RE-ASSESSMENT OF THE ARCHIVE OF THE EXCAVATION OF A ROUNDHOUSE IN PEN-Y-DINAS HILLFORT, GREAT ORME, LLANDUDNO IN 1960

Project No. G1770

Report No. 823



Prepared for Cadw

August 2009

By George Smith With a report on the Vertebrate Remains by Deborah Jaques

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Cover: Pen-y-dinas from the air

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ILLUSTRATIONS

1 GAT Survey of Pen-y-dinas Hillfort 1993

1. INTRODUCTION

This work was carried out as part of a project for Cadw, in partnership with Conwy County Borough Council, aiming to improve education and visitor facilities for hillforts in Conwy. Pen-y-dinas is a Scheduled Ancient Monument (Cn 39) and is an unusual hillfort in that it lies on the coastal promontory of the Great Orme and very close to the Bronze Age copper mines there. Although the copper mines have not produced evidence of working after the Bronze Age but before new workings in the 17th century it has always been thought that there may have been exploitation in the Iron Age and Roman period. If this were true, then the hillfort might have had an important association with the mines. 19th century excavation of one roundhouse within the fort produced one piece of Roman Samian ware (Penrhos 841). The hillfort is also interesting because excavation in 1960 of another roundhouse produced butchered animal bones and marine shells and such dietary and economic evidence is rare in North Wales. These excavations in 1960 were not published and so it was proposed to carry out a re-assessment of the site archive and if possible to carry out new scientific analysis and radiocarbon dating of the finds and to produce drawings and a report suitable for publication. This would be useful for archaeology in the area generally and would provide improved interpretation of the site and information for visitors.

A preliminary report was produced in 2008 (GAT Rep. No. 744) before the scientific reports and dating were completed. This has now been revised to include the completed specialist reports and provides a final assessment based on all the presently available information.

2. DESKTOP STUDY

The excavation in 1960 was carried out by Peter Sirrett, who recorded the work and finds in good detail and completed a catalogue of the finds and produced a typed report on the work. The site archive of finds

and site records from the excavation was deposited with the landowner, Mostyn Estate Office in 1989. Later they were transferred to Llandudno Museum and an accession catalogue produced there. Copies of the report of the excavation and the list of finds produced by Mr Sirrett are also at the Historic Environment Record at Gwynedd Archaeological Trust (Appendix 1).

On enquiry it was found that Llandudno Museum only held the artefacts from the 1960 excavation with no paper records, drawings or photographs. Further enquiry with Conwy Archives, Mostyn Estate Office and the Flintshire Record Office (who hold most of the Mostyn Estate papers) did not produce any of these records. On studying the artefacts at Llandudno Museum it was found that when they were accessioned on a database at the museum in 1992 the few diagnostic finds, that is those that would be worth drawing and publishing, were not present. Further enquiry with the Mostyn Estate Office did not produce any sign of the missing items.

The excavator, Peter Sirrett, is retired and still living in Llandudno and was able to confirm that all the finds and site records were together when deposited with Mostyn Estate Office. However, it appears that Mostyn Estate Office and Llandudno Museum have both moved premises in the past and possibly been subject to flooding, so the possibility of separation or even discard of material is possible. The fact that the few finds that are missing are just the diagnostic pieces suggests that they were kept separately in a small box and so could easily have become mislaid. Unfortunately Mr Sirrett did not keep any copies of records or photographs of the site or finds.

There are now no other avenues to pursue and even though the missing material may still exist, unrecognised, it will only be found by chance and it is unlikely that any further advance will be made. However, there still exists the residue of the finds in the museum, mainly animal bones, which allow some new interpretation and radiocarbon dating. Permission was been given for this work by the Trustees of the Museum. The animal bones were studied by Deborah Jaques of Palaeoecology Research Services, Durham (Appendix 2) and one bovid long bone fragment was selected for radiocarbon dating. A piece of this bone was submitted to Beta Analytic Inc, Radiocarbon Dating Services, Florida, and a date successfully obtained (Appendix 3).

Acknowledgements

Thanks go to Peter Sirrett, Richard Lloyd Hughes (Llandudno Museum), Paul Mason (Flintshire Record Office), Richard Thomas (Mostyn Estate Office), Susan Ellis (Conwy Archives) and Sue and Dave Chapman (Ancient Arts). The re-assessment benefited by having a new, detailed survey plan of the fort completed by Peter Muckle for Gwynedd Archaeological Trust (Fig. 1).

3. THE 1960 EXCAVATION

The work in 1960 was carried out as a spare time project by Peter Sirrett with assistance from two members of the Llandudno Pier orchestra. The work was supervised by Prof. Albert Bentley of Keele University, a mining engineer, who arranged for the animal bones to be identified.

Mr Sirrett produced a short typed report on the excavations and a catalogue of the eighty finds (Appendix 1). The finds were all carefully 3 dimensionally recorded in relation to a base line across the house.

The roundhouse excavated was identified by Mr Sirrett as that numbered 34 on a survey of the hillfort made in 1993 by GAT (Muckle 1993) (Fig. 1). It lies at the east edge of the summit plateau, the largest of a group of six there. The three best preserved roundhouses, where stone walling is still visible are houses 13, 17 and 18. During the GAT survey in 1993 it was thought the excavated hut might have been hut 17, which is on the east edge of the plateau, one of three particularly well-preserved houses there. However, these are on a fairly level area whereas the excavation says that the deposits in the house were very deep on one side but very shallow on the other, which suggests that the house was terraced into a slope, with deposits built up on the uphill side, which would accord more with a house on the slopes to the south.

The 1960 report describes that 'the site was excavated by the quadrant method, using a permanent northsouth line for measurement. Bedrock, and consequently the soil level, sloped gently from South to North. The two Southern quadrants were very shallow, while the North Western quadrant (which proved to be most productive as regards articles recovered) was, in places, several feet deep.' The catalogue list finds only from the south-west and north-west quadrants and of these the largest number, 48, came from the south-west quadrant, with 32 from the north-west. It is uncertain whether the depth was from a common datum or simply from the surface but the considerable depth in the north-west is confirmed by the recorded depth of one find at 39in. The lack of any finds from the south-east and north-east suggest that these areas were not excavated and Mr Sirrett in a recent letter (31-1-2007) states that '... we excavated the half section nearest to the cliff edge but were forced to discontinue the excavation due to persistent attacks of vandalism. For protection of the undisturbed portion of the site we infilled and re-turfed the area to prevent further damage.'

The report describes the roundhouse before excavation as a 'shallow saucer-shaped depression some 15 feet in diameter'. On excavation it was shown to have 'a drystone wall, wide at the base and narrowing towards the top'. There were no traces of internal posts or of any deliberate floor. The description and the recorded depths indicate that the finds were somehow incorporated in the deposits, rather than lying on an occupation horizon or horizons although it states that '...several small makeshift fireplaces were uncovered, at widely varying places and at different levels. All constructed of sea-washed stones.' There clearly were occupation levels and recognisable deposits. Without the site drawings or photographs it is not possible to produce any plan of the roundhouse excavation and the identification on the plan of the actual house excavated is slightly in doubt at present so further information could not easily be obtained by re-excavation.

4. ARTEFACTS

The objects held at Llandudno Museum have been listed with additional comments (Table 1).

Apart from these, the report also mentions 'Two granite mauls or stone hand-hammers' and various potboilers as well as limpet shells, and smaller numbers of mussel and oyster shells. These were perhaps discarded and are not in the museum archive.

The report's description of 'Several small, makeshift fireplaces were uncovered at widely varying places and at different levels' suggests different floor levels and phases of use, although no distinction is made of finds from different stratigraphic levels. So, although all the finds were given three dimensional measurements, the slope of the bedrock and of the overlying deposits and the lack of accompanying plan or section drawings means no information can be gained from plotting the finds. These almost certainly came from several different phases of use of the house, some possibly even from re-use of the abandoned house site. For instance 'a vast quantity of limpet shells were uncovered, at one place a bed several inches thick had accumulated.' and such refuse would be more likely to be found outside a house than within it.

Find no.	Material	1960 Description	Present	2007 Comment
2	Bone	Small jaw Celtic Sheep	Yes	Sheep/goat lwr jaw
3	Bone	Flat triangular bone	No	
4	Bone	Flat triangular bone	Yes	Young sheep/goat scapula
5	Bone	Frag. Large bone	Yes	Frag. Bovid long bone
7	Bone	Jaw Celtic Sheep	Yes	Sheep/goat lwr jaw
8	Bone	Jaw Celtic Sheep. Small	Yes	Sheep/goat lwr jaw
9	Bone	Large bone joint	Yes	Bovid knuckle

Table	1	Tint	-f	fin J.	free	41	10/0	amagnation	manant	-+	T 1	landud a	Management
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10	Bone	Large vertebra Ox, damaged.	Yes	Bovid vertebra
11	Bone	Flat bone, damaged.	Yes	Butchered frag. Of bovid
				scapula
12	Bone	Large marrow bone, broken.	Yes	Butchered bovid long bone
13	Bone	Large bone socket	Yes	Butchered frag., proximal end of bovid scapula
14	Bone	Bone.	Yes	Bovid knuckle
16	Bone	Bronze Age button. Found with ball.	No	Missing
17	Bone	Jawbone of pig, poss. Domesticated	Yes	Pig lwr jaw
18	Bone	Jaw Celtic sheep	Yes	Sheep/goat lwr jaw
19	Bone	Large curved tooth or jaw	Yes	Worn pig canine
20	Bone	Frag. Ox skull with horn and 7 assoc. bones	Yes	
21	Bone	Large teeth in frag. Jaw, poss. conn with above	Yes	2 bovid teeth in butchered jaw frag
22	Bone	Jaw Celtic sheep	Yes	
23	Bone	Triangular bone	Yes	Sheep/Goat scapula
24	Bone	Vertebra Ox	Yes	
25	Bone	Pigs tooth	Yes	Mature pig molar
26	Bone	Pigs tooth	Yes	Mature bovid molar
28	Bone	Toe small pig	Yes	Sheep/goat molar
29	Bone	Large bone	Yes	Young bovid scapula frag
30	Bone	Large joint bone	Yes	Mature bovid vertebra frag
31	Bone	Pigs jaw and tooth frag	Yes	Frag molar and jaw
32	Bone	Large ball joint	Yes	Bovid frag long bone
33	Bone	Leg bone	Yes	Frag sheep/goat leg bone
34	Bone	Large jaw, oxen, plus teeth	Yes	Frag mature bovid jaw and teeth
35	Bone	Rib with knife marks	Yes	Bovid rib frag with knife mark
36	Bone	Bone	Yes	Bovid jaw frag.
37	Bone	Jaw Celtic sheep	Yes	Bovid jaw frag
39	Bone	Flat bone	Yes	Bovid scapula frag.
42	Bone	Bone	Yes	Sheep/goat? Jaw frag
43	Bone	Large marrow bone, in side of site	Yes	Butchered mature bovid long bone
44	Bone	Small sheep horn	Yes	Young sheep/goat horn core and skull frag
46	Bone	Small leg bone, with parallel scratches 1 in long	Yes	Metatarsal with possible polish from use as bobbin
47	Bone	Bone	Yes	Sheep/goat heel bone
48	Bone	Bone	Yes	Sheep/goat tarsal
49	Bone	Large tooth. Horse	No	Missing
52	Bone	Large tooth	No	Missing
54	Bone	Notched bone	No	Missing
56	Bone	Bone	Yes	Sheep/goat long bone, deformed
57	Bone	Tooth	Yes	Mature horse molar

59	Bone	Rib	Yes	Cattle rib frag, possibly butchered
60	Bone	Jaw Celtic sheep	Yes	Part lwr jaw young sheep/goat
61	Bone	Jaw Celtic sheep	Yes	Part lwr jaw young sheep/goat
62	Bone	Large jaw Ox	No	Missing?
63	Bone	Bone	Yes	Proximal frag young bovid scapula
64	Bone	Bone, in side of exc.	Yes	Butchered frag sheep/goat
65	Bone	Tooth, in side of exc.	No	Missing
66	Bone	Bone	Yes	Bovid ?toe frag, butchered
67	Bone	Bone	Yes	Mature pig molar in jaw frag. Wrongly bagged?
68	Bone	Bone	Yes	2 sheep/goat vertebra
69	Bone	Small horn	Yes	Young sheep/goat horn core
71	Bone	Jaw Celtic sheep	Yes	Articular end of jaw of young sheep/goat
72	Bone	Leg bone sheep	Yes	Leg bone young sheep/goat
73	Bone	Deer horn knife handle	No	Missing
74	Bone	Small horn	No	Missing
75	Bone	Small curved tooth	Yes	Young pig canine
76	Bone	Bone needle	No	Missing
77	Bone	Tooth	No	Missing
78	Bone	Large bone joint	Yes	Bovid knee joint, butchered
79	Bone	Teeth	Yes	Frag young pig jaw and teeth
80	Bone	Marrow bone	Yes	Small bovid long bone frag
27	Burnt clay	Frag burnt clay, no pattern	Yes	Burnt daub frags. Poss wattle impression
38	Burnt clay	Frag fired clay in side of site	Yes	Fired daub. Possible wattle impression
50	Burnt clay	Frag burnt clay	Yes	Burnt daub with two original surfaces
1	Shell	Pierced Oyster Shell	No	
40	Shell	Calcined oyster shell	Yes	
6	Stone	Smooth black stone, worn.	Yes	Small natural pebble
15	Stone	Small stone sphere. Grey. Smooth 0,5in diam.	Yes	Natural pebble
41	Stone	Frag burnt stone	Yes	Frag of shattered cobble, probably burnt
45	Stone	Small oval red stone, chipped	Yes	Small pebble of heavy stone. Mineral?
51	Stone	Stone	No	Missing
53	Stone	Frag black pot boiler	No	Missing
55	Stone	Frag green stone	Yes	Slate pebble frag
58	Stone	Lump yellow ore	Yes	Stained calcitic deposit, not copper ore
70	Stone	Stone	Yes	Natural pebble frag

Worked objects

The missing finds include the deer-horn (antler) knife handle, the bone needle, the pierced shell and the bone button. Without seeing these or a photograph of them it is not possible to say any more. The excavator described the button (Find 16) as 'Bronze Age', however, this seems most unlikely in the context, Bronze Age 'buttons' being a specific type of conical fastener or ornament, usually in jet. Otherwise buttons as we know them really only came into use about the 13th century AD. The report describes it as 'a disc of animal bone neatly pierced in the centre.' No size is given so it could be some other type of artefact than a button.

The bone needle (Find 76) is not described but was presumably perforated. Needles have been used throughout prehistory and into the Roman period and if of a plain type would not be datable.

The description of the deer horn (antler) knife handle (Find 73) does not support the suggested interpretation since it says that it 'showed no sign of a blade having been in place'. This suggests that perhaps it was piece of cut antler that may not have been a handle, never used as such or perhaps some other type of artefact.

One sheep/goat foot tarsal/carpal bone (Find 46) has polish around its shaft as well as a possibly deliberate perforation and appears to have been well-used. Similar items have been found elsewhere, for example at the Iron Age settlement of Meare East in Somerset and classified as bobbins, for use in spinning, although other functions have been suggested (Coles 1987, 145-150). However, the specialist bone report (Appendix 2) did not support this interpretation, suggesting that it had not been utilised although it did have a possibly deliberate perforation.

The stone mauls or hammers mentioned in the report but missing from the museum collection are potentially interesting as such objects could be associated with mining or ore processing. However, without being able to see them it is possible that they are natural pebbles used for a domestic purpose such as food processing.

Burnt clay

Three pieces with irregular surfaces. It had been thought a possibility that these might be pieces of pottery but the irregular surfaces suggest otherwise. These could be burnt daub with wattle impressions and so may derive from the house structure but are too small to be positive.

Stone

The stones surviving are all natural pebbles and the two pieces that have produced interest in the past are the green stone and the one described as yellow ore, since these might have been copper ore and shown some association with the copper mining. However, neither are copper ore.

Vertebrate remains

There were 59 animal bone fragments, which comprised the three main domestic species cattle, sheep/goat and pig with one piece of horse and one possibly human. Several show clearly that they are butchery fragments by fragmentation or cut marks. The presence of a number of immature sheep/goat jaws is of interest for interpretation of husbandry. A specialist report on the bones was prepared and a summary is presented below while the complete report is included as an appendix (Appendix 2), and which provides more details of identification and interpretation.

Summary of vertebrate remains report by Deborah Jaques (Appendix 2) (Palaeoecology Research Services)

The main domestic mammals formed the bulk of the recovered assemblage, with cattle and caprovid remains being prevalent. Age-at-death information hinted at the presence of calves and lambs implying that animals were bred at the site. Although recovery of the remains was almost certainly biased in favour of larger and more recognisable fragments, bones representing both butchery and domestic refuse were present suggesting that the animals were not only raised at the site, but were butchered and consumed there too.

Marine Shell

There are two pieces of oyster in the museum collection but the report describes 'a vast quantity of limpet shells' as well as lesser quantities of mussels and oysters.

5. DISCUSSION AND DATING

The roundhouse was of a relatively small and simple kind and the absence of internal posts is not impossible as such a size of house could have a roof supported entirely on the walls although stone-filled post-pits could have been difficult to identify.

The author suggested that the house had been occupied only intermittently and this would explain the accumulation of deposits with scattered objects and the occurrence of a number of pebble 'fire-places' at different levels. Certainly most excavated roundhouses appear to have been kept relatively clear of accumulations. However, the situation here is unusual, because of its proximity to the sea and of the survival of animal bones and shells. Other roundhouses may have had accumulations of rubbish, which has left no archaeological trace. Roasting on hot stones is one recognised way of cooking limpets.

Shellfish gathering usually indicates a seasonal activity but he diet here was varied with a normal range of domestic animals indicating a permanent settlement based on agriculture with shellfish being only a seasonal addition. Limpets are easily available but the least desirable of shellfish and so their use may indicate a pressure on availability of other food resources. Fishing would also be expected but would be unlikely to leave any material remains.

The author of the 1960 report thought that the house might be of Bronze Age in date, based on the absence of finds of pottery or iron. However, the most likely date at least for its latest occupation might be expected to be in the Roman period, supported by the find of a piece of Samian pottery in one of the houses during the mid-19th century (Penrhos 841). Such a period of occupation would fit with finds of Roman pottery and other material from several other hillforts and roundhouse settlements in North-West Wales. However, as part of the re-assessment a radiocarbon date was obtained from a cattle bone (Find no. 12). Animal bones are not always suitable for radiocarbon dating due to lack of organic collagen. However, this bone did prove to be suitable and a date was obtained of 2270 +/- 40 BP, Cal BC 400 to 340 or Cal BC 320 to 210 (Beta-254961) (See Appendix 3). This date therefore falls in the Middle Iron Age and throws a new light on the fort. Evidence of occupation in that period is not surprising but is difficult to understand in relation to the context from which the date derived. The bone was recorded as at a depth of 9ins in the deposits within the roundhouse. This cannot be translated into stratigraphy but was at a sufficient depth to be well-stratified. It was not one of the earliest deposits, the deepest of the finds being at a depth of 39ins so the context of the bone could be expected to have been from a later rather than an early period of occupation of the house. For this context to be of Middle Iron Age date it would have to be assumed that there was a break in occupation of the fort during the later Iron Age or that not all the houses were occupied during the later periods of occupation. Of course the deposits could have been disturbed and a single date can be misleading purely on statistical grounds.

Overall it is important that there is now some evidence for occupation of the fort in the Middle Iron Age and this is significant for north-west Wales where construction or occupation during the Iron Age is difficult to demonstrate, partly because of the lack of excavation and partly because it was a period when pottery was not in use in this area. Thus, although there are several forts that have had some early excavation (before the availability of radiocarbon dating), they generally produced little dating evidence, limited to stone objects such as querns, spindle whorls, sling stones or pebble tools. Datable stray finds of all types of that period are rare. Those from hillforts comprise only a bead of middle Iron Age type from Garn Fadryn (Llŷn), Late Iron Age bronzes from Dinas Emrys (Conwy) and a ring-headed iron pin from Din Silwy, (Anglesey). Castell Odo (Llŷn) was certainly occupied during the middle of the first millennium as shown by radiocarbon dates and is the only fort to have produced pottery of that period. At the small but strongly defended ditch and bank defended fort of Pendinas, near Bangor, excavation of the rampart showed a singe phase construction associated with a radiocarbon date of 2nd to 1st century BC. Excavation at the small stone-walled fort of Bryn y Castell, (Meirionnydd) produced radiocarbon dates showed occupation during the late first millennium BC to the 1st century AD after which the fort was abandoned but later re-used, non-defensively for iron-working in the 2nd to 3rd centuries AD. Evidence of occupation at Pen-y-dinas in the Middle Iron Age is now also paralleled by three dates of that period (from well-stratified deposits) recently recovered from the nearby hillfort of Caer Seion, Conwy (Smith 2009).

The economic and dietary evidence from study of the vertebrate remains (Appendix 2) is limited by the small number of pieces but is still useful for north-west Wales where such information has so far been absent. All three of the main domestic species were present with no significant difference from assemblages from Iron Age sites elsewhere. There was evidence for slaughter and butchery on-site, and of the use of young individuals, suggesting that the occupants kept stock.

At Pen-y-dinas the lack of the original site drawings and of the few diagnostic finds makes any further interpretation of the 1960 excavations impossible. Re-excavation of the roundhouse would be useful and least intrusive, if the site of the earlier excavations could be identified with certainty. This would produce a new plan of the house and sections of the deposits as well as new samples for dating. It could verify the nature of the house structure, for instance the position of the entrance and whether there might have been internal posts. It might also identify a buried soil beneath the hut wall, which could provide environmental information. Re-excavation could also provide the basis for an informative, publicly displayable feature to add to the value of the hill fort as a whole. More substantial information could be provided by excavation of another house or other areas within the fort. The fort has much higher potential for research than other hill forts in the north-west because of the proven survival of animal bones.

6. REFERENCES

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APPENDIX 1

1960 EXCAVATION NOTE AND FINDS LIST

INVESTIGATION OF HUT CIRCLE. PEN DINAS.LLANDUDNO. 1960.

The hut-circle chosen for excavation was one of a series found on the summit of Pen Dinas, a great uptarust of limestome overlooking Llandulno bay. There is evidence to support the theory that the summit was at one time protected, on the steep approach side, by a great wall of boulders, thus forming a type of hillfort.

At the onset, it was hoped that this would prove to be a permanent settlement and would yeild information concerning the dating of the fort etc. This, unfortunately, was not the case, as will be explained later.

The hut circle was extremely well defined upon the surface, being a shallow saucer-shaped depression some 15 feet in diameter, situated on the Western rim of the summit plateau.

The site was excavated by the quadrant method, using a permanent North/South line for measurements.

Bedrock, and consequently the soil level, sloped gently from South to Notth. The two Southern quads. were very shallow, while the North Western quad. (which proved most productive as regards articles recovered) was, in places, several feet deep.

The site did not, as was hoped, prove to be a permanent settlement but rather a camp used occasionally during the Summer months, by a tribe having its permanent village further inland. Several small makeshift fireplaces were uncovered, at widely varying places and at different levels. All were constructed of sea-washed stones, brought up from the beach for that purpose, as the local stone is particularly unsuited for use as firestones (neat causes it to crack and disintegrate). Several small, round "Fot-Boilers" were also found. The excavation uncovered no occupation-levels, such as are found in permanent habitations, nothing even remotely resembling a floor was located. Very few articles of human usage were found, those that were indicate a period towards the end of the Bronze-Age. Cheifly they were as follows;

A fine example of a Deer Horn knife handle (R ed Deer). It was complete and undamaged, but showed no trace of a blade having been in place. Judging by its condition it had been lost or misplaced by the one time owner and not deliberately discarded. An equally fine bone needle, also undamaged.

A small bone button, a disc of animal bone neatly pierced in the centre.

Two large granite mauls or stone hand-hammers.

There was absolutely no trace of pottery throughout the whole site.

The hut itself consisted of a dry-stone wall,wide at the base and nerrowing towards the top,probably roofed over with branches and kins, a covering that could be easily renewed at each seasonal occupation. No trace of a more permanent form of timber construction, such as a centre-post, was found. (Any such post would leave a soil mark or discolouration at its base even after complete disintegration). Winter winds and rain would reduce the height of the wall annually,most of the rubble falling inside the hut and thus hindering the formation of accurate strata, judging by the position of most of the food debris (bones etc.) this in-filling was never frequently cleared out, again pointing to only occasional occupation. The bones were mainly those of the common Celtic sheep.mostly young animals. At one period, however, a young Ox made its way onto the menu, evidence of which is provided by a part of the skull and jnw, together with several other bones. some of which bear knife marks. Two small but unusually fine cow horns were also recovered, both nad been carefully sawn from the parent skull and were probably destined for use as knife handles or some such untensil. These horns were from the wild white cattle of the day, known now as the Chillington cattle. Other remains indicate the use for food of pigs(not apparently domesticated) and deer. There were no bird remains present. Several large horse teeth were also found, but with no associated bones.

Shell fish formed a large part of the diet. A vast quantity of limpet smells were uncovered, at one place a bed several inches thick had accumulated. Mussel shells were, to a lesser extent, in evidence, also several Oyster shells, one of which was neatly pierced and smoothed. perhaps for use as a food scraper.

To summarize, the findings are breifly as follows;

The site was part of a Summer camp, used mainly in the Late Bronze Age, by a community of herdmen who did not develope the site beyond catering for their immediate needs. The personal traces left by the occupants are of such general useage that it would be immpossible to identify the actual tribe concerned.

HS

P.SIRETT.

3". I6". Large ball joint.
3". I6". Large ball joint.
5". I6". I7". Large jaw, oxen, plus teeth.
5. 6'. I'II". I5". Rib with knife marks.
56. 5'9". 3'I". I6". Bone.
57. 4'I0". I'II". I5". Jaw Celtic sheep.
58. 5'II". 3'6". 7". Frag.fired clay in side of site.
59. 5'II". 3'5". I7". Flat bone.
40. 4'II". 2'7". I5". Calcined Oyster shell.
41. 5'I". 3'4". 6". Large marrow bone, in constant.
42. 5'2". 3'2". I8". Bone.
43. 5'II". 3'5". I5". Small sheep better.
44. 5'9". 3'5". I5". Small sheep better.
45. 5'6". 2'4". I4". Small 5'2". 3'2". 18". Bone.
5'11". 3'4". 6".Large marrow bone, in side of site.
5'9". 3'5". 15". Small sheep horn.
5'6". 2'4". 14". Small oval red stone, chippeu.
5'. 2'8". 14". Small leg bone, with parr. scratches I"long.
5'9". I'11". 12". Bone.
5'102. 3'5". 16". Bone. 48.

Finds relating to the North West Quadrant of Hut I.Pen Dinas.Llandudno 49. N;9'.W:2'6".D:10". Large tooth. Horse. 50. N:9'.W:1'3".D:10". Frag.burnt clay. 51. N:11',W:5'5".D:16". Stone. 52. N:11'3".W:8'3".D:11". Large tooth. 53. N:10'.W:7'6".D:17". Frag. plack pot boiler. 54. N:11'2".W:8'10".D:14". Notched bone. 55. N:11'2".W:5'1".D:2". Frag.green stone. 56. N:11'2".W:5'1".D:2". Frag.green stone. 57. N:10'9".W:2'10".D:12". Tooth. 58. N:10'5".W:4'.D:18". Lung yellow ore. 59. N:9'9".W:161".D:12". Rib. 60. N:10'10".W:7'2".D:30". Jaw Celtic Sheep. 61. "" "" "" "" "" "" "" "" c2. N:9'8".W:7'7".D:36". Large jaw Ox.. --63. N:11'.W:8'6".D:39". Bone. 64. N:11'1".W:8'6".D:6". Bone, in side of exc. 65. N:11'4".W:8'8".D:39". Bone. 66. N:11'4".W:8'8".D:6". Bone. 67. N:" ".W:"".D: ". Bone. 68. N: " W: " D: ". Bone. 69. N:11'.W:8'10".D:17". Jaw Celtic Sheep. 71. N:10'10".W:6'7".D:17". Jaw Celtic Sheep. 72. N:11'.W:8'10".D:18". Bone. 73. N:11'.W:8'10".D:19". Bone. 74. N:10'10".W:8'10".D:19". Bone. 75. N:11'.W:8'10".D:19". Bone. 76. N:11'.W:8'10".D:19". Bone. 77. N:10'10".W:6'7".D:20". Large bone sheep. 73. N:11'.W:6'.D:15". Deer horn hnife handle. 74. N:9'10".W:5'4".D:14". Small horn. 75. N:9'6".W:6'11".D:27". Small cutved tooth. 76. N:11'.W:8'1.D:27". Bone needle. 77. N:10'10".W:5'4".D:3". Bone. 78. N:10'10".W:5'4".D:3". Bone. 79. N:11'.W:8'5'.D:227". Small cutved tooth. 76. N:11'.W:10'.D:27". Large bone joint. 77. N:0'10".W:14'.D:3". Large bone joint. 79. N:9'6".W:5'1".D:18". Marrow bone.

APPENDIX 2

Palaeoecology Research Services PRS 2009/24

Technical report: Vertebrate remains from excavation of a roundhouse at Pen-y-dinas Hillfort, Great Orme, Llandudno, Gwynedd (site code: G1770)

by

Deborah Jaques

Summary

This report presents an archive of a small vertebrate assemblage recovered from deposits encountered during excavation of a roundhouse within the hillfort at Pen-y-dinas, Great Orme, Llandudno, in 1960. The work was undertaken as part of a CADW project to improve education and visitor facilities for hillforts in Conwy. Radiocarbon dating of one of the bones returned an Iron Age date.

The main domestic mammals formed the bulk of the recovered assemblage, with cattle and caprovid remains being prevalent. Age-at-death information hinted at the presence of calves and lambs implying that animals were bred at the site. Although recovery of the remains was almost certainly biased in favour of larger and more recognisable fragments, bones representing both butchery and domestic refuse were present suggesting that the animals were not only raised at the site, but were butchered and consumed there too.

KEYWORDS: PEN-Y-DINAS HILLFORT; GREAT ORME; LLANDUDNO; TECHNICAL REPORT; IRON AGE; VERTEBRATE REMAINS

Contact address for author:

Palaeoecology Research Services Unit 8 Dabble Duck Industrial Estate Shildon County Durham DL4 2RA Prepared for:

Gwynedd Archaeological Trust Craig Beuno Ffordd y Garth Gwynedd LL57 2RT

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Technical report: Vertebrate remains from excavation of a roundhouse at Pen-y-dinas Hillfort, Great Orme, Llandudno, Gwynedd (site code: G1770)

Introduction

Excavation of a roundhouse within the hillfort at Pen-y-dinas, located on the coastal promontory of the Great Orme, Llandudno, was undertaken in 1960. This work was never fully reported upon and an examination of the records and finds was undertaken by Gwynedd Archaeological Trust as part of a CADW project to improve education and visitor facilities for hillforts in Conwy.

Records and photographs, other than a brief report on the site and a list of artefacts recovered, have not been found. Exactly which roundhouse was excavated is a matter of some discussion, but on the basis of a survey of the area made in 1993 and discussions with the original excavator, two huts, 17 and 34 are possible contenders (Smith 2008). The extant report describes the roundhouse as a "shallow saucer-shaped depression some 15 feet in diameter" with a dry stone wall. No traces of internal posts or floors were identified and the finds (including the bones) were not lying on occupation surfaces but rather part of the backfill. However, several fireplaces at and varying different levels places. indicative of occupation, were present, and, besides the bones, an accumulation of limpets and other shells were also noted.

Radiocarbon dating of a bone (Id. no. 12) recovered from the excavations returned an Iron Age dual ranged 2-sigma calibrated date of <u>Cal BC 400 to 340 (Cal BP 2350 to 2290) and Cal BC 320 to 210 (Cal BP 2270 to 2160).</u>

Methods

For the vertebrate remains, data were recorded electronically directly into a series

of tables using a purpose-built input system and *Paradox* software. Subjective records were made of the state of preservation, colour of the fragments, and the appearance of broken surfaces ('angularity'), with additional, semi-quantitative information recorded concerning fragment size, dog gnawing, burning, butchery and fresh breakage, where appropriate.

Identifications to species or species group were carried out using the PRS modern reference comparative collection. Distinctions between sheep and goat bones were undertaken using comparative material at PRS, with reference to Boessneck (1969). Skeletal elements which could be identified to species were recorded using the diagnostic zones method described by Dobney and Rielly (1988), whilst other fragments (classified as 'unidentified') were, where possible, grouped into categories: large mammal (assumed to be horse, cow or large cervid) and medium-sized mammal (assumed to be sheep, pig or small cervid).

The total number of fragments (NISP) and the minimum number of elements (MNE) were calculated using the zone system devised by Dobney and Rielly (1988), and minimum numbers of individuals (MNI) were derived from the most common element as determined from the MNE counts (side was also taken into account). As well as counts of fragments, weights were recorded for each bone.

Caprovid tooth wear stages were recorded using those outlined by Payne (1973; 1987), and those for cattle followed the scheme set out by Grant (1982). Caprovid mandibles and isolated teeth were assigned to the general age categories outlined by Payne (1973; 1987). Where present, epiphyseal fusion data was recorded. Mammal bones were described as 'juvenile' if the epiphyses were unfused and the associated shaft fragment appeared spongy and porous. They were recorded as 'neonatal' if they were also of small size.

Measurements followed von den Driesch (1976) unless otherwise specified. These are listed in the appendix but were too few to enable any further comment.

Vertebrate remains

assemblage Although the vertebrate recovered from the excavations at Pen-ydinas was small and somewhat fragmented, analysis was recommended in view of the vertebrate remains scarcity of from settlements of this date in Wales. The following account provides some general comments regarding the composition of the vertebrate material; however, the small size of the assemblage and paucity of the archaeological information was restrictive.

Summary information for the vertebrate remains is reported in Tables 1 to 3, whilst detailed records of individual bones, including tooth wear data and measurements can be found in the Appendix.

In total, 59 bones were recovered from the excavations; their preservation being surprisingly good given that vertebrate material of prehistoric date is generally in a rather poor condition (or completely absent) because of the acidic nature of the soils over much of Wales (Caseldine 2003). A single fragment (a cattle calcaneum) showed possible dog gnawing damage, whilst fresh breakage was apparent throughout the assemblage. Six of the nine caprovid mandibles recovered had broken teeth; however, it was not readily apparent (in most cases) whether this damage was recent or had occurred in the past, however. Tooth damage to the third and fourth premolars and the first molar of one of the mandibles (Id.

no. 22) may have been the result of shattering after being subjected to heat, but this could not be confirmed with any certainty. As might be expected, dental attrition information from some of the broken teeth could not be determined or could only be approximated (see Appendix).

Species representation

Cattle and caprovid remains provided the bulk of the identified assemblage (Table 1), with one of the caprovid bones being more closely identified as goat. A small piece of horn core may also have been of the same species. Pig remains were present, together with single fragments of horse and ?human. Diagnostic features were absent from some of the fragments and these were assigned to the large and medium-sized mammal categories. Most of the large mammal fragments were probably cattle, whilst two medium-sized mammal vertebrae were almost certainly caprovid.

Although the size of the assemblage precluded detailed analysis, frequencies calculated on the basis of fragment counts (NISP) suggested that cattle remains were most numerous, forming 42% of the identified assemblage, with caprovid remains being just slightly less common -40% (Table 2). However, using MNI (minimum number of individual) values, these frequencies altered considerably, with caprovids forming 56% of the identified assemblage and cattle providing 22%. Pig remains were the least significant of the three main taxa on the basis of fragment counts (18%) but MNI values placed pigs on a par with domestic cattle with a frequency of 22%. It must be noted that both quantification methods have disadvantages particularly when applied to small assemblages. In short, NISP counts may over represent species with more bones and those whose bones fragment into more readily identifiable pieces, whilst MNI values can over emphasise the importance of less common species, a problem that increases the smaller the assemblage (Hambleton 1999).

Nine of the 18 caprovid bones were mandibles, with parts of the fore (scapula, radius and ulna) and hind (pelvis and femur) limbs also identified. Two horn core fragments (one of which may be goat, as mentioned above) and two medium-sized mammal vertebrae (sheep/goat/small cervid rather than pig) were also recorded. Cattle remains included a range of skeletal elements representing the head (cranium, maxillae, mandible fragments and isolated teeth) and limbs, including meat-bearing elements, such as the pelvis and scapula, and terminal limb bones, such as astragalus and calcaneum.

Pigs were represented predominantly by isolated teeth and maxilla fragments, together with a single metacarpal. The mandibular canine present (Id. no. 19) was that of a female individual. A single tooth (a maxillary premolar/molar) was identified as horse. One fragment could not be identified but may represent part of a human collar bone (Id. no. 56). A confident identification of this fragment could not be made, despite its examination by two human bone specialists (Dobney and Gowland pers. comm.).

Butchery

Marks on the bones which provided evidence of butchery were quite frequently encountered and were mainly, although not exclusively, observed on the cattle bones.

Knife marks were noted on a cattle frontal bone fragment (Id. no. 20), whilst horizontal cuts were observed just below the proximal articulation of a cattle metacarpal; these probably result from skinning. The latter had also been split longitudinally, almost certainly for the removal of the marrow. Damage to a cattle mandible (Id. no. 63),

which had been chopped across the diastema, may also have been related to marrow extraction (Dobney et al. 1996). This fragment was possibly heat damaged (there were slight traces of a blackened area and some splitting of the bone surface into layers) which would have facilitated the chopping of the bone into two, with the additional benefit of heating the marrow so that it could be more easily removed. However, Rixson (1989) suggests that chopping through the diastema, and also across the vertical ramus of the mandible (fragment indicative of this was also noted -Id. no. 36) was more likely for the removal of the extremities of the mandible and the recovery of the cheek meat (Figure 1.). This would accord well with a cattle maxilla fragment (Id. no. 34) which had a pair of vertical (shallow) chop marks above the molars and the bone had also been chopped through at the end of the tooth row. These could have been made during the removal of the cheek meat, together with the tongue, both of which would have been a valuable resource. Alternatively, once the meat had been removed the cranium may have been chopped into pieces for fat extraction (Rixson op. cit.).

Second and tertiary butchery, i.e. division of the carcass into major portions and then into more manageable household 'joints', was also indicated by the chopped femur and humerus shafts, and the scapula and pelvis fragments. Trimming of the scapula 'spine' (as noted on Id. no. 29) was the result of removal of the meat (Seetah 2002), as were knife marks on the pelvis (ilium). Filleting was also apparent as evinced by knife marks on a caprovid lumbar vertebra and associated sacrum.

Age at death

As a result of the damage to the caprovid teeth, it was not always possible to confidently determine the wear stage of a particular tooth, although occasionally a

wear stage could be approximated (see Appendix). Where possible, mmandibles with incomplete tooth rows were assigned to age groups on the basis of comparison with records from more complete aged mandibles from this site and other assemblages from sites of similar date. On this basis, it was possible to suggest that at least four of the eight mandibles available were probably from individuals of 12 months of age or less (in three cases, not less than 6 months) when killed, whilst four were from animals of two to three years old at death. Epiphyseal fusion data suggested that the animals represented were mostly less than 2 years old, with just one bone from a sheep that was at least 2 years old.

Little information concerning age [from teeth] was available for cattle or pigs, with the exception of two cattle maxilla fragments. One included a deciduous third representing premolar an immature individual, although actual age cannot be determined. Teeth from the other maxilla fragment also included deciduous premolars which showed no evidence of wear. These teeth erupt within the first three weeks of birth (Hillson 1986), and, typically, unless kept as veal calves, the animals start to eat grass from about two weeks, after which, wear on the surface of the tooth would be expected. This fragment is, therefore, likely to represent a neonatal or juvenile animal. Fusion data was scarce and it was only possible to suggest that the animals represented were over 18 months, whilst a calcaneum was from an individual of less than 24 months.

Conclusions

Though well preserved, the small size of this bone assemblage renders it of limited interpretative value. Species identified were restricted to the main domestic mammals and no bird or wild mammal remains were recorded. In all likelihood, given the date of the excavations, and that no sieving was

undertaken, a bias in favour of larger fragments and those that are most easily recognizable (such as mandibles for example) is inevitable. Most other assemblages of Iron Age date from elsewhere in Britain are also typically by domestic animals dominated and evidence for the exploitation of wild resources is usually minimal (Hambleton 1999).

Although little age-at-death information was available for the main domesticates, there was some evidence for the slaughter of young sheep of less than a year old. These were probably for meat, whilst those that were slightly older would have provided several fleeces before they were culled. Hambleton found, in her study of animal husbandry regimes in Iron Age Britain (1999), that on most sites of Iron Age date a large proportion of the sheep were slaughtered at a relatively early age. Various researchers (e.g. Albarella, 2007; Hambleton 1999) have suggested that the culling of young sheep prior to the optimum size in terms of meat production (typically between 1.5 and 2.5 years) may relate to the problems of keeping and feeding large numbers of animals over the winter months and additionally that sheep (and goats) would also have been of use as sacrificial animals during autumn/winter religious festivals and feasts. Both Albarella (2007) and Hambleton (1999) found no evidence for a particular emphasis on any one product during the Iron Age and suggested that meat and wool (and possibly milk) were likely to have been of equal value. This would also fit with the limited information supplied by the small data set from Pen-y-dinas.

There were too few fragments for detailed analysis but the remains would appear to represent waste from all stages of butchering – heads and lower limbs from initial preparation of carcasses (with evidence for skinning), bones representing joints of meat and those, such as vertebrae, from which the meat had been filleted. This suggests that the animals were slaughtered, butchered and eaten on-site, with the presence of young individuals (calves and lambs) implying that livestock was also raised at the site or nearby.

Archive

All material is currently stored by Palaeoecology Research Services (Unit 8, Dabble Duck Industrial Estate, Shildon, County Durham), along with paper and electronic records pertaining to the work described here.

Acknowledgements

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Table 1. Hand-collected vertebrate remains from excavations at Pen-y-dinas Hillfort, Great Orme, Llandudno.

Species		Total
Equus f. domestic	horse	1
Sus f. domestic	pig	8
Bos f. domestic	cattle	19
Caprovid	sheep/goat	17
Capra f. domestic	goat	1
?Homo sapiens	?human	1
Large mammal		10
Medium-sized mammal		2
Total		59

Table 2. Fragment counts and MNI values for the main domestic mammals from excavations at Pen-ydinas Hillfort, Great Orme, Llandudno. Key: NISP = number of identified fragments; MNI = minimum number of individuals, *includes goat.

	NISP	%	MNI	%
*sheep/goat	18	40	5	56
cattle	19	42	2	22
pig	8	18	2	22

Table 3. Fragment counts for individual skeletal elements from the main domestic mammals from excavations at Pen-y-dinas Hillfort, Great Orme, Llandudno. Key: * = goat.

skeletal element	horse	pig	cow	sheep/goat
horncore	-	-	-	2
cranium	-	1	1	-
maxilla + teeth	-	3	2	-
upper incisor	-	1	-	-
mandible	-	-	2	9
isolated teeth	1	2	2	1
scapula	-	-	2	1
humerus	-	-	1	-
radio/ulna	-	-	-	1*
radius	-	-	1	-
ulna	-	-	-	1
metacarpal	-	1	1	1
pelvis	-	-	3	-
femur	-	-	-	1
astragalus	-	-	1	-
calcaneum	-	-	2	-
metatarsal	-	-	-	1
cuboid-navicular	-	-	1	-
Total	1	8	19	18



Figure 1. Diagram of mandible butchery, after Rixson (1989). Key: A = diastema area; B = meat-bearing body of mandible; C = top part of vertical ramus.

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Appendix

Individual bone record

Key: Id. no. = museum reference number, mostly unique to individual fragments; Frags = number of fragments; GT50% = zones with greater than 50% present; LT50% = zones with less than 50% present; l = left; r = right; i = indeterminate; Prox = proximal fusion; Dist = distal fusion; pu = proximal unfused; pf = proximal fused; du = distal unfused; df = distal fused; j = juvenile. Zones after Dobney and Rielly (1988) except 'Y' and 'Y' which equate to Dobney and Rielly zones '10' and '11'.

Notes	well preserved fragment	slight fresh breakage damage and root etching. Possibly from an immature individual as the bone	quite porous	good preservation, slightly rounded edges. Possibly a	tibia shaft fragment	Teeth = P2 to M2	dP2 to M1. dP4 damaged, may be modern breakage	adult individual represented	some fresh breakage damage. Cervical vertebra, fused	chopped through zones 2 and 4	shaft fragment, quite large, probably cattle. Bone	chopped down shaft. Submitted by GAT for C14	dating	spine chopped	rather battered, damage to one surface	dP3 to M2 and incisor, slight damage to M1	mandibular canine, female individual	lower orbit and skull fragment. Knife marks on skull	part of the bone	mandibular P3	split longitudinally and two knife marks just below the	proximial articulation chonned through acetabuilitin knifemarks on zone 5		fresh breakage damage, possibly part other pelvis	Iragment with this number	maxilla fragment with d <i>P3</i> and dP4 unworn. Neonatal/juvenile individual	P3 to M3. P3, P4 and M1 all slightly damaged,
Wt (g)	10	11		19		19	7	43	57	54	74			94	32	21	9				154				0 7	18	35
Dist	ı	df		I		ı	ı	ı	ı	ı	ı			df	ı	ı	ı	ı		ı	ı	1		I		ı	ı
Prox	ı	ı		ı		ı	ı	ı	ı	ı	ı			ı	ı	ı	ı	ı		ı	ı	1		I		ſ	ı
LT50%	2	ı		ı		ı	ı	ı	ı	ı	ı			45	ı	ı	ı	ı		ı	26	17X	V /1	ı		ı	ı
GT50%	1	1234567		ı		12	12367	ı	ı	246				123	ı	12367	ı				15	v	ر ا	XL			12
Side	1	1		ı		r	1	I	ı	1	ı			r	ı	I	ı	1		r	Ι	_		-		r	r
Frags	, —	1		1		-	1	1	1	1	1			-	1	1	1	1			1	.	- ,	-	·	-	1
Element	mandible	scapula		shaft		mandible	mandible	astragalus	vertebra	pelvis	femur			scapula	cuboid	mandible	canine	cranium		isolated teeth	metacarpal	nelvis		pelvis		maxılla + teetn	mandible
Species	sheep/goat	sheep/goat		large mammal		sheep/goat	sheep/goat	cattle	large mammal	cattle	large mammal			cattle	cattle	sheep/goat	pig	cattle		cattle	cattle	cattle	cauto .	cattle	.	cattle	sheep/goat
Id. no.	7	4		5		7	8	6	10	11	12			13	14	18	19	20		20	20	00	04	20	ö	17	22

Id. no.	Species	Element	Frags	Side	GT50%	LT50%	Prox	Dist	Wt (g)	9 modern or ancient
23	cattle	scapula	-	'n	234568	17	I	· -,	33	notation of anotation neonatal/juvenile individual represented, small and quite porous, part of zone 1 absent
24	large mammal	vertebra	1	ı		ı	ı	I	45	cervical vertebra, fused
25	pig	M3	1	ı			ı	ı	10	probably maxilliary tooth as has quite splayed roots
26	cattle	dP4	1	ı		I	ı	ı	5	very worn
28	sheep/goat	M1/M2	1	ı			ı	ı	7	
29	large mammal	scapula	1	r	46	I	I	ı	44	greasy appearance. Blade fragment, probably cattle. Chopped at both ends and spine also trimmed
30	cattle	calcaneum	1	r	2345	ı	nd	ı	76	
31	pig	maxilla + teeth	1	r	I	ı	I	ı	14	M2 broken
32	large mammal	femur	1	ı	6	ı	ı	ı	34	shaft fragment, probably cattle definitely not horse
33	sheep	metacarpal	1	.1	3478	ı	ı	df	13	
34	cattle	maxilla + teeth	1	1	I	ı	I	ı	103	dP3 to M2. Vertical knife marks or shallow chops
										tooth row
35	large mammal	rib	1	ı	ı	ı	ı	I	12	deep cut/knife mark across bone, probably also
										cnopped unrougn the bone at one end
36	cattle	mandible	1	-	45	3	ı	ı	31	slightly porous. Chopped through zones 3 and 5
37	sheep/goat	mandible	1	1	1	I	ı	ı	25	P4 to M3. M1 and M3 broken, ?modern damage
39	large mammal	cranium	1	ı	ı	I	·	ı	17	1
42	pig	cranium	1	1			ı	ı	6	occipital condyle fragment
43	large mammal	femur	1	ı	ı	I	ı	ı	43	shaft fragment, chopped, also fresh breakage damage
44	sheep/goat	horncore	1	r	I	ı	I	ı	17	very straight, porous, immature individual, may be
46	sheep/goat	metatarsal	1	r	125678	ı	I	qu	14	sectors of the pole in the pole. Addition of the pole. Addition articulation
47	sheep/goat	ulna	1	r	BCDEFG		nd	ı	9	
48	pig	3rd metacarpal	1	r	13		ı	qu	6	
56	?human	?clavicle	1	ı	I	ı	ı	ı	14	this fragment may represent a human clavicle or ?rib
57	horse	isolated teeth		ı	ı		ı	,	34	li maxillary tooth, quite well worn
59	large mammal	rib	1	ı	1	ı	ı	ı	19	returned to GAT for radiocarbon dating
09	sheep/goat	mandible	1	1	127		ı	ı	18	P2 to M2, M1 and M2 damaged by breakage, ?modern
61	sheep/goat	mandible	1	r	12	ı	ı	ı	12	or ancient dP3 to MI. dP3 and dP4 damaged, ?fresh breakage

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Notes no teeth. Chopped through zone 2. Area of possible scorching or heat damage	chopped across the shaft	proximal articulation destroyed by dog gnawing	M2, M3	sacrum and lumbar vertebra, both fused. Lumbar	vertebra has small chop in centrum, and knife marks	which carry on across sacrum	immature individual represented, including part of	cranium	no teeth	immature	1	chopped zone 5 and chopped through shaft (zones 7	and 8)	dP3 to M1	some damage to the edges of the proximal articulation,	?scorching. Fresh breakage damage
Wt (g) 24	23	57	22	31			13		Ζ	13	2	131		12	91	
Dist -	ı	ı	ı	ı			ı		ı	du	ı	df		ı	ı	
Prox -	pf	ı	ı	ı			ı		ı	nd	ı	ı		ı	pf	
LT50%	8G			ı			ı		1	ı	ı	ı		ı	I	
GT50% 27	12567ABCDEF	2345		ı			ı		345	235678	ı	345678		ı	12567	
Side 1	1	r	1	ı			1		1	r	ı	ċ		1	1	
Frags 1	1	1	1	7			1		1	1	1	1		1	1	
Element mandible	radio/ulna	calcaneum	maxilla + teeth	vertebra			horncore		mandible	femur	upper incisor	humerus		maxilla + teeth	radius	
Species cattle	goat	cattle	pig	medium mammal			sheep/goat		sheep/goat	sheep/goat	pig	cattle		pig	cattle	
Id. no. 63	64	66	67	68			69		71	72	75	78		62	80	

Technical report: Pen-y-dinas Hillfort, Llandudno

Palaeoecology Research Services 2009/24

Mandible and tooth wear records

Key: id. no. = museum reference number. Tooth wear stages for cattle follow those outlined by Grant (1982) and for caprovids those detailed by Payne (1973; 1987). Key: CRP = tooth still in crypt; ERP = tooth erupting: * after Payne (1973; 1987): B (2-6 months); C (6-12 months); D (1-2 years); E (2-3 years); F (3-4 years). Note: Italic face in table indicates an approximate wear or age stage.

Id. No.	Species	Element	dP4	P4	M1	M2	M3	*Age stage	Notes
5	sheep/goat	mandible	13L	·	2A	ı	ı	С	C or over
7	sheep/goat	mandible	ı	TT	9A	9A	·	D/E	at least D, likely to be E
8	sheep/goat	mandible	bkn	ı	CRP	ı	ı	В	B/juvenile
18	sheep/goat	mandible	16L	ı	8A	ERP	ı	C	
22	sheep/goat	mandible	ı	8A	9A	9A	2A	н	
37	sheep/goat	mandible	ı	4A	9A	8A	bkn (2A)	E	at least E/adult
60	sheep/goat	mandible	ı	9 S	ı	9A	·	E	?E/F
61	sheep/goat	mandible	14L	ı	ΤA	ı	·	С	C or over
Id. no.	Species	Element	Tooth we	ear stage					
26	cow	DP4	Μ						
28	sheep/goat	M1/M2	5A						

12

Measurements

Id. no. = museum reference number

All measurements are given in millimetres and follow von den Driesch (1976).

Id. no. 9	Species cow	Element astragalus	BD 33.73	GLI 53.21	
Id. no. 78	Species cow	Element humerus	BT 61.16		
Id. no. 33	Species sheep	Element metacarpal	Bd 23.73	Dd 15.66	
Id. no. 64 80	Species goat cow	Element radio/ulna radius	SD 16.86	Bd 27.29 65.01	BFd 25.78 60.16
Id. no. 13	Species cow	Element scapula	GLP 69.48	SLC 53.03	

APPENDIX 3

RADIOCARBON DATING RESULTS

Radiocarbon dating of cattle long bone fragment 12 from 1960 excavation.



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Darden Hood President

Ronald Hatfield Christopher Patrick Deputy Directors

February 17, 2009

Mr. George Smith Gwynedd Archaeological Trust Craig Beuno, Ffordd y Garth Bangor Gwynedd, North Wales LL57 2RT United Kingdom

RE: Radiocarbon Dating Result For Sample LLDMG1989312

Dear George:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report sheet and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. It was analyzed with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analysis. A receipt is enclosed with the mailed report copy. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

4985 S.W. 74 COURT MIAMI, FLORIDA, USA 33155 PH: 305-667-5167 FAX:305-663-0964 beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. George Smith

BETA

Report Date: 2/17/2009

Gwynedd Archaeological Trust

Material Received: 1/26/2009

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 254961 SAMPLE - 11 DMG1989312	2230 +/- 40 BP	-22.4 0/00	2270 +/- 40 BP
ANALYSIS : AMS-Standard delivery	(with all all	
2 SIGMA CALIBRATION	oone collagen): collagen extraction:	with alkali 2290) AND Cal BC 320 to 2	210 (Cal BP 2270 to 2160)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS



Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com



Fig. 1 Penydinas: Archaeological Survey by GAT 1993





GWYNEDD ARCHAEOLOGICAL TRUST

YMDDIRIEDOLAETH ARCHAEOLEGOL GWYNEDD

Craig Beuno, Ffordd y Garth, Bangor, Gwynedd LL57 2RT Ffon/Tel 01248 352535 Ffacs/Fax 01248 370925 e-mail: gat@heneb.co.uk web site: www.heneb.co.uk