/119.
- 2008. 'The Pembrokeshire cemeteries project. Excavations at West Angle Bay 2005–6', unpublished report, Dyfed Archaeological Trust Report No. 2008/34.
- 2010. 'West Angle Bay, Pembrokeshire: Arfordir excavation 2010', unpublished report, Dyfed Archaeological Trust Report No. 2010/58.
- Schlesinger, A. and Walls, C., 1995. 'Excavations at Llanelen, Llanrhidian: an early church and medieval farmstead site', *Gower* 46, 58–79.
- Schoch, W., Heller, I., Schweingruber, F. H. and Kienast, F., 2004. *Wood Anatomy of Central European Species* (available online at www.woodanatomy.ch).
- Schoch, W. H., Pawlik, B. and Schweingruber, F. H., 1988. *Botanical macro-remains* (Berne and Stuttgart: Paul Haupt).
- Schweingruber F. H., 1978. *Microscopic Wood Anatomy* (Birmensdorf: Swiss Federal Institute for Forest, Snow and Landscape Research).
- Sealy, J., Armstrong, R. and Schrire, C., 1995. 'Beyond lifetime averages – tracing life histories through isotopic analysis of different calcified tissues from archaeological human skeletons', *Antiquity* 69, 290–300.
- Smalley, R., 2008. 'West Angle Bay', unpublished report, Stratascan.
- Smith, C., 1987. 'Excavations at the Ty Mawr hut-circles, Holyhead, Anglesey. Part IV: chronology and discussion', *Archaeologia Cambrensis* 86, 20–38.
- Stace, C., 1995. *New Flora of the British Isles* (Cambridge: Cambridge University Press).
- Thomas, C., 1959. 'Imported pottery in dark-age western Britain', *Medieval Archaeology* 3, 89–111.
- Van der Veen, M., 1992. *Crop Husbandry Regimes: An Archaeobotanical Study of Farming in Northern England, 1000 BC–AD 500*, Sheffield Archaeological Monographs 3.
- Van Klinken, G. J., 1999. 'Bone collagen quality indicators for palaeodietary and radiocarbon measurements', *Journal of Archaeological Science* 26, 687–95.

- Waldron, T., 1985. 'DISH at Merton Priory: evidence for a new occupational disease?' *British Medical Journal* 291,1762–3.
- 2006. 'Nutrition and the skeleton', in C. M. Woolgar, D. Serjeantson and T. Waldron (eds), *Food in Medieval England. Diet and nutrition* (Oxford: Oxford University Press).
- Warrilow, W., Owen, G. and Britnell, W., 1986. 'Eight Ring-ditches at Four Crosses, Llandysilio, Powys; 1981–85', *Proceedings of the Prehistoric Society* 52, 53–87.
- Watts, L. and Leach, P., 1996. *Henley Wood, Temples and Cemetery: excavations 1962–69 by the late Ernest Greenfield and others*, CBA Research Report 99 (York: Council for British Archaeology).
- Webster, C. J., and Brunning, R. A., 2004. 'A seventh-century AD cemetery at Stoneage Barton Farm, Bishop's Lydeard, Somerset, and square-ditched burials in post-Roman Britain', *Archaeological Journal* 61, 54–81.
- White, R. B., 1971–72. 'Excavations at Arfryn, Bodedern: long-cisted cemeteries and the origins of Christianity in Britain', *Transactions of the Anglesey Antiquarian Society* (1971–72), 19–51.
- White, S. I. and Smith, G., 1999. 'A funerary and ceremonial centre at Capel Eithin, Gaerwen, Anglesey: excavations of Neolithic, Bronze-Age, Roman and early medieval features in 1980 and 1981' *Transactions of the Anglesey Antiquarian Society* (1999), 1–166.
- Wilkinson, J. L., 2001. 'Analysis of skeletal remains', in, T. James (ed.) *Excavations at Carmarthen Greyfriars, 1983–1997*, unpublished report, Dyfed Archaeological Trust.
- Williams, D., 1986. 'Plant macrofossils', in C. Smith, 'Excavations at the Ty Mawr hut circles, Holyhead, Anglesey, Part III: the finds', *Archaeologia. Cambrensis* 135, 64–8.
- Williams, H., 1998. 'Monuments and the past in early Anglo-Saxon England', *World Archaeology* 31, 90–108.
- Wooding, J. M., 1996. *Communication and Commerce along the Western Sealandes AD 400–800*, British Archaeological Reports, International Series 654 (Oxford).
- Woolf, A., 2007. 'The expulsion of the Irish from Dyfed', in K. Jankulak, T. O'Loughlin and J. Wooding (eds), *Ireland and Wales in the Middle Ages* (Dublin: Four Courts Press), 102–115.
- Young, T. P., 2006. 'Evaluation of archaeometallurgical residues from Brownslade, Castlemartin, Pembrokeshire', unpublished report, GeoArch Report 2006/16.
- 2010. 'Analysis of archaeometallurgical residues from Brownslade, Pembrokeshire [NPRN 94225]', unpublished report, GeoArch Report 2010/07.

*Published with the help of grant aid from Cadw, Welsh Government, and the Defence Estate,
Ministry of Defence*

