Burnt mounds in north-west Wales: are these ubiquitous features really so dull?

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This is an opportune time to reconsider the burnt mounds in north-west Wales: the list of excavated examples is growing rapidly and although many of these have been published they are frequently considered in isolation, whereas numerous comparisons are now possible. Burnt mounds are often an under-appreciated site type—Barber and Russell-White in their overview of Scottish sites (1990) having described them as 'among the most boring sites with which a field archaeologist must deal'. This paper, seeks to overturn this view, however, and to show that this common site type holds a mine of valuable information and deserves much more interest from the archaeological community at large. Their function is still hotly debated; their relationship to settlement remains obscure, and their dating in Wales is only just becoming clarified.

This paper focuses on excavated sites in the region covered by the Historical Environment Record (HER) maintained by the Gwynedd Archaeological Trust, within which a total of over two hundred examples are currently known from fieldwork and from recent excavations (Fig. 1).[1] Details of most of the sites discussed below are given in the appendices.

FORM

Classic burnt mounds (or *fulachta fiadh* as they are called in Ireland) are easily defined with their deep troughs and fire sites covered or surrounded by an often crescentic mound of heat-shattered burnt stone. Many sites do fit this description but the variations on this theme are wider and more common than is often suggested. Pits of a type similar to those that can occur under burnt mounds are also found in isolation, either because the mound has eroded away or because one never existed. Some of these features are also included in the discussion below to broaden the perspective on these sites.

Mounds

The mounds themselves can vary significantly in size; they can be over 20m in diameter, but 10m is more usual, and occasionally survive to over 1m in height. Often size and thickness are determined largely by preservation or erosion, but clearly some sites were used for long periods of time and grew large and others witnessed only one or two events. The composition of the mounds is often very similar with a high proportion of stone shattered to a fairly small size by heat, and there is almost always a high charcoal content. There seems to have been some tendency to select rocks more resistant to heat but generally any locally available rocks were used (Jenkins 1992; 2002), including occasionally limestone (e.g. Figin Fawr). Stratification in mounds is often poor, with much mixing during the use of the mound. Occasionally phasing is possible, such as at Nant Farm, where a trough and related launder clearly cut through burnt mound layers associated with another trough.

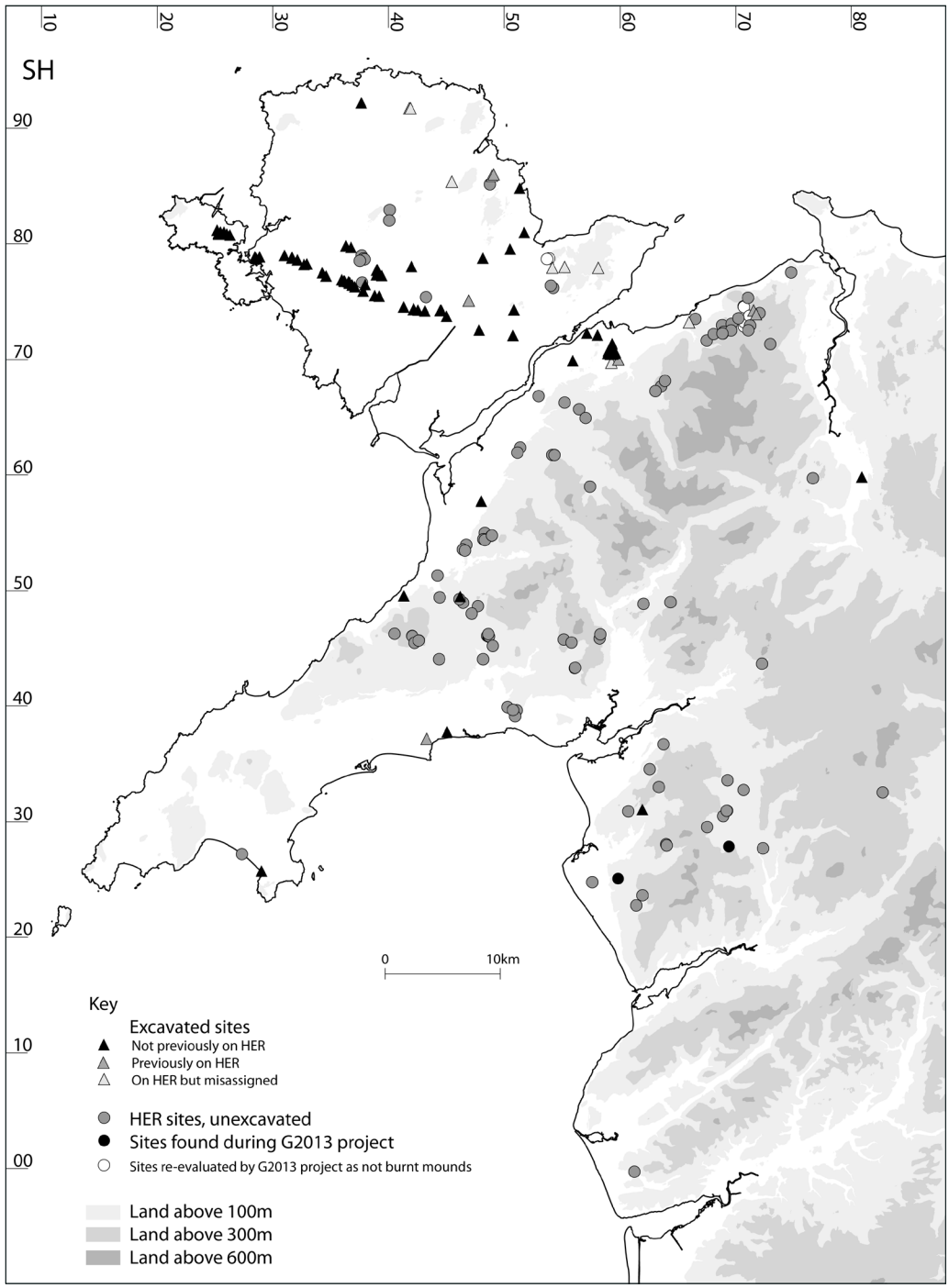

Fig. 1. Distribution of burnt mounds in north-west Wales. *Based on OS map data © Crown copyright Ordnance Survey. All rights reserved.*

As the troughs are often filled with burnt mound material redeposited or eroded into them even stratification within pits is often unreliable.

Troughs (Fig. 2)

Although many burnt mound sites are not excavated extensively enough to locate a trough, the presence of one is usually assumed. As the fracturing of the stone indicates immersion in water a mound of any significant size requires a trough to produce it. A trough can be defined as a fairly deep, steep-sided pit designed to hold water. They are most commonly thought of as rectangular, but in the excavated sample 65 per cent with an identifiable, regular shape were circular or sub-circular and both forms seem to have had similar functions. In fact the difference between a sub-rectangular and a sub-circular trough is often very subjective. Although the largest troughs are rectangular several sub-circular examples have areas almost as large (Fig. 3). Depth often seems to be related to the degree of truncation or lack of it, but both forms reach depths of up to 0.5m. Area rather than volume has been used for comparison in Figure 3 because of this problem with the depth. Rectangular and sub-circular troughs can occur under the same mounds, and seem to have no chronological significance.

In some cases erosion of the trough sides (e.g. Fig. 4, troughs 2186 and 2202 under mound 2176, Parc Bryn Cegin, Llandygai) imply that the sides were unprotected. However, the steepness of the sides of most troughs, especially in their lower parts, suggests that the troughs were often lined. In some cases this lining has been preserved. The best example in north-west Wales is Nant Farm, Porth Neigwl where the large wooden slabs forming one trough were remarkably well preserved. In most cases the linings are more fragmentary, with planks, possibly representing two phases of use, surviving in the base of the trough at Nant Porth, Bangor and split branches on the base of the trough at Glyn, Llanbedrgoch. Both sites also had some evidence of vertical stakes, possibly to support linings on the sides. Lynch (2000, 90) also states that a wooden trough is recognisable in an unexcavated burnt mound at Llanllechid (RCAHMW 1956, 146).

However, suggestions of linings are generally more subtle. At Bryn Cefni, Llangefni impressions of a probable timber lining were preserved in clay and at Parc Bryn Cegin differential infilling of pit 2149 (under mound 2031) left a vertical boundary indicating the former presence of a decayed lining. Elsewhere in Britain, especially in the Northern Isles (Moore and Wilson 1999), more permanent stone slab linings are common. These seem to have been rare in north-west Wales but do seem to have occurred in the uplands where suitable stone was easily available. A mound found in 2009 close to Gerddi Bluog, near Harlech was revealed during water-pipe replacement work, and the top of a stone trough was exposed. Features interpreted by the excavator as hearths in two mounds near Moelfre were probably the disturbed remains of stone troughs (Baynes 1913).

Rectangular troughs would have been much easier to line with stone or planks, but the steep sides of many sub-circular troughs suggest that these were also normally lined, possibly with wattle. Smaller troughs, such as that at Parc Cybi, Holyhead were lined with clay, but in places where the ground was naturally clayey no lining might have been necessary (e.g. Tan-y-Bwlch Farm, Bodffordd).

Rectangular troughs do seem to be the more developed and complex form and sometimes have features to aid access at one short end. At Parc Bryn Cegin (pit 2197) a step was cut in the eastern end, adjacent to the fire site. This was partially covered by burnt mound material and then paved with flat stones. At Nant Farm the end next to the fire also had a step cut into it and the trough seemed to have had a removable board at this end. At Bryn Cefni, at the end away from the fire, the pit opened out into an adjacent channel. This feature was not caused by later erosion as the hollow was

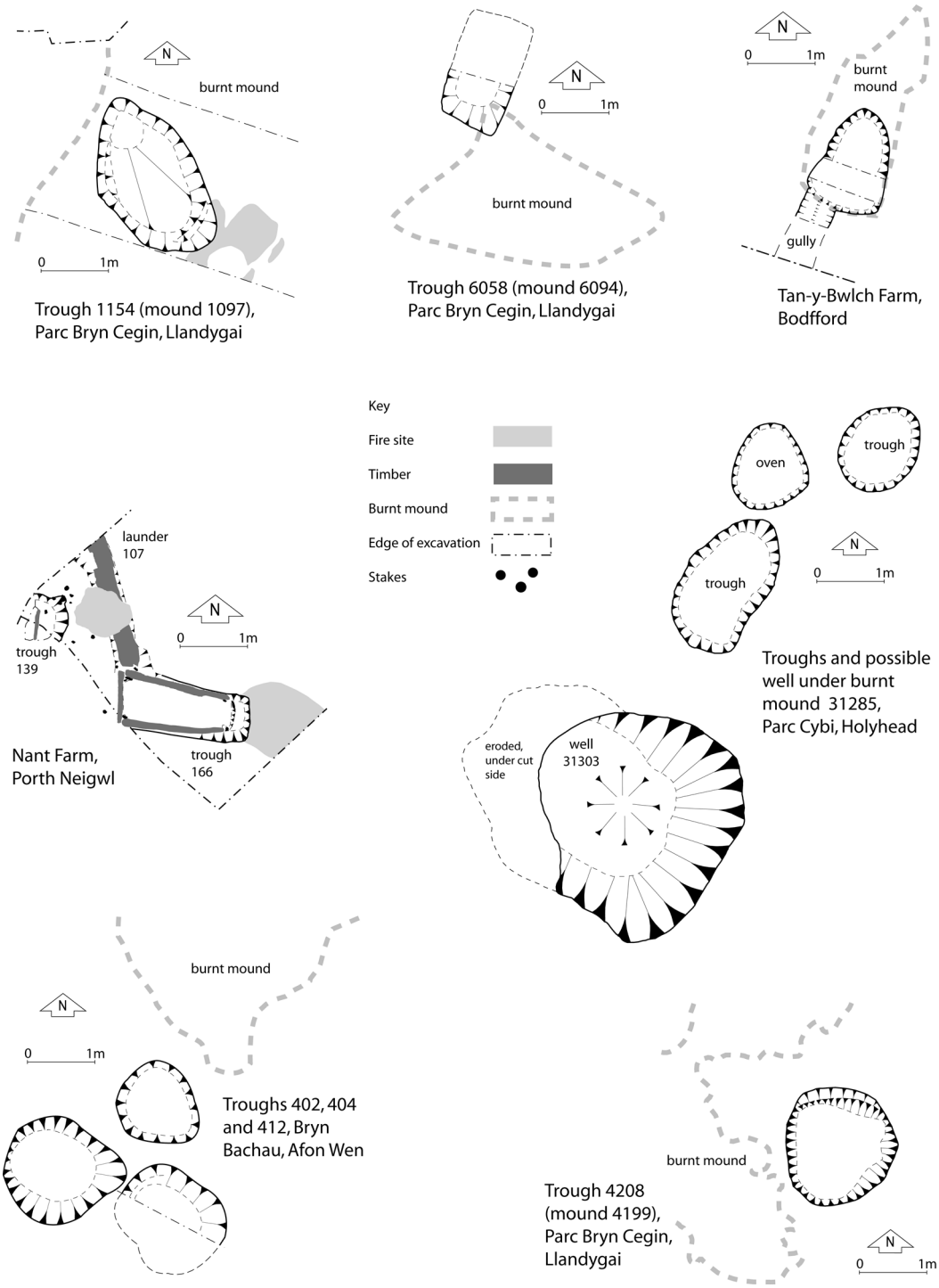

Fig. 2. Troughs associated with burnt mounds (see appendices for sources).

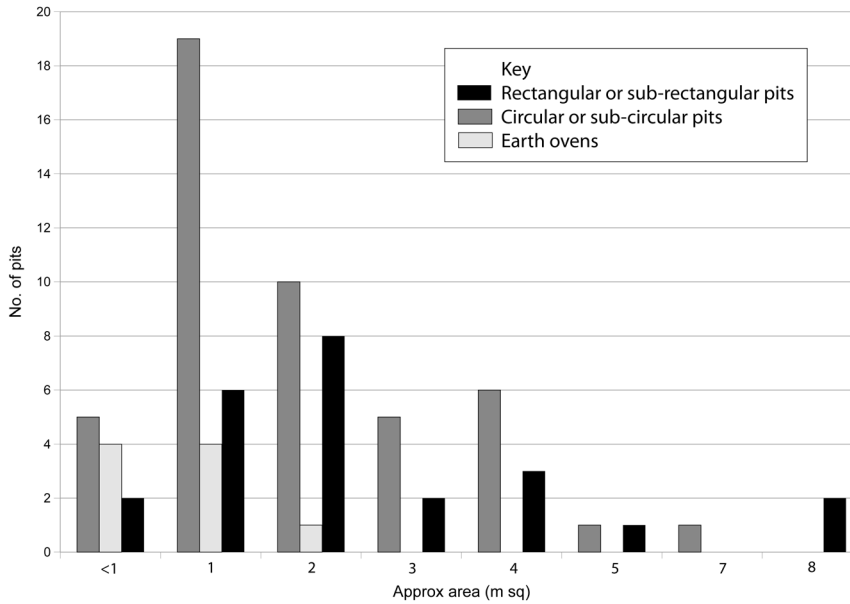

Fig. 3. Graph showing approximate areas of different types of burnt mound pits.

filled with burnt mound material continuous with that in the trough. This open end can be paralleled by the site of Killeens 1, Co. Cork (O'Kelly 1954, 129), where a short length of plank lay in a similar extension and was interpreted as a 'kneeler' for access to the trough.

Pits and earth ovens (Fig. 5)

Shallow pits or amorphous hollows are often found under burnt mounds, either along side troughs or apparently instead of them. It is difficult to judge how small a pit must be before it could no longer function as a trough. A particularly small burnt mound found at Parc Cybi had a sub-circular pit 0.64m in diameter. This had steep sides, a flat base and evidence of clay lining, suggesting that it functioned as a trough. A pit of the same size at Parc Bryn Cegin (under mound 5023) had a bowl-shaped profile, lacked a lining and was dug into well-drained gravel, making it unlikely to have held water.

Some pits have heat alteration of their sides and base and may contain unshattered heated stones. These are suggestive of ovens, and they can occur with typical troughs as at Parc Cybi. These indicate different activities taking place on burnt mound sites, all involving hot stones but not all requiring water.

Very similar earth ovens, often lined with clay, with hints of clay to seal the pit, and filled with burnt stone, are also found in isolation. Several were identified at Parc Bryn Cegin and some isolated pits at Parc Cybi seem to be of this type, although in this case none was lined. In some cases a layer of charcoal and heat alteration of the sides in the base of the pit suggested a fire lit inside it. The size of these pits is at the lower end of the scale for burnt mound pits (Fig. 3) but they are no smaller than many pits and troughs found with burnt mounds. The difference between a burnt mound pit and an

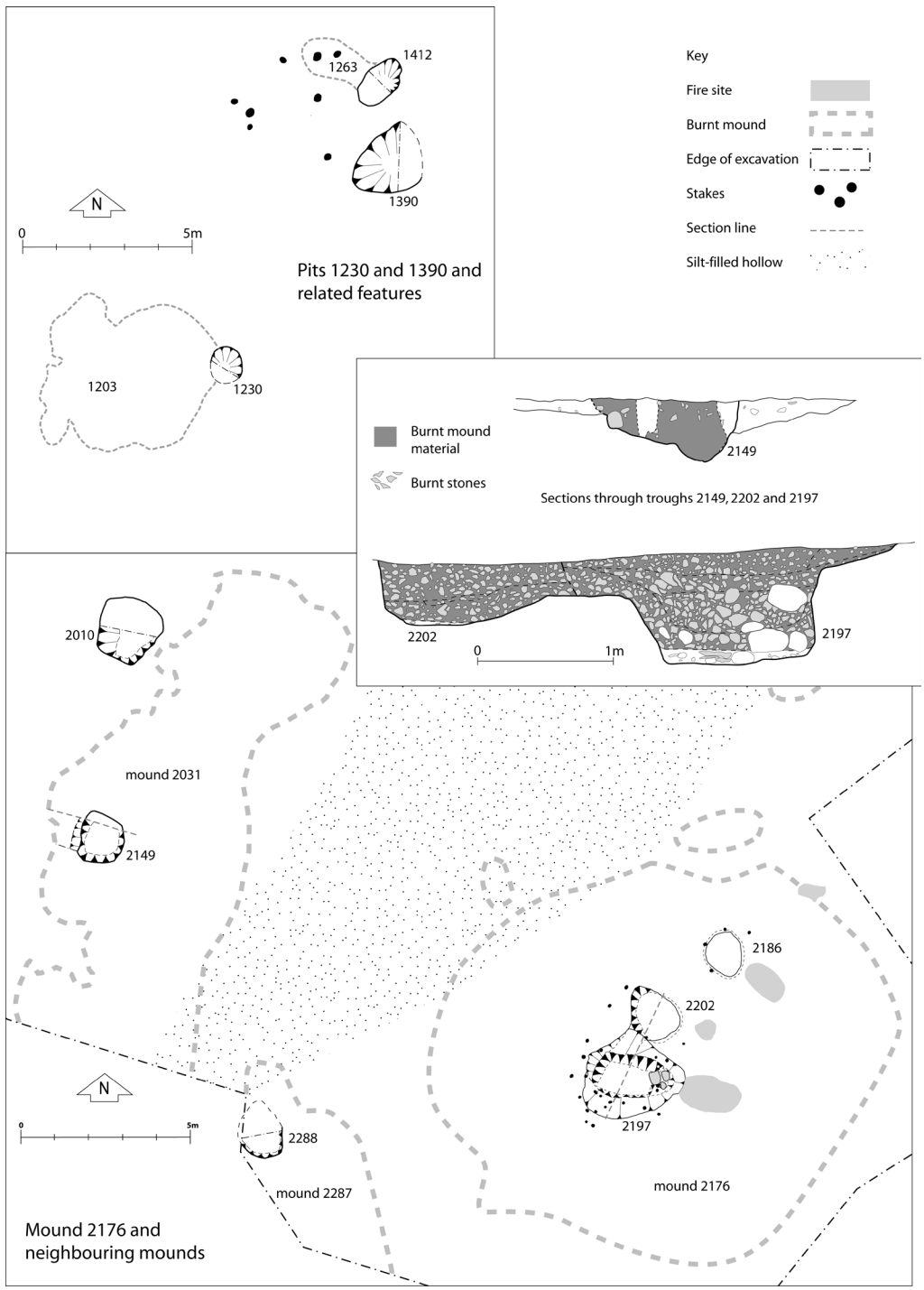

Fig. 4. More complex groups of features from Parc Bryn Cegin, Llandygai (after Kenney 2008a).

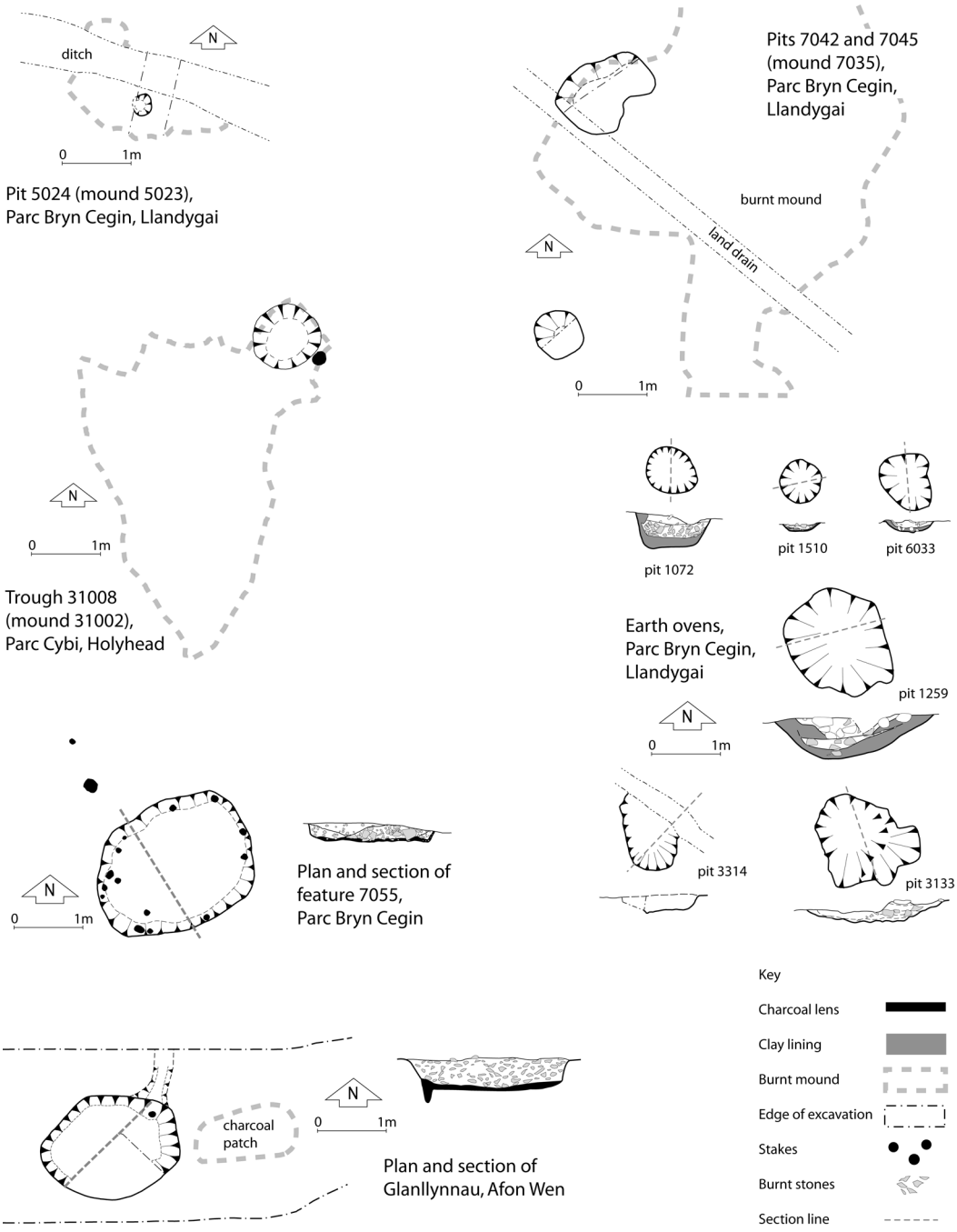

Fig. 5. Pits associated with burnt mounds and other features containing burnt stone (see appendices for sources).

earth oven seems to be largely determined by the presence or absence of a mound.

Wells

The rarest of the types of pits that can be found associated with burnt mounds are large pits that might be considered as wells. At Parc Bryn Cegin a pit over 0.7m deep was associated with an earth oven-type pit (1230), a pit lacking burnt stone and a stake structure (Fig. 4). The large pit (1390) was dug down to the present water table and seemed to have held water in the past. It is suggested that this pit was a well and this water source implies that one of the associated pits was a trough for heating water. An even more impressive example was found at Parc Cybi under a fairly typical burnt mound with 2 troughs and a probable oven (Fig. 2). This pit (31303) was 3m in diameter and 1.6m deep, dug into a water-bearing sand layer. It seems to have been recut at least once in its deep, well-like form and the sides had repeatedly collapsed due to water erosion. The pit was then backfilled with burnt mound material and recut at least twice more to form what may have been troughs, one possibly lined with stone. Similar features have occasionally been reported from sites in Ireland (e.g. Clashnevin 1, Tipperary, Ireland; Ronayne 2007).

Fire sites

As one of the main functions of burnt mounds seems to be to heat water with the addition of hot stones a fire must have been present. These do not always survive erosion of the site but can often be located. Hopewell and Smith (2010) noticed that some earthwork mounds have a second small heap of stone in the mouth of the crescent of the main mound. These may indicate the location of the fires in these well-preserved examples. On excavated sites fires are generally seen as areas where the natural subsoil has been burnt red and they often have a layer of charcoal over them, presumably representing the last use of the fire. The lack of structure suggests that these were not formal hearths but just fires built on the ground surface in a convenient position. They are usually very close to one end of the trough, and generally on the side away from the prevailing wind, presumably to prevent ash blowing into the fire, but also because a fire tends to move in the direction of the wind, and would risk spilling into the trough if on the other side. However, this is not always the case and at Bryn Cefni the fire site was to the south-west of the trough.

Structures and other features

A scatter of postholes and stakeholes are fairly common on carefully excavated sites. Most commonly they surround a trough or pit, such as those around pit M14 at Graeanog, near Llanllyfni, and around the three troughs under mound 2176 at Parc Bryn Cegin (Fig. 4). These sometimes form arcs and may have supported windbreaks or when very close to the edge of the pit may have held down a cover, perhaps in leather, to limit heat loss.

More coherent structures are also found. Postholes and stakeholes representing some kind of structure that seems to have burnt down were found on Anglesey under site 6 on the Shell Oil Pipeline (Rhosybol; White 1977). At Parc Bryn Cegin the well and pits discussed above were associated with a group of postholes surrounded and sealed by a charcoal spread, possibly representing a structure for drying or smoking.

In some cases the stakes seem to be more integral to the trough or pit. At Nant Porth it was suggested that the depth to which stakes were wedged into the ground around the inside of the trough might indicate that they supported a superstructure over the trough. At Parc Bryn Cegin a broad, shallow pit filled with burnt stone (7055) had stakeholes all around the inside of the cut. These stakeholes were angled so that the stakes would have met over the middle of the pit. A layer

of charcoal in the base of the pit suggests a fire and this feature may have been for smoking or drying rather than being a water trough. A rather similar pit, again with no associated burnt mound was found at Glanllynnau, Llanystumdwy. It also had a charcoal rich layer in the base but only one stakehole was found, and in this case the pit had a gully running into it so water might have been used in some part of the process (Fig. 5). At Parc Bryn Cegin slivers of charred oak characteristic of structural timber were found in the fills of the trough at mound 4199, possibly indicating the former the presence of a structure nearby. Alternatively old timbers might have been used as fuel. Stone structures are found in association with burnt mounds in the Northern and Western Isles but no such features have yet been recorded from Wales (Moore and Wilson 1999; Armit and Braby 2002).

A steep-sided gully defining a rectangular feature measuring 4.6m long by 2.2 to 2.0m wide was found 25m from a burnt mound at site C2/3 Cefn Cwmwd, Anglesey. It was suggested by Maynard (2011) that these features might have been related despite the lack of dating evidence from the rectangular gully. However, this feature closely resembles small gully-defined enclosures found at Parc Cybi, which produced post-medieval pottery and were interpreted as possible peat-drying features.

Some troughs have gullies running into and/or out of them. Some of these are quite short and their function unclear (e.g. Graeanog pits M12 and M14), but many seem to have been designed to carry water into and away from the troughs. Radiocarbon dates from two such channels at Bryn Cefni showed that they were probably contemporary with the trough, and the trough at Nant Porth had very similar gullies running into and out of it. It is possible that these may have been lined as a particularly well-preserved example was found at Nant Farm, Porth Neigwl. In this case a launder made of a single hollowed timber was laid to feed water into the end of the trough away from the fire. This launder was held in a shallow gully and fixed in place by wooden stakes.

LOCATION

In north Wales most burnt mounds were previously known from the fringes of the uplands, where they are preserved as earthworks, but it can now be seen that this distribution was purely the result of differential preservation. The number of mounds found on the lowlands during recent development archaeology, particularly the density of sites along the A55 route across Anglesey (Maynard 2011), demonstrates that burnt mounds were at least as common on the lowlands, and it may be that the earthwork sites represent only the upper margin of burnt mound distribution (Fig. 1). The scarcity of sites on the Llŷn Peninsula must solely be due to the lack of fieldwork there.

Access to water seems to be the main factor in the location of the mounds, although this can be where groundwater is close to the surface, as at Parc Bryn Cegin, or where it is within reach of a well, as at Parc Cybi. More commonly burnt mounds are located adjacent to streams, although these may no longer be extant and are visible in excavations as infilled palaeochannels.

Mounds seem to be often concentrated in specific areas, perhaps because of a reliable water source. At Nant Farm, Porth Neigwl the farmer had noticed several probable burnt mounds nearby during ploughing. Gwalchmai seems to be a focus for burnt mounds (Davidson 1998a), many mounds are found near the excavated example at Graeanog (Kelly 1992) and there is a particular concentration in the Llanfairfechan area. The dates from Parc Bryn Cegin demonstrate that a group of mounds had developed sequentially over more than a thousand years.

The proximity of burnt mounds to settlements is usually difficult to assess without excavation. Upstanding settlements visible in the uplands are generally assumed to post-date the mounds and

slight, earlier settlement may be impossible to detect without excavation. Hopewell and Smith (2010) found that only 14 per cent of burnt mounds had known prehistoric settlement of any sort nearby and that most were in areas lacking traces of settlement and apparently unsuitable for settlement. The scarcity of finds on burnt mound sites also argues for their isolation from settlements; however, burnt stone deposits are found on settlement sites of many periods, occasionally in combination with troughs or pits (Barber 1990a; Barfield 1991; Benson *et al.* 1990), so the definition of burnt mounds as isolated areas of a very specific activity are critical in this context.

Where large area excavations have been carried out the isolation of burnt mounds has been supported. At Parc Bryn Cegin, Llandygai and Parc Cybi, Holyhead extensive areas around the burnt mounds were investigated and no associated settlement was found. The need for a wet location for the mounds probably resulted in them normally being removed from the close proximity of settlement. However, repeated reuse of the mounds must indicate that they were not remote from settlement sites, and cereal pollen from the mound at Felin Fulbrook, Ceredigion suggests close proximity to arable land (Williams *et al.* 1987). Only one mound is known from above 400m above sea level and it has been suggested that this distribution is related to the availability of wood for fuel (Hopewell and Smith 2010). The current author believes that burnt mounds indicate, in a general way, the area of settlement; an interpretation also suggested in studies elsewhere (Hedges 1975; Ehrenberg 1991; Moore and Wilson 1999). Occasionally, excavated sites across Britain and Ireland have been found adjacent to possibly contemporary settlement of differing sizes (Strachan *et al.* 1998; Pryor 2004, 312, 289–93; Sheehan 1990). At Waun Llanfair above Llanfairfechan platform settlements have been identified close to some burnt mounds but excavation would be required to test whether they are associated (Hopewell and Smith 2010).

FINDS

The common assumption that no finds are ever recovered from burnt mounds is incorrect, although the numbers are not great. There were small numbers of flints from the Parc Bryn Cegin mounds including a knife on fine imported flint. A leaf-shaped arrowhead was found under the small burnt mound at Parc Cybi, along with a few other flint flakes. A recut (pit 31413) in the top of the infilled well associated with the large mound at Parc Cybi contained two worked flints including a thumbnail scraper. Fifteen pieces of chert were recovered from around the mound at Graeanog, but only one had been deliberately flaked (Kelly 1992, 87). Mound PRN467 at Waun Llanfair produced a thumbnail scraper which was burnt and seems to have been directly associated with the activity. At Pen y Fan Agosaf, Llanddyfnan an early Mesolithic microlith was recovered from the mound but this is assumed to be residual (Gwyn 1996a).

Three mounds at Parc Bryn Cegin produced small fragments of pottery, possibly Late Neolithic or Bronze Age. Small, unidentifiable fragments of pottery were also found at Penciw, site 2, but the pot sherd from the Rhosybol mound was more substantial. This is described as a Bronze Age rim sherd with twisted cord-impressed decoration, and the illustration suggests it came from a vessel 260mm in diameter. The sherd was found sealed beneath the mound so its context cannot be in doubt (White 1977, 471–2). The Graeanog mound also produced a sherd of probably Early Bronze Age pot. Three conjoined sherds formed part of the wall of a round-bodied vessel in a hard fabric with a grey core and pinky-buff surface (Green 1992).

The small piece of slag from Penciw, site 3, led to the interpretation of all the burnt mounds on the Rhosgoch to Stanlow Shell oil pipeline as metalworking sites (White 1977). However, the slag

might have been intrusive, as was surely the piece from the Rhosybol mound. The latter is described as having a volume of only 1 cubic centimetre (White 1977, 471) and could have easily worked its way into the pit fill.

The earth ovens at Parc Bryn Cegin had similarly sparse finds with two fragments of pottery from one and a flint blade on fine imported flint from another. A flake of Graig Lwyd stone was recovered from near but not within another. An earth oven at Parc Cybi (pit 31306) produced undiagnostic pot sherds as well as some flint flakes.

ECOFACTS

Almost all burnt mounds produce quantities of charcoal, although it is not always identifiable. At Parc Bryn Cegin both oak and hazel was found but there was no correlation between the date of the mound and the fuel used. In some the temperature was high enough to produce fused fuel ash. Charred hazelnut shells were also present but in low numbers suggesting they had been introduced attached to the fuel branches. If this is correct it suggests at least some uses of the mounds occurred in autumn. The earth ovens at this site also used hazel and oak as fuel, with a general preference for hazel and again no correlation with the date of the features. Occasional hazelnut shells again probably introduced with the fuel were also present, but pit 1072 produced eleven charred fragments of hazelnut shell. This may indicate the consumption of nuts at this site (Schmidl *et al.* 2008).

In general it seems that the closest fuel source was used for burnt mounds, so that in wetter environments, such as at Nant Farm, alder was the fuel and on drier land, such as at Llandygai, hazel or oak might be available. At Bryn Cefni the lack of oak from the burnt mound material and presence of ash seems to have reflected the local geology. The predominance of birch charcoal in the upper fill of pit M11 at Graeanog and ash charcoal in the lower fill suggests two separate events using different fuel sources (Thompson 1992). The predominance of hazel on most sites may indicate coppicing making small easily harvested stems available for fuel. Thompson (1992) suggests hazel, alder and ash, which all colonise cleared areas, are indicative of secondary regeneration of a gradually deforested landscape. The presence of blackthorn at Graeanog is particularly indicative of this and the pollen analysis from this site also indicated secondary woodland and human disturbance with arable agriculture nearby (Chambers 1992). However, the narrow rings of charred twigs from Bryn Derwen, Conwy Valley and Bryn Bachau, Llanystumdwy suggested old natural or semi-natural woodland rather than coppice (Denne 2008; Davidson *et al.* 2007).

At Parc Bryn Cegin one mound (1097) produced six charred grains of barley, one grain of emmer wheat and one unidentifiable cereal grain. Another (2176) produced a single unidentifiable grain. Although the numbers are low and probably do not indicate the processing of cereal on site, they do indicate its presence, possibly being used in a way that meant the grains were rarely charred. Earth oven 1072 was the only earth oven at Parc Bryn Cegin to produce grain, with one charred grain of barley and one of wheat.

Nant Farm, Porth Neigwl also produced evidence of cereals. In this case most of the material was chaff, suggesting the use of grain-processing waste as a fuel for the fire, with the few grains present probably accidentally introduced with the chaff. The best-preserved trough excavated on this site also produced a range of waterlogged seeds and invertebrate remains indicating stagnant water and probably indicating that the trough was left open after abandonment and slowly infilled (Schmidl *et al.* 2009).

Bone survives poorly on Welsh sites of all periods due to the generally acidic nature of the soils

across the country. Soils in wet areas are even more likely to be acidic and less likely to preserve bone. However, fragments of a cattle tooth survived in the base of the trough at Bryn Cefni and two fragments of burnt bone were recovered from Nant Farm. Tiny unidentifiable fragments of burnt bone were also found within the mound at Graeanog (Kelly 1992, 87). It might be expected that burnt bone would be found more frequently as this is preserved under most pedological conditions, but is rarely recovered.

A study by Dr Stephen Davis of insect remains from burnt mounds across Britain has not yet been published but generally assemblages were 'quite natural looking with little indication of human activity' (Stephen Davis, University College Dublin, pers. com.). It was hoped that parasite or other remains might give an indication of the materials and processes within the troughs, but this hope seems not to have been fulfilled.

DATES

Burnt mounds were assumed to be Bronze Age from their first recognition in Wales, dated by comparison to finds from Irish examples (Baynes 1913) and from very occasional finds on Welsh sites (White 1977), although as recently as 1991 their dating was uncertain enough to allow an attribution to the Iron Age (Lynch 1991). However, in 1990 a rigorous study of radiocarbon dates from sites across Ireland and Britain demonstrated burnt mounds to be a Bronze Age phenomenon (Brindley *et al.* 1990). Since then Late Neolithic dates have increasingly been obtained in both Britain and Ireland (Kenney 2008a, 64–65), with occasional early Neolithic dates (Connolly 2001, 12). At the other end of the range Scotland and the Isle of Man have some Iron Age mounds (Russell-White 1990; Hedges *et al.* 1995), and there are rare later dates extending into the medieval period, some but not all unreliable (Ryan 1990, 46; Brindley *et al.* 1990, 28; Russell-White 1990, 91; Walsh 1990).

There are now 98 radiocarbon dates available from 44 sites (including earth ovens) from north-west Wales, but there are some problems with these dates. Thirty-six per cent of the sites have only a single date, preventing any assessment of the full period of use of these mounds or the identification of contamination. Awareness of the need for better dating means that recent projects have acquired at least two dates per mound with 18 per cent of sites having three dates or more (nine dates being the maximum). Many of the dates are on bulk samples of unidentified charcoal and must include some old wood effect. The comparison of the dates from the oak planks and ash plank from Nant Porth, Bangor, suggests an old wood effect on the oak planks of possibly 200 years, but again more recent projects are taking greater care in the selection of sample material.

The dates are presented in Figure 6 and details are given in Appendix 1. A very early date was obtained from charcoal beneath the Graeanog mound, but this relates to activity prior to the use of the mound. The earliest date for a burnt mound is of 3490–3120 cal. BC to 3340–3020 cal. BC from a mound at Parc Bryn Cegin. This was dated with two fairly consistent dates and there is no reason to consider mid Neolithic burnt mounds to be impossible. Although not yet dated, the leaf-shaped arrowhead from under the small burnt mound at Parc Cybi may indicate a Neolithic date for that mound.

The number of dated mounds from Parc Bryn Cegin provides a microcosm of burnt mound use across the region, as almost the full date range was present on this one site. The first peak of burnt mound activity at Parc Bryn Cegin was from 2490–2290 cal. BC to 2290–2020 cal. BC and this fits well with the earliest dates from other Welsh mounds. At Parc Bryn Cegin and the region at large

burnt mounds were used throughout the Bronze Age. The two latest dates from Parc Bryn Cegin are open to some doubt as they are not supported, but activity here could continue as late as 1120–900 cal. BC. The latest activity at Graeanog is securely dated to the very end of the Bronze Age and single dates from Glyn and Glanllynnau support similarly late activity. The single dates from Cefn Gwyn and Caergeiliog (site DA5b) could be seen as taking the use of the mounds into the early Iron Age, but they would fit as well with late Bronze Age use. The majority of burnt mound activity in north-west Wales can therefore probably be summarised as starting shortly after 2500 cal. BC and probably ending by 800 cal. BC, with a hint of earlier activity. Burnt mounds therefore demonstrate continuity across the Neolithic/Bronze Age transition, and start in a social context that includes henges and cursus monuments.

There are a small number of later dates. The latest date from pit 7055, Parc Bryn Cegin, is interpreted as being on an intrusive cereal grain and is discounted as a date for the feature. The early medieval date from the pit under the mound at Holyrood, Bryngwran (site DA3) was on gorse or broom that could have been used as fuel, but as a single date it must remain in doubt, and might also be intrusive, possibly from scrub clearance. In south Wales a mound at Dan-y-Coed produced an Iron Age date and one at Morfa Mawr was dated to the early medieval period by a single radiocarbon date (Williams 1985; 1990), but late dates seem to be very rare and usually in some doubt.

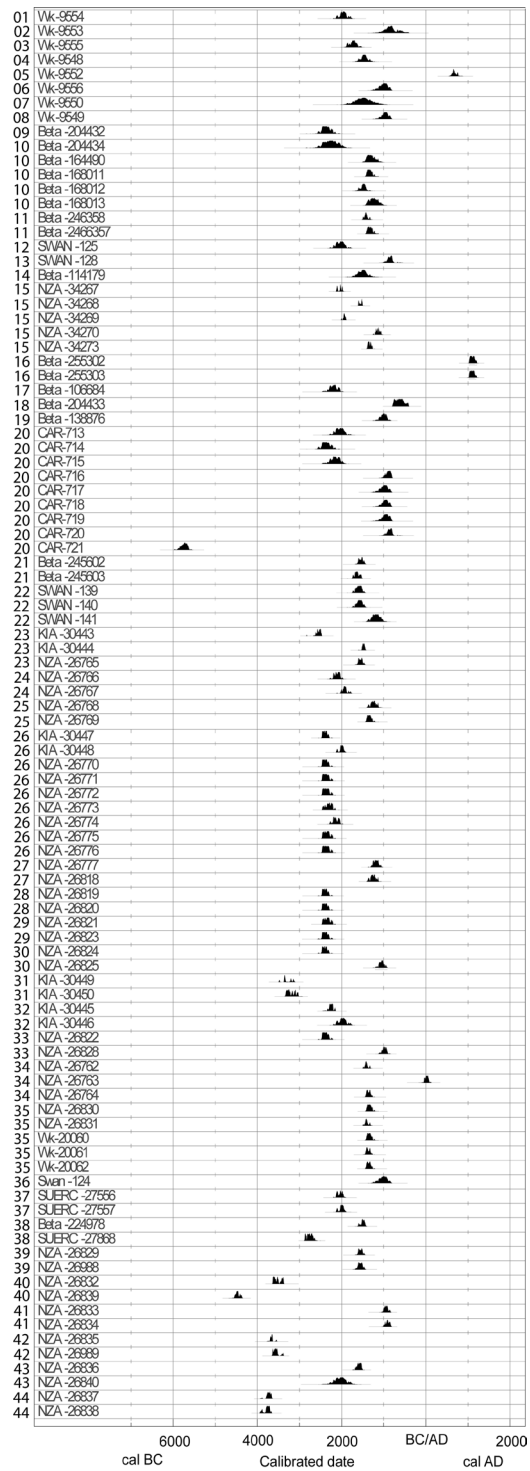

Fig. 6. Graph of radiocarbon dates from burnt mounds and related features in north-west Wales. Numbers on left side refer to sites in Appendix 1. Created using OxCal v3.10 Bronk Ramsey (2005), with atmospheric data from Reimer *et al.* (2004).

The two latest dates on Figure 6 are very consistent, are not in doubt, and provide a warning against assuming that all burnt mound material is prehistoric. In the base of evaluation trenches in the Deanery Yard, Bangor Cathedral, burnt mound-type material was found. This was quite typical except for the presence of animal bone, including butchered pieces, but the two dates produced from the site were returned as cal. AD 1020–1210. These dates were statistically indistinguishable, suggesting that the material was not of mixed age and that this medieval date must be accepted. The unusual presence of butchered bone also supports this. The construction of the cathedral started around AD 1120 and timber piles possibly related to or preceding the construction of the Bishop's Palace have been dated to AD 1120–1121 by dendrochronology. It is possible that the 'burnt mound' was contemporary with these construction projects and may have helped feed the builders (Smith forthcoming).

The small number of dates from most mounds means that it is difficult to study the duration of use of single mounds. However, a few sites do provide some indication of duration and phases of use. Five dates were obtained from Clynnog site 2, and these show that a pit immediately east of the burnt mound trough was much later than the primary activity associated with the mound. The duration of the latter could be estimated using Bayesian modelling to provide a start date of probably 2375–1950 cal. BC and an end date of 2025–1610 cal. BC (95% probability; Marshall forthcoming). The nine dates from Graeanog revealed two distinct, short periods of use separated by up to a thousand years. Each phase had its own trough and the date of a third trough was difficult to establish because of reworking of old material. The four dates from Bryn Cefni indicate a single phase of fairly short duration, relating to the single trough at this site.

At mound 2176, Parc Bryn Cegin the nine dates failed to identify any chronological differences between the three troughs, despite stratigraphic evidence that one trough cut the fill of another. However modelling of the dates gave a start date for the activity of 2570–2370 cal. BC and an end date of 2390–2010 cal. BC (95% probability). This suggests a duration of use of probably 80–260 years (at 68% probability; Marshall 2008). In human terms this represents long-term use and makes it probable that the troughs were sequential, but it rules out reuse at widely separated periods. The general area, however, was repeatedly reused with surrounding mounds (Fig. 4) taking the dates through to the end of the Bronze Age. The hydrological conditions of this location must have made it particularly suitable for burnt mounds, despite the lack of running water, although the visible presence of earlier mounds may also have attracted later activity.

Some of the earth ovens from Parc Bryn Cegin can be seen to pre-date even the earliest burnt mounds, and they might be taken to represent the only surviving evidence for temporary early Neolithic settlements. Some of the ovens do fall within the period of the main Bronze Age use of the burnt mounds and, while they may represent smaller scale events, the technology used seems to be interchangeable with activities being carried out on the burnt mounds.

FUNCTION

It is generally accepted that stones were heated in a hearth and then transferred to a water-filled trough to heat the water, being discarded to form the mound once they had shattered into pieces too small to be used. It is the purpose to which the heated water was put that is contentious. Any explanation must account for specific features of these sites. The trough, carefully dug with some effort, often carefully lined and centrally placed, was a principal part of the site's function, not incidental. The size of the mounds suggests that the water in the trough was raised to boiling point

and kept boiling for some considerable period of time. None of the many ethnographic examples of bathing and saunas listed by Barfield and Hodder (1987) required such a trough, especially when there was often a stream nearby. Most of the suggested industrial uses of hot stones either do not require a trough or would produce relatively few shattered stones. Dying or fulling are possibilities (Jeffery 1991), but they do not require boiling water and it is doubtful that they would have produced the recorded quantities of shattered stone. They also require clean running water, which was not available at all burnt mounds, such as those at Parc Bryn Cegin.

White in 1977 was convinced that the sites he excavated on Anglesey could have been used for metalworking despite the very small quantity of slag found. The experimental copper smelting he described (White 1977, 475–6) would have produced very different archaeological remains to those that he found, and this interpretation has generally been disregarded. At Parc Bryn Cegin and Parc Cybi residue samples from wet sieving were searched for small fragments of slag and other metalworking waste with no success (Kenney 2008a).

The interpretation of burnt mounds as cooking places comes originally from Ireland where they have traditionally been called *fulachta fiadh* or *fulachta fian* ('cooking places of the wild/of the deer' and 'cooking places of the roving hunters/warriors or Fianna' respectively; O'Kelly 1954). Ó Drisceoil (1990) warns about the late and confused nature of these terms, but some of the Irish tales, although written down in the seventeenth or eighteenth centuries, contain detail that corresponds very closely with excavated examples. These particularly include Keating's *Forus Feasa ar Éirinn* and 'The Romance of Mis and Dubh Ruis' (quoted at length in Ó Drisceoil 1990) that refer to both cooking and bathing in troughs. The descriptions are so close to the observed archaeology that either a later medieval practice was being applied anachronistically or they record genuine memory of more ancient practices. Although there are records of sweat baths in post-medieval Ireland (Barfield 1991), there seems to be little evidence of the late use of burnt mound-type sites. However, the thirteenth-century AD Waterford example (Walsh 1990) and the burnt mound material from Deanery Yard, Bangor does show that this technology was sometimes still used for cooking in the medieval period, and the ancient sites might have been interpreted through medieval experience.

Numerous experiments of a more or less formal nature into the use of burnt mounds have demonstrated that this was an effective way of cooking meat (O'Kelly 1954; James 1986; Ó Drisceoil 1988; Allen 1994). The process also produces exactly the sort and quantity of burnt stone debris found on the archaeological mounds.

The main argument against the cooking of meat is the almost total lack of bones from the sites. Howeversome sites in Ireland have produced bone as for example at Fahee South, Co. Clare (Ó Drisceoil 1988) and Mullamast, Co. Kildare (Stephenson 2007) and ten burnt mounds along the Carlow Bypass section of the N9/N10 road scheme, Co. Carlow (Tourunen 2007). On some of the latter sites the quantity and range of bones present indicated that animals were slaughtered and butchered on site. Mammal and fish bones from the trough of a burnt mound at Meur, Sanday, Orkney were confidently interpreted as evidence for cooking (Toolis 2007). The cattle tooth from Bryn Cefni, Llangefni, and burnt bone from Nant Farm and Graeanog hint at the possibility of bone survival on Welsh sites. Soil acidity must play a role in the lack of bone on these usually waterlogged sites; even at Fahee South, located on limestone, Ó Drisceoil (1988) found only robust bones. However, this cannot explain the lack of bones on all sites; the soil acidity at Cob Lane, Bournville was tested and found to be neutral (Barfield 1991, 60).

Barber (1990b) has suggested that meat may have been prepared and consumed away from the burnt mound and no bones or other debris would necessarily be discarded on the site. The isolation of the burnt mound from settlement or food preparation activities could also explain the rarity of

artefacts on these sites. Finds where they occur are usually a few flint flakes or very occasional pot sherds, with the exception of some Scottish and Irish sites where hammerstones and stone 'pot lids' are common finds (Hedges 1975; Cherry 1990; O'Kelly 1954). The site at Tangwick, Shetland (Moore and Wilson 1999) provides a contrast as it produced significant quantities of pottery, the spalling damage on which suggested they had been used for cooking.

Small-scale cookery as might take place on a daily basis on settlement sites is more efficiently done using a hide to hold the water or in dry ovens. The time and labour expended in creating and using large troughs would only be justified when large quantities of meat were to be cooked. It is possible therefore that mounds with troughs could indicate larger aggregations of people and feasting. The latter seems to be most graphically illustrated by a burnt mound at Bestwall, Dorset (Ladle and Woodward 2003). This was associated with the demolition and abandonment of a roundhouse and the artefacts, including large pottery vessels, suggest the use of the mound for feasting, perhaps to mark the end of the house. Seasonal curing and preservation of meat might also provide a reason for the expenditure on trough construction (Roycroft 2006).

Most mounds have no evidence for the consumption of plant foods. The small number of charred hazelnut shells probably indicates their introduction with fuel wood and occasional single cereal grains may be incidental or intrusive. However, the eight charred grains recovered from mound 1097 at Parc Bryn Cegin show that cereals were present and presumably being used in some way on the site. Most of the cereal remains at Nant Farm were chaff that might have been used as fuel. It seems unlikely that chaff would have been transported any distance specifically for use on the fire, so this presumably suggests cereal processing on the site. Very few sites in Ireland report the recovery of charred grain but a quern stone was found buried in a timber-lined burnt mound trough at Site 43, Ballyduff East, Co. Waterford (Hegarty 2005), suggesting at very least that the mound was in the proximity of food-processing activities.

Recent experiments with beer making in troughs suggests a possible role for cereals on these sites (Pitts 2010; Quinn and Moore 2008; Wilkins 2011). For brewing the water must boil for at least 3 minutes to sterilise the trough and the mash must be kept at between 60–70°C for about an hour (David Chapman, Ancient Arts, pers. comm.). This on its own might not be enough to account for the largest mounds of shattered stone but would contribute in association with the boiling of meat. The cereal grains would not normally risk carbonisation during this process but the chaff might very well be disposed of on the fire. Brewing might have preceded the cooking of quantities of meat as part of the preparations for a feast.

Some pits under burnt mounds have evidence for fires in their bases and seem not to have been troughs for water. These are very similar to the isolated earth ovens discussed above. The identification of such features as oven—for dry cooking sealed within the pit—comes from ethnographic parallels. Similar technology is still used for cooking in Polynesia and Australia (Hurl 1990; Wright 2000), and there are ethnographic records from Canada (Campling 1991).

The presence of these ovens on burnt mound sites supports the suggestion that cooking was one of the main functions of these sites. The first use of these ovens seems to pre-date the development of burnt mounds but the technology was available for application to burnt mound sites. The scarcity of finds from these sites and the similarity of the few finds that do occur to those from burnt mounds implies a similar separation from longer term settlement. There are also similarities in the ecofacts recovered from the ovens and from burnt mounds, although pit 1072, Parc Bryn Cegin, may indicate the consumption of hazelnuts, not attested from burnt mounds.

CONCLUSION

The dates for burnt mounds in north-west Wales are starting to form a fairly clear pattern with a late Neolithic start but very little evidence for classic burnt mounds later than the Bronze Age. Future discoveries might well change this but only if good quality radiocarbon dates are obtained. More work is still needed on the function of the mounds. Samples of charred plant remains need to be collected as routine from these sites for both adequate dating and detection of cereal grains and other evidence. Insect remains seem not to hold the answer to the question of function, but might still be worth investigating where preservation is good. The occurrence of burnt stone in other features convincingly related to cooking and the presence of some of these features, such as earth ovens, on burnt mound sites supports the probable function of burnt mounds as cooking places. This function has been widely demonstrated as viable by experiment and can now perhaps also be linked to brewing. The two together would be appropriate for feasting, when larger scale cooking might require the use of different techniques to everyday cooking. Perhaps the most important issue is to clarify the relationship of burnt mounds to settlement and this could be achieved by large-scale development archaeology in combination with more targeted studies of upland areas such as Waun Llanfair in north-west Wales where contemporary settlement might be relatively easy to detect.

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APPENDIX 1
EXCAVATED BURNT MOUNDS AND EARTH OVENS IN NORTH-EAST WALES WITH ASSOCIATED RADIOCARBON DATES

The leading numbers in the following catalogue refer to Figure 6. PRNs refer to record numbers in the regional Historic Environment Record maintained by Gwynedd Archaeologial Trust.

BURNT MOUNDS AND SIMILAR SITES

1. A55 Anglesey DBFO Scheme Caergeiliog (site DA5a), Caergeiliog, PRN 31814, SH 3164 7876, (Maynard 2011)
   Birch, oak, hazel and alder from fill of pit F2, Wk-9554: 3600±61 BP (2140–1760 cal. BC)

2. A55 Anglesey DBFO Scheme Caergeiliog (site DA5b), Caergeiliog, PRN 31813, SH 3163 7874, (Maynard 2011)
   Birch, oak, hazel and alder from fill of pit F19, Wk-9553: 2672±117 BP (1150–400 cal. BC)

3. A55 Anglesey DBFO Scheme Caergeiliog (site DA5c), Caergeiliog, PRN 31812, SH 3161 7870, (Maynard 2011)
   Oak sapwood from pit fill, Wk-9555: 3420±58 BP (1890–1580 cal. BC)

4. A55 Anglesey DBFO Scheme Cefn Cwmwd (site C2/3), Cefn Cwmwd, PRN 31838, SH 4311 7411, (Maynard 2011)
   4 cereal grains from lower portion of mound, Wk-9548: 3187±77 BP (1640–1290 cal. BC)

5. A55 Anglesey DBFO Scheme Holyrood (site DA3), Bryngwran, PRN 31821, SH 3612 7672, (Maynard 2011)
   Gorse or broom from fill of pit F19, Wk-9552: 1356±59

BP (cal. AD 560–810)

6. A55 Anglesey DBFO Scheme Penmynydd (DA7a), Bodedern, PRN 31815, SH 3210 7853, (Maynard 2011)
   Charcoal from fill of pit, Wk-9556: 2828±73 BP (1220–820 cal. BC)

7. A55 Anglesey DBFO Scheme Waen Hir (site C14b), Llangristiolus, PRN 31841, SH 4451 7419, (Maynard 2011)
   Ash and hazel from centre of mound, Wk-9550: 3206±157 BP (1900–1000 cal. BC)

8. A55 Anglesey DBFO Scheme Waen Hir (site C14c), Llangristiolus, PRN 31840, SH 4446 7413, (Maynard 2011)
   Birch and hazel from fill of pit F301, WK-9549: 2806±61 BP (1130–820 cal. BC)

9. Bryn Bachau, Afon Wen, Llanystumdwy, PRN 31151, SH 4326 3713, (Berks *et al.* 2008, 9–11; Davidson *et al.* 2007)
   Hazel and oak from charcoal (275) on burnt mound, Beta-204432: 3890±70 BP (2550–2540 and 2490–2140 cal. BC)
   Hazel and oak from primary fill of pit 402, Beta-204434: 3810±120 BP (2580–1910 cal. BC)

10. Bryn Cefni, Llangefni, PRN 16073, approx. SH 469 750, (Smith and Kenney 2002; Kenney 2002)
    Hazel charcoal from base of pit (11), Beta-164490: 3050±70 BP (1460–1080 cal. BC)
    Charcoal (short-lived species) from fill of gully (13), Beta-168011: 3060±40 BP (1430–1210 cal. BC)
    Charcoal (short-lived species) from fill of gully (15), Beta-168012: 3210±60 BP (1630–1380 cal. BC)
    Charcoal (short-lived species) from basal fill of pit (11), Beta-168013: 3000±70 BP (1420–1020 cal. BC)

11. Bryn Derwen, Llanrwst, PRN 31846, SH 80861 59755, (Maynard 2008)
    Alder charcoal, from (114), fill of pit 113, Beta-246358: 3140±40 BP (1450–1300 cal. BC)
    Hazel charcoal, from (115), fill of pit 104, Beta-2466357: 3050±40 BP (1420–1250 and 1240–1220 cal. BC)

12. Bryn Goleu (sites 9, 10, 11), Gwalchmai, PRN 31797, SH 3901 7768, (Davidson 1998a, 51–2)
    Charcoal from burnt mound material (site 11), SWAN-125: 3650±70 BP (2210–1810 cal. BC)

13. Cefn Gwyn (site 13), Bodedern, PRN 31798, SH 3674 7962, (Davidson 1998a, 52)
    Charcoal from burnt mound material, SWAN-128: 2680±70 BP (1020–660 cal. BC)

14. Cefn Hendre, Llanwnda, SH 4798 5767, (Richards 1997, 4–5)
    Charcoal from burnt mound, Beta-114179: 3220±100 (1740–1260 cal. BC)

15. Clynnog Fawr (site 02), Clynnog Fawr, SH 4125 4957, (Roberts 2007, 129; Roberts forthcoming)
    Charcoal, hazel, from the mound (0110), NZA-34267: 3661±15 BP (2130–1975 cal. BC)
    Charcoal, hazel, from hearth (0111), NZA-34268: 3268±15 BP (2035–1935 cal. BC)
    Charcoal, *alnus*/*corylus*, from the primary fill (0119) of the trough, NZA-34269: 3586±15 BP (2015–1885 cal. BC)
    Charcoal, *alnus*/*corylus*, from the primary fill of pit (context 0121), NZA-34270: 2928±15 BP (1215–1050 cal. BC)
    Charcoal, hazel, from the tertiary fill of pit (context 0121), NZA-34273: 3050±15 BP (1395–1260 cal. BC)

16. Deanery Yard, Bangor, SH 5802 7203 (Smith 2007; Smith forthcoming)
    Charred hazelnut shell, from layer 545, fill of gully in trench 2, Beta-255302: 920±40 BP (cal. AD 1020–1210)
    Charred twig of *salix*/*populus*, from burnt mound layer 548, in trench 5, Beta-255303: 930±40 BP (cal. AD 1020–1210)

17. Figin Fawr, Llanddona, SH 5130 8472, (Smith 1997, 57; Smith 1998)
    Charcoal, from mound, Beta-106684: 3770±60 BP (2350–1985 cal. BC)

18. Glanllynnau, Afon Wen, Llanystumdwy, SH 4503 3774 (Berks *et al*. 2008, 12–14; Davidson *et al.* 2007)
    Bulk charcoal sample, mostly hazel, from lower fill (343) in pit, Beta-204433: 2490±50 BP (1280–970 cal. BC)

19. Glyn, Llanbedrgoch, SH 517 809, (Redknap 2004, 149)
    Charcoal from the mound, Beta-138876: 2840±50 BP (1200–840 cal. BC)

20. Graeanog, Clynnog, PRN 129, SH 4616 4945 (Kelly 1992, 84, 85)
    Charcoal from pit M12, CAR-713: 3660±70 BP (2280–1870 cal. BC)
    Charcoal from pit M12 (from same sample as CAR-713), CAR-714: 3890±70 BP (2570–2140 cal. BC)
    Charcoal, over half oak, lowest layer but one in the mound, near pit M12, CAR-715: 3740±70 BP (2410–1940 cal. BC)
    Charcoal from base of pit M11, CAR-716: 2740±60 BP (1020–790 cal. BC)
    Charcoal, hazel/alder, birch and ash, from charcoal rich layer on stream bed, partially sealed by mound and associated with central pit M14, CAR-717: 2820±70 BP (1210–820 cal. BC)
    Charcoal, nearly half birch, from the top of pit M14, CAR-718: 2800±60 BP (1120–820 cal. BC)
    Charcoal, hazel/alder, birch and ash, from the middle fill of pit M14, CAR-719: 2790±70 BP (1130–800 cal. BC)
    Charcoal, from the lowest fill of pit M14, CAR-720: 2690±70 BP (1020–760 cal. BC)
    Charcoal, from a burnt deposit cut by pit M14, CAR-721: 6840±80 BP (5910–5610 cal. BC)

21. Nant Farm, Porth Neigwl, Llanengan, PRN 27509, SH 290 257 (Smith 2008; Smith 2009)
    Charred alder twig, from burnt mound, Beta-245602: 3260±40 BP (1610–1420 cal. BC)
    Oak heartwood timber from the trough, Beta-245603: 3350±40 BP (1740–1520 cal. BC)

22. Nant Porth, Bangor, SH 571 722 (Davidson 1998b)
    Oak plank, from base of trough, SWAN-139: 3310±60 (1740-1450 cal. BC)
    Oak plank, from base of trough, SWAN-140: 3290±60 (1730–1430 cal. BC)
    Ash plank, from base of trough, SWAN-141: 2960±60 (1380–1000 cal. BC)

23. Parc Bryn Cegin burnt mound 1097, Llandygai, Bangor, PRN 31775, SH 59532 70521 (Kenney 2008a and b)
    Charred hazelnut shell, from primary fill of trough 1154, KIA-30443: 4034±31 BP (2830–2470 cal. BC)
    Hazel charcoal, from primary fill of trough 1154, KIA-30444: 3216±26 BP (1530–1420 cal. BC)
    Hazel charcoal, from fill of trough 1154, NZA-26765: 3270±35 BP (1630–1450 cal. BC)

24. Parc Bryn Cegin burnt mound 2031, Llandygai, Bangor, PRN 31773, SH 59543 70556 (Kenney 2008a and b)
    Hazel charcoal, from fill of trough 2149, NZA-26766: 3716±40 BP (2280–1970 cal. BC)
    Hazel charcoal, from fill of trough 2149, NZA-26767: 3575±40 BP (2030–1770 cal. BC)

25. Parc Bryn Cegin burnt mound 2167, Llandygai, Bangor, PRN 31771, SH 59573 70566 (Kenney 2008a and b)
    Hazel charcoal, from fill of pit 2175, NZA-26768: 2998±35 (1390–1120 cal. BC)
    Hazel charcoal, from fill of pit 2175, NZA-26769: 3064±35 BP (1420–1210 cal. BC)

26. Parc Bryn Cegin burnt mound 2176, Llandygai, Bangor, PRN 31772, SH 59558 70548 (Kenney 2008a and b)
    Possibly hazel charcoal, indeterminate age, from main fill of trough 2197, KIA-30447: 3904±30 BP (2480–2290 cal. BC)
    Charred grain, species unidentified, from main fill of trough 2197, KIA-30448: 3636±30 BP (2130–1910 cal. BC)
    Hazel charcoal, from fill of trough 2186, NZA-26770: 3899±35 BP (2480–2230 cal. BC)
    Hazel charcoal, from fill of trough 2186, NZA-26771: 3886±40 BP (2480–2200 cal. BC)
    Hazel charcoal, from fill of trough 2197, NZA-26772: 3878±40 BP (2480–2200 cal. BC)
    Hazel charcoal, from fill of trough 2202, NZA-26773: 3839±40 BP (2470–2140 cal. BC)
    Hazel charcoal, from fill of trough 2202, NZA-26774: 3738±40 BP (2290–2020 cal. BC)
    Hazel charcoal, from fill of hearth 2212, NZA-26775: 3869±40 BP (2470–2200 cal. BC)
    Hazel charcoal, from fill of hearth 2212, NZA-26776: 3879±40 BP (2470–2200 cal. BC)

27. Parc Bryn Cegin burnt mound 2287, Llandygai, Bangor, PRN 31774, SH 59547 70544 (Kenney 2008a and b)
    Hazel charcoal, from fill of trough 2288, NZA-26777: 2960±35 BP (1310–1040 cal. BC)
    Hazel charcoal, from fill of trough 2288, NZA-26818: 3003±35 BP (1390–1120 cal. BC)

28. Parc Bryn Cegin burnt mound 4199, Llandygai, Bangor, PRN 31776, SH 59358 70404 (Kenney 2008a and b)
    Hazel charcoal, from fill of trough 4208, NZA-26819: 3904±35 BP (2480–2280 cal. BC)
    Hazel charcoal, from fill of trough 4208, NZA-26820: 3903±35 BP (2480–2280 cal. BC)

29. Parc Bryn Cegin burnt mound 6016, Llandygai, Bangor, PRN 31777, SH 58986 70683 (Kenney 2008a and b)
    Hazel charcoal, from fill of pit 6018, NZA-26821: 3863±40 BP (2470–2200 cal. BC)
    Hazel charcoal, from fill of pit 6018, NZA-26823: 3903±40 BP (2480-2210 cal. BC)

30. Parc Bryn Cegin burnt mound 6019, Llandygai, Bangor, PRN 31768, SH 59008 70638 (Kenney 2008a and b)
    Hazel charcoal, from fill of pit 6023, NZA-26824: 3913±35 BP (2490–2290 cal. BC)
    Hazel charcoal, from fill of pit 6023, NZA-26825: 2872±35 BP (1190–920 cal. BC)

31. Parc Bryn Cegin burnt mound 6094, Llandygai, Bangor, PRN 31777, SH 58986 70683 (Kenney 2008a and b)
    Charred hazelnut shell, from fill of trough 6058, KIA-30449: 4572±32 BP (3490–3120 cal. BC)
    Charred hazelnut shell, from fill of trough 6058, KIA-30450: 4467±29 BP (3340–3020 cal. BC)

32. Parc Bryn Cegin burnt mound 7035, Llandygai, Bangor, PRN 31766, SH 58937 70449 (Kenney 2008a and b)
    Possibly oak charcoal, indeterminate age, from upper fill of pit 7045, KIA-30445: 3811±28 BP (2350–2140 cal. BC)
    Possibly oak charcoal, indeterminate age, from middle fill of pit 7045, KIA-30446: 3612±68 BP (2200–1760 cal. BC)

33. Parc Bryn Cegin burnt mound 7039, Llandygai, Bangor, PRN 31767, SH 58954 70516 (Kenney 2008a and b)
    Hazel charcoal, from fill of pit 7043, NZA-26822: 3898±40 BP (2480–2210 cal. BC)
    Hazel charcoal, from fill of pit 7043, NZA-26828: 2829±35 BP (1120–900 cal. BC)

34. Parc Bryn Cegin burnt mound-like feature 7055, Llandygai, Bangor, PRN 31778, SH 59014 70464 (Kenney 2008a and b)
    Hazel charcoal, from base of pit 7055, NZA-26762: 3132±35 BP (1500–1310 cal. BC)
    Unidentifiable cereal grain, from main fill of pit 7055, NZA-26763: 1980±35 BP (50 cal. BC–cal. AD 90)

Charcoal, probably hazel, from fill of stakehole in base of pit 7055, NZA-26764: 3087±35 BP (1440–1260 cal. BC)

35. Parc Bryn Cegin pit 1230/burnt mound 1203, Llandygai, Bangor, PRN 31761, SH 59479 70462 (Kenney 2008a and b)
Charcoal, probably hazel, from main fill of pit 1230, NZA-26830: 3062±35 BP (1420–1210 cal. BC)
Hazel charcoal, from main fill of pit 1230, NZA-26831: 3127±35 BP (1490–1310 cal. BC)
Hazelnut shell from charcoal spread (1263) over postholes near pit 1230, Wk-20060: 3066±35 BP (1420–1210 cal. BC)
Probably hazel charcoal, from primary fill of deep pit 1390, Wk-20061: 3098±36 BP (1440–1260 cal. BC)
Probably hazel charcoal, from primary fill of deep pit 1390, Wk-20062: 3078±35 BP (1430–1260 cal. BC)

36. Pen y Fan Agosaf, Llanddyfnan, SH 4812 7868 (Davidson 1998a, 53; Gwyn 1996a and b)
Charcoal from burnt mound, Swan-124: 2840±70 BP (1220–830 cal. BC)

37. Waun Llanfair, Llanfairfechan PRN 466, SH 7150 7415 (Caseldine *et al.* 2007)
Hazel charcoal from mound, SUERC-27556: 3660±35 BP (2140–1930 cal. BC)
Alder charcoal from mound, SUERC-27557: 3635±35 BP (2140–2080 and 2060–1900 cal. BC)

38. Waun Llanfair, Llanfairfechan, PRN 467, SH 7173 7383 (Caseldine 2006, 239; Caseldine *et al.* 2007)
Hazel charcoal from mound, Beta-224978: 3230±40 BP (1520–1455 cal. BC)
Hazel charcoal, SUERC-27868 (GU-20858): 4165±30 BP (2880–2830 and 2820–2630 cal. BC)

EARTH OVENS

39. Parc Bryn Cegin earth oven 1072, Llandygai, Bangor, PRN 31759, SH 59538 70468 (Kenney 2008a and b)
Hazelnut shell, from main fill of pit 1072, NZA-26829: 3271±35 BP (1630–1450 cal. BC)
Barley grain, from main fill of pit 1072, NZA-26988: 3276±45 BP (1680–1440 cal. BC)

40. Parc Bryn Cegin earth oven 1259, Llandygai, Bangor, PRN 31760, SH 59500 70464 (Kenney 2008a and b)
Hazelnut shell, from main fill of pit 1259, NZA-26832: 4732±40 BP (3640–3370 cal. BC)
Hazelnut shell, from main fill of pit 1259, NZA-26839: 5639±40 BP (4550–4360 cal. BC)

41. Parc Bryn Cegin earth oven 1510, Llandygai, Bangor, PRN 31762, SH 59476 70525 (Kenney 2008a and b)
Hazel charcoal, from main fill of pit 1510, NZA-26833: 2791±35 BP (1020–830 cal. BC)
Hazel charcoal, from lining of pit 1510, NZA-26834: 2766±35 BP (1010–820 cal. BC)

42. Parc Bryn Cegin earth oven 3133, Llandygai, Bangor, PRN 31763, SH 59140 70378 (Kenney 2008a and b)
Hazel charcoal, from primary fill of pit 3133, NZA-26835: 4870±40 BP (3710–3530 cal. BC)
Hazelnut shell, from main fill of pit 3133, NZA-26989: 4772±40 BP (3650–3380 cal. BC)

43. Parc Bryn Cegin earth oven 3314, Llandygai, Bangor, PRN 31764, SH 59248 70556 (Kenney 2008a and b)
Hazel charcoal, from main fill of pit 3314, NZA-26836: 3313±35 BP (1690–1500 cal. BC)
Hazel charcoal, from main fill of pit 3314, NZA-26840: 3647±95 BP (2290–1740 cal. BC)

44. Parc Bryn Cegin earth oven 6033, Llandygai, Bangor, PRN 31765, SH 59017 70657 (Kenney 2008a and b)
Hazel charcoal, from main fill of pit 6033, NZA-26837: 4949±40 BP (3900–3640 cal. BC)
Hazel charcoal, from lower fill of pit 6033, NZA-26838: 4985±40 BP (3940–3650 cal. BC)

APPENDIX 2
EXCAVATED BURNT MOUNDS AND EARTH OVENS IN NORTH-EAST WALES WITHOUT ASSOCIATED RADIOCARBON DATES

PRNs in the following catalogue refer to record numbers in the regional Historic Environment Record maintained by Gwynedd Archaeologial Trust.

A55 Anglesey DBFO Scheme 10000.1, Llangristiolus, PRN 31837, SH 4252 7418 (Maynard 2011)

A55 Anglesey DBFO Scheme 11000.1, Llangristiolus, PRN 31836, SH 4214 7430 (Maynard 2011)

A55 Anglesey DBFO Scheme 14000.2, Gwalchmai, PRN 31832, SH 3878 7544 (Maynard 2011)

A55 Anglesey DBFO Scheme 2000.1, Star, PRN 31845, SH 5072 7199 (Maynard 2011)

A55 Anglesey DBFO Scheme 4000.1, Gaerwen, PRN 31844, SH 4780 7247 (Maynard 2011)

A55 Anglesey DBFO Scheme Bryn Twr, Llangristiolus, PRN 31835, SH 4211 7422 (Maynard 2011)

A55 Anglesey DBFO Scheme Bwlcyn (16000.3), Bryngwran, PRN 31827, SH 3684 7638 (Maynard 2011)

A55 Anglesey DBFO Scheme Bwlcyn (17000.1), Bryngwran, PRN 31825, SH 3659 7656 (Maynard 2011)

A55 Anglesey DBFO Scheme Bwlcyn (17000.2), Bryngwran, PRN 31824, SH 3658 7652 (Maynard 2011)

A55 Anglesey DBFO Scheme Bwlcyn (17000.3), Bryngwran, PRN 31823, SH 3651 7664 (Maynard 2011)

A55 Anglesey DBFO Scheme Bwlcyn (B15), Bryngwran, PRN 31826, SH 3665 7653 (Maynard 2011)

A55 Anglesey DBFO Scheme Cae-glas (41000.1), Trearddur, PRN 31806, SH 2627 8068 (Maynard 2011)

A55 Anglesey DBFO Scheme Cae-glas (41000.2), Trearddur, PRN 31805, SH 2601 8076 (Maynard 2011)

A55 Anglesey DBFO Scheme Cae-glas (42000.3), Trearddur, PRN 31804, SH 2575 8093 (Maynard 2011)

A55 Anglesey DBFO Scheme Caer Elen, Bodedern, PRN 31816, SH 3267 7813 (Maynard 2011)

A55 Anglesey DBFO Scheme Caer Elen (33000.1), Bodedern, PRN 31817, SH 3292 7819 (Maynard 2011)

A55 Anglesey DBFO Scheme Cefn Llongau, Gwalchmai, PRN 31833, SH 3917 7539 (Maynard 2011)

A55 Anglesey DBFO Scheme Crig-las (DA7b), Valley, PRN 31810, SH 2884 7879 (Maynard 2011)

A55 Anglesey DBFO Scheme Graig Lwyd (DA2a), Valley, PRN 31809, SH 2855 7866 (Maynard 2011)

A55 Anglesey DBFO Scheme Graig Lwyd (DA2b), Valley, PRN 31808, SH 2848 7872 (Maynard 2011)

A55 Anglesey DBFO Scheme Graig Lwyd (DA2c), Valley, PRN 31807, SH 2842 7880 (Maynard 2011)

A55 Anglesey DBFO Scheme Gwalchmai, Gwalchmai, PRN 31831, SH 3796 7641 (Maynard 2011)

A55 Anglesey DBFO Scheme Holyrood (17000.4), Bryngwran, PRN 31822, SH 3619 7668 (Maynard 2011)

A55 Anglesey DBFO Scheme Holyrood (17000.5), Bryngwran, PRN 31820, SH 3594 7682 (Maynard 2011)

A55 Anglesey DBFO Scheme Melin y Plas (site DA6a), Bryngwran, PRN 31818, SH 3425 7743 (Maynard 2011)

A55 Anglesey DBFO Scheme Melin y Plas (site DA6b), Bryngwran, PRN 31819, SH 3458 7714 (Maynard 2011)

A55 Anglesey DBFO Scheme Nant Turnpike (site DA6d), Llangristiolus, PRN 31843, SH 4498 7366 (Maynard 2011)

A55 Anglesey DBFO Scheme Treddolphin (16000.1), Bryngwran, PRN 31829, SH 3706 7622 (Maynard 2011)

A55 Anglesey DBFO Scheme Treddolphin (16000.2), Bryngwran, PRN 31828, SH 3685 7636 (Maynard 2011)

A55 Anglesey DBFO Scheme Treddolphin (site DA6c), Bryngwran, PRN 31830, SH 3778 7584 (Maynard 2011)

A55 Anglesey DBFO Scheme Tyn y Bont, Llangristiolus, PRN 31834, SH 4128 7446 (Maynard 2011)

A55 Anglesey DBFO Scheme Waen Hir (site C14a), Llangristiolus, PRN 31839, SH 4443 7416 (Maynard 2011)

A55 Anglesey DBFO Scheme Waen Hir (site DA1), Llangristiolus, PRN 31842, SH 4454 7414 (Maynard 2011)

A55 Anglesey DBFO Scheme Ysbylltir, Llanfair yn Neubwll, PRN 31811, SH 3098 7892 (Maynard 2011)

Abergwyngregyn, PRN 4092, SH 6594 7313 (White 1977)

Afon Braint, Cwm Cadnant, PRN 5598, SH 5412 7785 (White 1977)

Beaumaris, Beaumaris, PRN 2664, SH 5809 7784 (White 1977)

Beaumaris, PRN 2665, SH 5518 7791 (White 1977)

Bryn Afon (site 5), Gwalchmai, PRN 31794, SH 3900 7740 (Davidson 1998a, 51)

Bryn Ala (site 2), Gwalchmai, PRN 31791, SH 3893 7726 (Davidson 1998a, 51)

Bryn Ala (site 3), Gwalchmai, PRN 31792, SH 3895 7725 (Davidson 1998a, 51)

Bryn Ala Farm (east of), Gwalchmai, PRN 31284, SH 3939 7719 (Davidson *et al.* 2010)

Bryn Goleu (site 8), Gwalchmai, PRN 31796, SH 3894 7765

(Davidson 1998a, 51)

Carrog, Llanbadrig, PRN 27515, SH 3732 9204 (George Smith pers. com.)

Cefn Gwyn (site 17), Bodedern, PRN 31802, SH 3629 7974 (Davidson 1998a, 52)

Coed Newydd site 1, Penrhos Lligwy, Moelfre, PRN 2117, SH 4890 8580 (Baynes 1913)

Coed Newydd site 2, Penrhos Lligwy, Moelfre, PRN 2130, SH 4905 8591 (Baynes 1913)

Coed Newydd site 3, Penrhos Lligwy, Moelfre, PRN 5635, SH 4906 8591 (Baynes 1913)

Gerddi Bluog, Llanfair, Harlech, PRN 31061, SH 61899 31022 (Cooke *et al.* 2010)

Llanddyfnan (destroyed site), Llanddyfnan, SH 5047 7947 (White 1977, 470)

Llandygai Industrial Estate, Llandygai, SH 594 710 (White 1975)

Mynydd Mwyn Farm (east of), Penmynydd, PRN 31286, SH 5081 7421 (Davidson *et al.* 2010)

Mynydd Mwyn Farm (possible mound to east of farm), Penmynydd, SH 50802 74196 (Davidson *et al.* 2010)

Parc Bryn Cegin burnt mound 5023, Llandygai, Bangor, PRN 31770, SH 59315 70631 (Kenney 2008a and b)

Parc Bryn Cegin burnt mound 6056, Llandygai, Bangor, PRN 31769, SH 59070 70599 (Kenney 2008a and b)

Parc Bryn Cegin, burnt mound 3830, Llandygai, Bangor, PRN 31779, SH 59312 70586 (Kenney 2008a and b)

Parc Cybi earth oven or burnt mound trough, Holyhead, PRN 31586, SH 2516 8110 (Kenney *et al*. 2011)

Parc Cybi earth oven, Holyhead, PRN 31584, SH 2528 8080 (Kenney *et al.* 2011)

Parc Cybi earth ovens, Holyhead, PRN 31585, SH 2529 8085 (Kenney *et al*. 2011)

Parc Cybi pits with burnt stone, Holyhead, PRN 31587, SH 2545 8094 (Kenney *et al*. 2011)

Parc Cybi, large burnt mound (31285), Holyhead, PRN 31582, SH 25335 80747 (Kenney *et al*. 2011)

Parc Cybi, Small Burnt Mound (31002), Holyhead, PRN 31583, SH 25301 80755 (Kenney *et al.* 2011)

Penciw (east of) (site 2), Amlwch, PRN 3559, SH 4187 9162 (White 1977)

Penciw (east of) (site.3), Amlwch, PRN 3565, SH 4177 9162 (White 1977)

Rhos-Uchaf, Llandygai, PRN 815, SH 5978 6978 (Kelly 1982)

Rhosybol, PRN 2120, SH 4544 8528 (White 1977, 470–2)

Tan-y-Bwlch Farm (west of), Bodffordd, PRN 31285, SH 4195 7796 (Davidson *et al.* 2010)

Wet Covert, Llandygai, PRN 877, SH 5934 6946 (Kelly 1990)

Ysbyty Gwynedd, Bangor, SH 5563 6992 (Davidson 2010)

NOTES

1. The regional Historic Environment Record currently lists 119 examples. A recent study (Hopewell and Smith 2010) identified five further examples, but considered seven of the sites to in the HER to be incorrectly identified. To this can be added an additional 88 excavated sites or sites found during excavation projects, plus 9 sites formerly listed in the HER as metalworking sites. This gives a current total of 216 burnt mounds. I have also considered some isolated pits with burnt stone fills because of their similarity with pits that occur under burnt mounds; adding a further 8 features to the list. A database of the excavated sites has been created for this paper and can be consulted at the Gwynedd HER.

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