A 12th-century 'Bowl-Fired' Grain Drying Kiln at Druminnor, Aberdeenshire. Implications for Social Change, Agricultural Productivity and Landscape Development in North-east Scotland.

Colin Shepherd
with environmental analyses by Jackaline Robertson

Abstract

The discovery of a Medieval 'bowl-fired' grain-drying kiln during excavations at Druminnor Castle has implications for how we view the management of agricultural practices in the North-east of Scotland during the 12th-century. Landscape study of the Forbes Estate has suggested the former existence of two large open fields associated with the castle. Technological change associated with the construction of a kiln may have coincided with a parallel development in field layout. The 12th-century date of the kiln might suggest a similar date for the fields. These changes occurred within a 'native' lordship prior to a later influx of Anglo-Norman influence in the area.

Background

To date, six years of excavation have taken place at Druminnor Castle, Aberdeenshire as part of the ongoing Bennachie Landscapes project. The project is run jointly by the Bailies of Bennachie and the University of Aberdeen with the permission of the landowner, Alex Forbes, and with financial support for specialised analysis generously given by The Hunter Archaeological and Historical Trust and Aberdeenshire Council. All excavation, site recording and most of the post-excavation processing has been carried out by local volunteers. This report focuses upon a 12th-century grain-drying kiln sealed by subsequent architectural remains.

Duncan de Forbeys was granted a royal charter for the lands of Forbes and Kearn in 1271/2 (Forbes, 2011, 1) (see Figure 1). The 'Ecclesia de Keryn' was recorded by Bagimond c.1275 (Misc. Scot. Hist. Soc., 1939, 42; Watt, 2001) and the parish of 'Kierne' is recorded in the taxations for the Bishops of Aberdeen in 1275 (Reg. Episc. Aberdon., II, 52). A former 'great tower' stood at Druminnor until it was demolished in 1800 (Leyden, 1903, 229). Two drawings and two estate plans clearly record this feature (RHP 260/1; RHP 44705). It was the recognition of this cartographic evidence in 2010 that led to the present excavations.

The size and shape of the tower - ultimately, six storeys high and rectangular with 3metre wide walls - suggest a date in the 13th century, similar to the presumed dates for the tower at Drum (Greig, 2004, 454) and, possibly, Hallforest (Slade, 1985, 315-6). Dunnideer castle appears to be noted in a charter to Lindores Abbey in 1260 (Lind. Chart., 1903, 152-3) - though, of course, that may not refer to the present ruined tower. A later tower, seemingly built by Sir William Forbes at Pitsligo, appears to have been modeled on the family caput at Druminnor (McKean, 1991, 371, 381) and the Preston Tower at Tolquhon – another Forbes stronghold – may have been similarly inspired, if not built by the preceding lord, Sir Henry Preston (Simpson, 1938, 248). Both appear to have been constructed in the first half of the 15th-century.

The present excavations have demonstrated that the tower was positioned upon a narrow basalt dyke intruding through the parent rock - Devonian sandstone. These Devonian beds have been tilted out of the horizontal either by tectonic or later metamorphic action which, in turn, has resulted in a range of sandstone beds providing distinctive bedding underlying the archaeology across the site. A massive amount of site preparation occurred in order to provide a footprint for the construction of the castle (Shepherd et al, 2015, 55-82). However, the discovery of the kiln and the C14 dates suggest

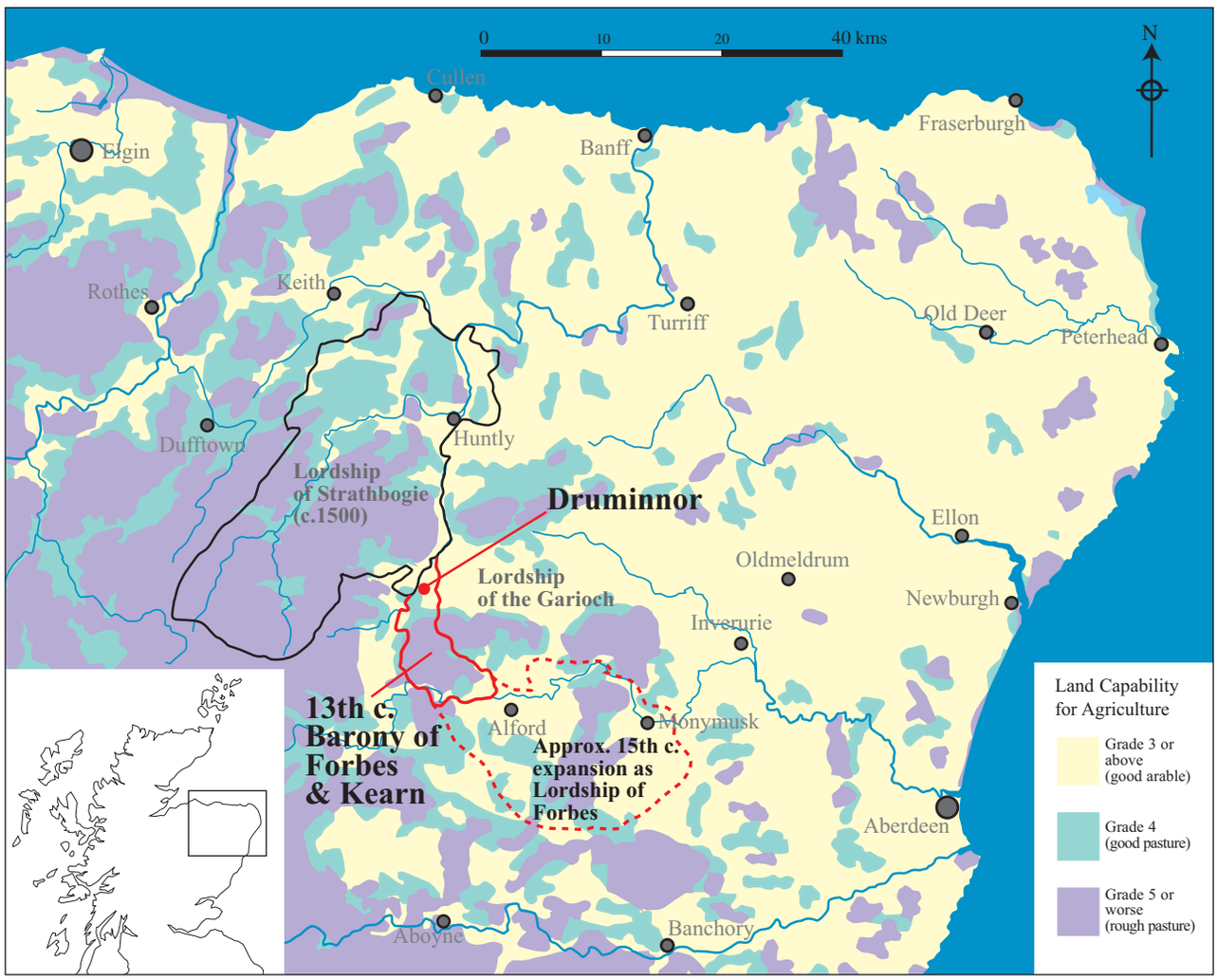

Figure 1. Location of Druminnor with respect to agricultural land capabilities of the North-east of Scotland (based upon Macaulay Institute, 1982).

that the site was already inhabited by the time of the Forbes' charter of 1271/2 and, probably, also prior to the construction of the tower. The recognition of a possible former rampart outwith the later footprint of the castle, noted during the programme of excavations, also suggests an earlier phase of site development.

The Kiln

The kiln partly underlies the former west range and main entrance of the castle. This range had been demolished along with the tower and most of the castle in 1800 (Leyden, 1903, 229). Only the south range was left standing and this has remained inhabited till the present. Between 1841 and 1849 the Aberdeen architect Archibald Simpson designed a number of alterations to the existing structure and undertook to build a 'mansion' to cover the site of the former west range (Forbes, n.d., 6). This was duly demolished in the 1960s (*ibid*., 1; 6) leaving only its foundations still visible. The discovery of the kiln was unexpected and serendipitous. A metre-wide trench dug for drainage works some years before had cut through the foundations of the former mansion and had been left partly unfilled. Cleaning the trench sides showed a U-shaped 'cut' in its eastern (west-facing) side. This was later found to have been the access end of the kiln chamber. This cut did not extend to be visible in the east-facing side of the drainage works and the termination of the kiln had clearly been removed by those drainage works. The south side of the kiln had been largely quarried away when a 'basement' room

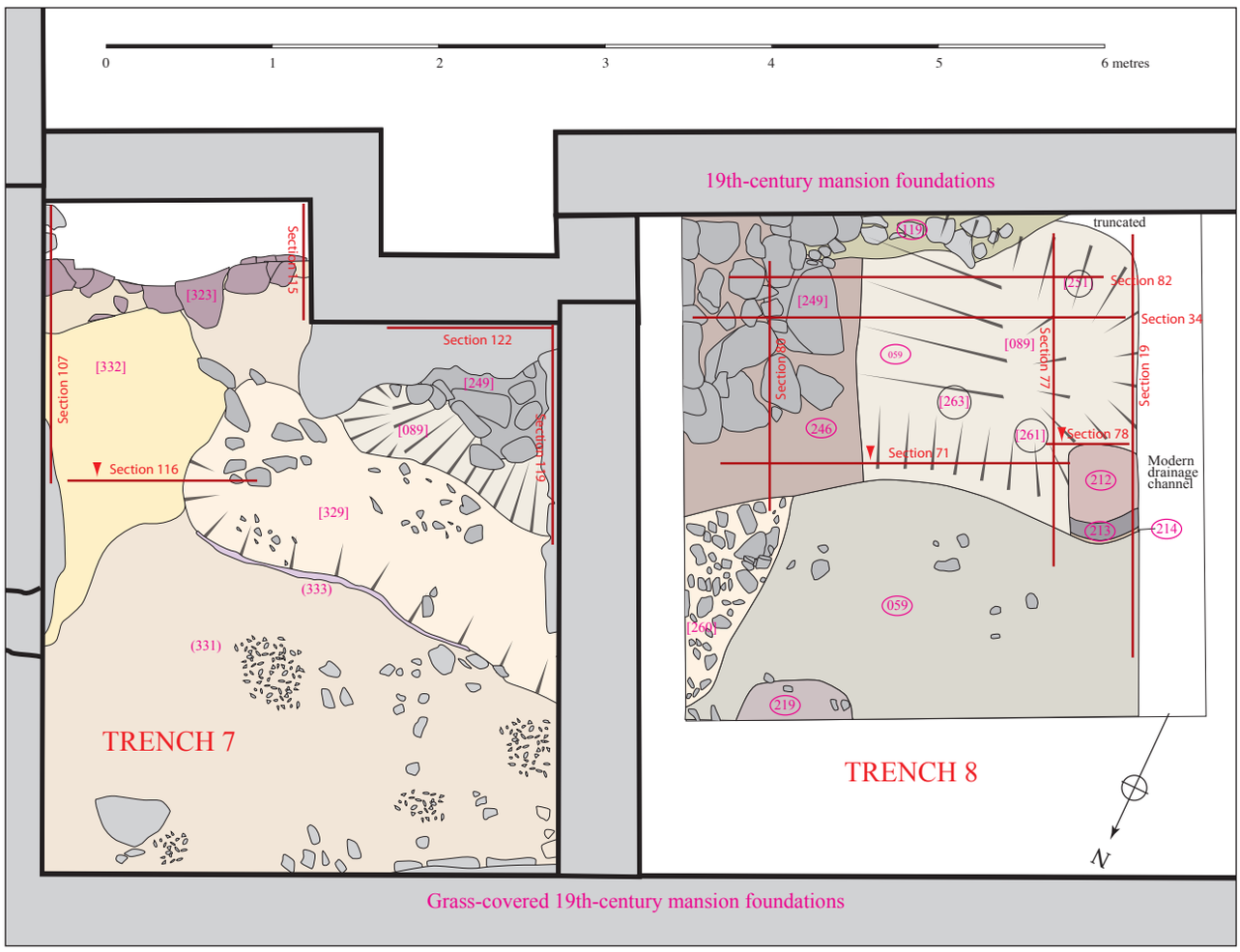

Figure 2. Plan of the kiln.

Photo 1. View of kiln with later foundations and revetment wall with possible truncated 'step' in foreground (courtesy of Iain Ralston).

had been created as part of Simpson's mansion, with a retaining wall built against the quarried side. However, this lower room of the mansion appears to have replaced an earlier 'basement' at this end of the gatehouse range. This lower floor may be indicated on the sketches appended to the estate plans, though this is not completely certain owing to inconsistences within the drawings. The earlier retaining wall (see Figure 2, [323]) was set behind (north of) the later 19th-century wall but did not extend as far as the kiln. Fortunately, these earlier structures failed to remove the rest of the kiln and its survival, beneath so much later construction and reconstruction, is little short of miraculous (Photo 1). As can be seen from Figure 2, the surviving portion of the kiln was itself bisected by later foundations which resulted in the kiln being excavated in two separate trenches.

The kiln is superficially similar to the 'keyhole' structures found at Hoddom (Lowe, 2006) and, more locally, at Inverness (Ellis, 2002). Smaller and earlier 7th-8th-century kilns found at Gogar

Photo 2. Fisher Gate kiln, Nottingham (courtesy and copyright of Nottingham City Museums and Galleries.

Mains (Will & James, 2017, 15-17) and, more locally, the 7th-9th century versions at Kintore (Murray & Dunbar, 2008, 152-159) may suggest a pedigree for such kilns. However, the closest comparison architecturally for the Druminnor kiln would seem to be with a 12th-century rock-cut kiln found at Fisher Gate, Nottingham (Knight, 2015) (Photo 2). At Druminnor, the kiln chamber had been cut steeply into the friable Devonian sandstone. Its southern side may have been cut into a former pit. A piece of charred roundwood hazel mixed in with the kiln's fill may derive from that pit. It returned a C14 date of 1762 +/- 29 BP (211 – 382 calAD at 92.9% prob.) (SUERC-70893). However, this should be treated with caution and the sample may simply have produced an erroneous result. C14 analysis of a charred grain (*Avena sp.*) from the base of the kiln returned a date of 906 +/- 31 BP (1035 – 1207 calAD at 95.4% prob.) (SUERC-67036). A sample of birch (*betula*) wood from a post pit (Figure 2, [263]) found on the base of the kiln chamber returned a date of 837 +/-29 BP (1158 – 1262 calAD at 95.4% prob) (SUERC-76174). These two dates appear to conform to the architecturally-similar kilns found at Inverness and Nottingham. The Druminnor kiln had no stone lining as became common in later times, (though, at Capo and Abercairny, stone-lined kilns can be seen to have been in use from the mid-11th to the 14th century (Gibson, 1989)). At Hoddom, it was thought that the fire was set at the opposite end from the bowl, as happened in the Capo and Abercairney kilns. If this was the case, it would signal a difference in practice between these and the Druminnor and Nottingham examples. At Nottingham the fire was clearly laid beneath the drying floor and, although this area was not accessible at Druminnor, it is evident that the same practice occurred there. There is no way that a fire could have sat at the steeply-inclined access end of the flue and neither was there any evidence of burning on the floor there. Ellis draws comparisons between the Inverness kiln and the Capo and Abercairny ones. But, the section of the kiln (2002, Illus.5) may suggest the fire had been set at the bowl end where the burnt clay was found but does not appear to be conclusive on this point. It does seem likely that there were significant operating differences between the Nottingham and Druminnor kilns on the one hand and the Capo and Abercairny ones on the other. Into which group the Hoddom and Inverness kilns fall is still open to question. But, the Hoddom kilns were set into a slope, as at Capo and Abercairney, in contrast to the situation at Nottingham and Druminnor and this suggests that the fire was set away from the bowl, also akin to Capo and Abercairney.

What does appear to be evident is that the Capo/Abercairny practice became the adopted normal approach to kiln construction with the fire set away from the bowl and separated by a flue of varying length, both bowl and flue usually constructed with a stone floor. However, the dating evidence from Hoddom suggests that this method of firing was being employed contemporaneously with the alternative practice found at Nottingham and Druminnor. Consequently, although both methods of firing appear to have been occurring contemporaneously, it seems sensible to try to distinguish semantically between the two. The term 'bowl-fired' is used to here to describe the kilns excavated at Druminnor and Nottingham. Perhaps 'flue-fired' might serve to define the Capo, Abercairney and

other related kilns that utilised a fire set at the opposite end of a flue from the heating chamber or 'bowl'. It is interesting to note that the earlier Kintore and Gogar Mains kilns appear to have conformed to the 'bowl-fired' form though the evidence is not entirely clear on that point.

Finally, two kilns discovered at Repton Manor, Ashord in Kent (Atkins and Webster, 2012) may be pertinent to this discussion. These small kilns were dated by pottery to between the later 12th- and later 13th centuries and appear to have been associated with a manorial complex. The first fits into the 'flue-fired' variety, having a stoke-hole clearly separated from the bowl. The second is of a more 'compressed' form with the fire appearing to have been set within the bowl. A secondary 'scoop' was interpreted as a stoke-hole, though this seems odd if the fire were clearly set within the bowl. The section drawing appears to show the bowl to be 'cutting' the stoke hole which may suggest two phases of site use with a later bowl-fired kiln simply replacing an earlier one. The pottery from the fills of both kilns suggested a late 12th- to mid 13th-century date range.

Returning to Druminnor, the friable nature of the sandstone bed into which the Druminnor kiln had been quarried permitted the digging of the bowl and flue into a stable geological layer. Other beds recognized across the site would have been much harder or softer, suggesting that this bed may have been selected for its potential architectural qualities. It may be that this geological aspect may also have helped to determine the design of the kilns at Druminnor and Nottingham where both were able to be dug into a solid natural material. At Inverness and Hoddom the subsoils were not solid and required shoring-up with wattle or clay. At Abercairny and Capo the sides were revetted by stone and turf respectively. However, once open to the elements, the Druminnor sandstone weathers and crumbles quite quickly whilst remaining largely non-porous. In other words, the Druminnor kiln would have required some form of roofing, though this has also been assumed to have been a requirement of the other kilns noted.

Whilst grain may be dried for numerous reasons, the environmental evidence (see below) suggests that, at Druminnor, drying was carried out for purposes other than simply to prepare a field crop for subsequent processing. The generally low levels of weed taxa found deposited on the base of the kiln suggest that the crop had already undergone a degree of processing that had removed most of the weeds. The drying of this clean crop is, therefore, likely to have been undertaken to create a dry, uniform product suitable for storage, milling or transportation (Holden, 2006, 109-10). However, the different contexts of the kiln demonstrate variation in the proportion of grain to weed taxa. The samples taken from the deposit on the kiln floor (243) and from within the post hole [263] contain

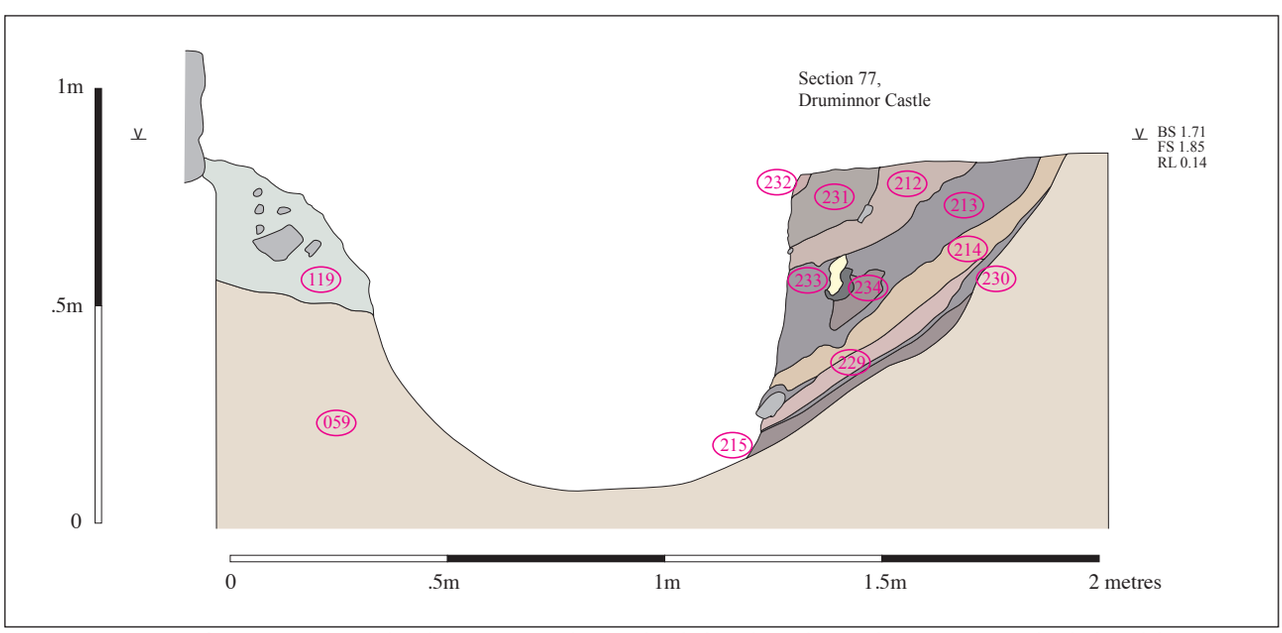

Figure 3. East-facing section looking west along the kiln chamber, also cut at a slightly oblique angle to the kiln's axis.

Photo 3. Post holes [263] and [261] in base of flue.

99% and 100% grain taxa respectively - or, 1% and 0% weeds. In contrast, the outermost context adhering to the sides of the kiln (214) contained 61% weed taxa (see Figure 3). The next context (213) contained 12% with the innermost sample (212) containing 10% weed taxa. A block sample <33> from context (213) appears to derive from a single structure and to have been composed of predominantly hazel roundwood along with a proportion of willow. It may be of note that Structure 14 at Hoddom had originally been lined with wattle - being replaced by a clay lining later (*ibid*., 95). If deposit (213) were to be seen as the remains of a wattle lining, this might explain the much higher weed residue lying between it and the kiln sides: debris from the uncleaned crop, perhaps undergoing preparation nearby, may have fallen down the gap. The final fill (212) is also likely to have had a higher weed residue adhering to any structural component falling onto the underlying layers.

Of structural interest was the discovery of three post holes sunk into the natural subsoil forming the base and sides of the kiln and a further smaller one set into the old ground surface on the north side of the kiln (Photo 3; Figure 4). One of these post holes [261] may have been created in error. Its fill comprised re-deposited, clean sandstone with no evidence of any other intrusive fill. Post hole [263] was of identical size but retained the charred remains of a birch post along with residual grain. The holes had a 'drilled' appearance with sharp, vertical sides cut into the natural geology. Below the charred remains, the pit also had a lower fill of re-deposited clean, weathered sandstone. It is suggested that this was used as packing to bring the post up to the required height. If so, this may indicate that a particular height for the post was fairly critical to the architectural design of the kiln. The third post [251] penetrated the side of the kiln and can also be seen to have been set vertically (Figure 4). A small hazel stake on the north side of the kiln <034> had been driven into the subsoil at an oblique angle. It should be noted that evidence for the superstructure of these types of kiln have not survived at Hoddom or Inverness and their constructional detail is a matter for speculation. At Nottingham, the evidence did suggest a possible reconstruction comprising timber framing, wattle and a clay lining (Young, 1982, Fig.2).

The excavated elements at Druminnor do afford some evidence as to how the kiln was used. It is interesting to note the depth of this kiln and Holden's reference to the necessity of being able

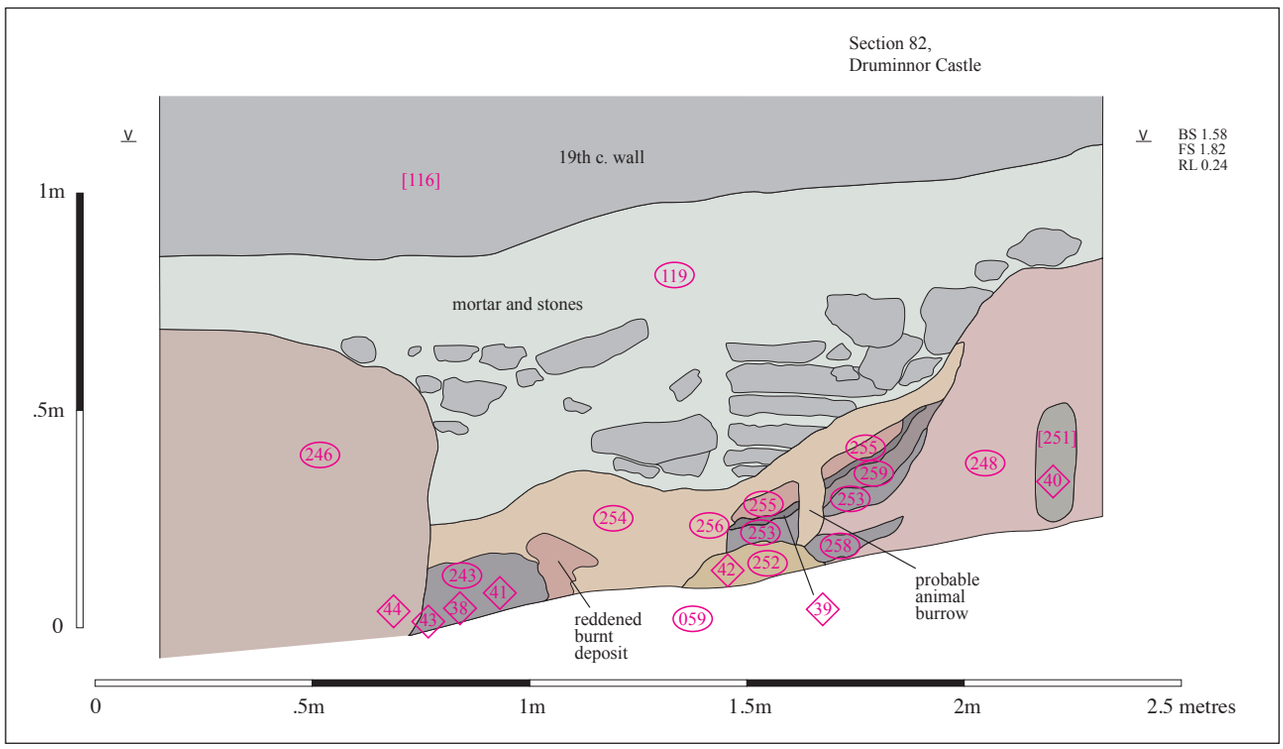

Figure 4. North-facing section probably cut at a slightly oblique angle to the kiln's axis owing to truncation by the 19th-century revetment wall.

to climb in and out of some Irish kilns (2006, 109). That would certainly have been a requirement in this instance. One limiting factor at Druminnor was that the base of the bowl was inaccessible to excavation owing to the surviving 19th-century, or earlier, foundation walls and the severe truncation of the feature at the eastern end. Fortunately, the example excavated at Fisher Gate, Nottingham (Knight, 2015) gives a good indication of how the entire below-ground structure may have looked and functioned (see Photo 2). The Fisher Gate kiln, dated to c.1200 and rock cut, appears to have been fired from the base of the bowl and accessed by a stepped access down into the flue. A similar step may be recogniseable at the west end of the flue at Druminnor (Photo 1). Such an interpretation might result in the post holes being viewed as roof supports/and/or hand supports for climbing in and out. At Druminnor, one issue is in understanding the accumulation of weed taxa between the side of the flue and what might appear to be the remains of a wattle lining. The description of the wattle lining of the Fisher Gate kiln bowl appears to correspond to the observations recorded for the bowl at Druminnor. It was noted at Fisher Gate that the wattle lining had been kept separate from the pit wall by a thin layer of of sand packing (Knight *et al*, 2012, 48). This may well have been the construction technique at Druminnor as well with the sandy layer visible as (242) in Figure 5. However, a reconstruction drawing of the Fisher Gate kiln (Young, 1982, Fig.2) suggests that kiln not to have had a wattle lining along the flue. At Druminnor the wattle lining does appear to have continued as suggested by the analysed remains in context (213) (see below). Furthermore, it is difficult to see how the Druminnor weed taxa along the edge of the flue might have accumulated without a wattle lining. Were the flue to be acting merely as an access point and draught hole, there would appear to be little need for such a lining, as also indicated by its apparent absence at Fisher Gate. Perhaps it was there simply to protect against wear to the friable subsoil. As noted, both flue and bowl would certainly have required protection from the elements.

The environmental evidence, described at length below, suggests that the deposit of large stones found in the fill of the kiln's bowl (249) were formerly structural elements; they were associated with scorched clay and charred grain. As their shape and size prohibits their interpretation as being associated with a lining for the kiln, they may have been associated with its superstructure. This would,

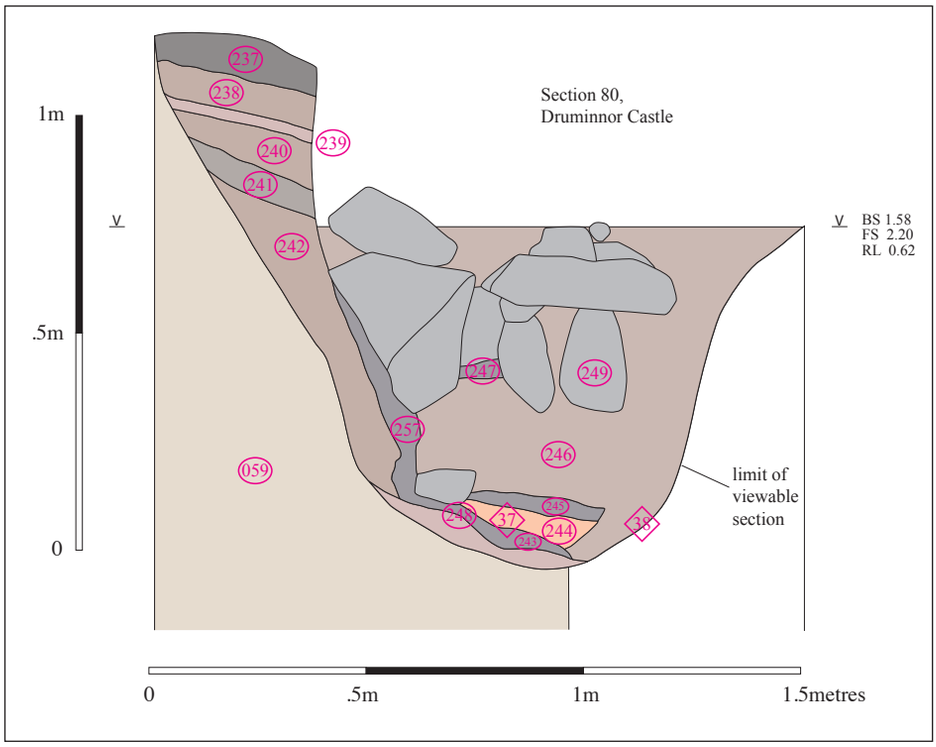

Figure 5. West-facing section showing masonry fill of bowl and sandy fill (242) between probable remains of wattle lining (257) and pit edge.

therefore, lead to the possibility of a stone-built kiln superstructure. If so, this suggests a considerable investment of resources during a period of very limited stone architecture in the region. However, such construction would certainly have helped in limiting the risks of total destruction by fire. The clay lining noted in the environmental report (see below, sample <42>) may have been associated with this structure's internal wall-facing. Were it to be a remnant of lining from the bowl chamber, it would be hard to explain how so little of it survived. At Fisher Gate the surviving evidence suggested a timber-framed superstructure (Young, 1982, Fig.2).

A hard-packed platform of 'hardcore' surrounded the surviving bowl end of the kiln but did not extend along the length of its flue (Figure 2, Trench 7, [329]; Trench 8, [260]). This 'hardcore' structure was not found within the fill of the kiln and was either contemporary with the kiln or pre-dated it. It may be suggested that this platform was contemporary and provided a base for a stone kiln superstructure as well as providing an external working area. Holden (2006, 108) notes the benefit of an associated working area where the crop could be processed prior to drying. However, it also possible that the kiln was excavated through an earlier platform, making use of it as a secure foundation for the stone superstructure. A 'lower' platform is outlined by what may be a residue (333) (Figure 2, Trench 7) derived from an outer wall covering and mirrors the cut of the kiln's bowl. No post or stake holes were found within these 'hardcore' deposits, again suggesting that stone may have comprised the walling of the superstructure. It is interesting to note that many of the stones included within the matrix of the underlying platform were smoothed, red, granitic stones not native to the immediate environment. If the second suggestion is preferred, then, clearly, the kiln was not the first structure on the site.

As noted, the kiln provided a good array of environmental evidence. This was analysed by Jackaline Robertson of AOC supported by a generous grant from the Hunter Archaeological and Historical Trust.

The Environmental Evidence

Jackaline Robertson

Factual Data

Fifteen environmental samples were submitted for analysis from the excavation of the kiln undertaken at Druminnor Castle. The samples were composed of three bulk samples, two *in situ* burnt wood samples, three charcoal samples, two deposits of clay sediment, one shell, a kubiena ('soil block') sample, three samples of mixed macroplant and charcoal remains. These samples were collected from a series of features associated with a corn drying kiln within the castle footprint. The environmental remains recovered from the samples comprised a large number of carbonised macroplant items, in particular cereal caryopses, charcoal and sediment deposits. The aim of this report is to analyse the ecofact assemblages in order to characterise and understand the archaeological features from which they derived.

Methodology

The three bulk samples were processed in their entirety in laboratory conditions using a floatation method designed to retrieve environmental remains (cf. Kenward et al. 1980). The sandy sediment did not require any pre treatment. Sample <43> was a kubiena sample composed of three separate tins. Unfortunately these samples had dried out and disaggregated within the tins. This kubiena sample was therefore treated as a bulk sample and processed accordingly to maximise recovery of ecofacts. The three samples described as a mix of charred grain and charcoal were dry sieved in an effort to extract all the identifiable remains. All plant macrofossils were subsequently examined at magnifications of x10 and up to x100 where necessary to aid identification. The exception was the cereal remains recovered from (243) where a sub sample was selected for analyses due to the large quantity of available remains for study. Identifications were confirmed using modern reference material and seed atlases stored at AOC Edinburgh (Cappers et al 2006; Jacomet 2006). Taxonomic and nomenclature for plants follows Stace (2010).

The charcoal assemblage was concentrated within a number of contexts. The following criteria were used as a guideline for interpreting feature usage. Those samples which contained two or more species were typically designated as fuel waste, whereas large concentrations of single species were viewed as more likely to represent structural burning. Samples <33> and <34> were lifted as block samples to determine the nature of the burnt wood within. These samples were excavated in laboratory conditions. Sample <33> was composed of four distinct fills but it was only from the inner (relative to the kiln) black silty fill that charcoal roundwood was recovered. Sample <34> appeared to belong to a single burnt element. Five pieces of charcoal were selected from sample <34> for species identification to confirm if it belonged to a single piece or if it was an accumulation of brushwood.

Results of Macroplant Analysis (Table 1)

The charred macroplant assemblage was large with over 10000 items recovered from five contexts. The plant remains were dominated by cereal caryopses which were concentrated within a single deposit (243). Preservation of this material ranged from poor to excellent and most were described as good. The cereal species identified were black oat (*Avena strigosa L*), wild oat (*Avena fatua L*), hulled barley (*Hordeum vulgare L*), rye (*Secale sp*) and wheat/rye (*Triticum/secale sp*). Approximately 9986 cereal caryopses were recorded and the dominant species was oat which accounted for 97% of the assemblage. This was followed by black oat and indeterminate cereal which

	Sample			30	31	32	37	38	41	43	45
	Context			212	213	214	243	243	243	243	265/263
	% Sort			100	100	100	100	25	25	25	100
Species		**Name**	**Part**								
Crops:											
Hordeum vulgare L.		Hulled barley	Caryopsis/es	5		1					
Hordeum sp.		Barley	Caryopsis/es	12	20	2					2
Secale sp.		Rye	Caryopsis/es	3	1						
Secale sp.		Rye	Internode		1					1	1
Triticum/Secale sp.		Wheat/rye	Caryopsis/es	1	1	1				2	
Avena Strigosa L.		Black oat	Caryopsis/es	3	20			4	37		10
Avena Strigosa L.		Black oat	Floret	1	4			13	7		2
Avena fatua L.		Wild oat	Caryopsis/es		3			1	2		
Avena fatua L.		Wild oat	Floret		1			1			
Avena sp.		Oat	Caryopsis/es	268	802	95	947	>1000	>5000	>1000	615
Cereal		Cereal	Caryopsis/es	18	15	6	18	10	5	9	6
Cereal		Chaff nodes			5				1	3	
Economically useful plants:											
Corylus avellana L.		Hazel	Nutshell	1							
Calluna vulgaris L.		Heather	Bud		1						
Calluna vulgaris L.		Heather	Twigs		8						
Vicia sp.		Pea	Seed(s)					`1			
Weed species:											
Atriplex hortensis L.		Red orach	Fruit(s)		1						
Carex sp.		Sedge	Fruit(s)	4	>50	7	1			1	
Galeopsis sp.		Hemp nettle	Schizocarp	7	3	3			1	2	
Fallopia convolvulus L.		Black bindweed	Fruit(s)		2			2			
Ranunculus sp.		Buttercup	Fruit(s)	2	>50	1					
Rumex sp.		Dock	Fruit(s)	1							
Spergula arvensis L.		Corn spurry	Seed(s)	1		54		1			
Lapsana communis L.		Common nipplewort	Fruit(s)	1		1					
Unknown		Indet	Seed(s)/fruit(s)	3		2	1				1
Sclerotia		Spore	Spore	11	1						

Table 1. The carbonised macroplant remains.

Sample	Context	Species	Name	Frag	RW	Weight
30	212	*Alnus glutinosa L.*	Alder	1		
30	212	*Betula sp.*	Birch	5		
30	212	*Corylus avellana L.*	Hazel		4	13.5
31	213	*Alnus glutinosa L.*	Alder		1	
31	213	*Betula sp.*	Birch		1	
31	213	*Corylus avellana L.*	Hazel		17	94.5
32	214	*Corylus avellana L.*	Hazel	1		
32	214	*Pinus sp.*	Pine	2		0.1
33	213	*Corylus avellana L.*	Hazel		9	
33	213	*Salix sp.*	Willow		1	39.7
34	213	*Corylus avellana L.*	Hazel		5	4.4
37	243	*Alnus glutinosa L.*	Alder	1		
37	243	*Betula sp.*	Birch	1		0.2
38	243	*Corylus avellana L.*	Hazel		10	4.5
39	256	*Betula sp.*	Birch	6	3	
39	256	*Corylus avellana L.*	Hazel		1	58.3
40	251	*Betula sp.*	Birch	1		0.6
41	243	*Corylus avellana L.*	Hazel		3	
41	243	*Salix sp.*	Willow		7	12.4
43	243	*Corylus avellana L.*	Hazel		2	0.9
45	265/263	*Betula sp.*	Birch	9		
45	265/263	*Corylus avellana L.*	Hazel		1	12.3

Table 2. The charcoal species.

both formed 1% respectively. The remaining 1% of the cereal assemblage included small quantities of hulled barley, barley, wild oat, rye and wheat/rye.

Potentially economically useful plants in the form of food or fuel were hazelnut shell (*Corylus avellana L*), pea (*Vicia sp*) and heather (*Calluna vulgaris L*).

The weed taxa totaled 196 and were identified as buttercup (*Ranunculus sp*), black bindweed (*Fallopia convolvulus L*), common nipplewort (*Lapsana communis L*), corn spurry (*Spergula arvensis L*), dock (*Rumex sp*), hemp nettle (*Galeopsis sp*), red orach (*Atriplex hortensis L*) and sedge (*Carex sp*). These species are a mix of agricultural contaminants and heathland plants which tend to favour acidic damp habitats. A further seven weed remains could not be identified to species due to poor preservation. There were also 12 charred spores.

Results of Charcoal Analysis (Table 2)

The charcoal assemblage (241.4g) was recovered from seven contexts. The species identified were alder (*Alnus glutinosa L*), birch (*Betula sp*), hazel (*Corylus avellana L*), willow (*Salix sp*) and pine (*Pinus sp*). The dominant species was hazel which formed 58% of the assemblage followed by birch (28%), willow (9%), alder (3%) and pine (2%). The charcoal fragments were concentrated within contexts (213) and (256). The rest of the assemblage was scattered throughout the remaining features in relatively small quantities. There were alder, birch, hazel and willow roundwood fragments which formed 71% of the identified assemblage.

The Kiln Features by Context

Context (212) Sample <30>

A single bulk sample from deposit (212) described as an accumulated fill of the kiln was processed and a large number of charred macroplants and charcoal fragments were recovered.

Macroplant: The charred macroplant assemblage totalled 342 remains which were dominated by cereal caryopses. The cereal remains numbered 311 and the species identified were hulled barley (2%), barley (4%), rye (1%), wheat/rye, black oat (1%), oat (86%) and cereal (6%). There was also one caryopsis identified as wheat/rye. The other edible species were hazelnut shell. The weed taxa included small numbers of buttercup, common nipplewort, corn spurry, dock, hemp nettle and sedge. There was also a small quantity of spores.

Charcoal: The charcoal assemblage was small (13.5g) and was identified as alder (10%), birch (50%) and hazel (40%). The hazel remains were composed entirely of roundwood.

Synthesis: The cereal remains are corn drying waste and the weed taxa are common agricultural contaminants. The charcoal remains have derived from fuel residue.

Context (213) Samples <31>, <33>, <34>

From this context described as an accumulated fill of kiln a single bulk sample and two block samples of burnt wood were submitted for analysis.

Macroplant: A minimum of 989 carbonised macroplant remains were noted within the bulk sample. The cereal remains totalled 873 and were identified as barley (2%), rye (0.3%), wheat/rye (0.2%),

black oat (3%), wild oat (0.5) and oat (92%). A further 2% were described as indeterminate cereal. There were also a small number of heather remains in the form of buds and twigs. The weed taxa were dominated by buttercups and sedge which were recovered alongside smaller numbers of black bindweed, hemp nettle and red orach.

Charcoal: The greatest concentration of charcoal (138.6g) was recovered from context (213). Sample <31> contained the largest quantity of charcoal (94.5g) followed by samples <33> and <34> which had 39.7g and 4.4g respectively. This was a mixed deposit composed entirely of roundwood and the species identified were alder (3%), birch (3%), hazel (91%) and willow (3%).

Synthesis: The cereal is waste debris from the kiln. It is likely the heather and weed seeds are inclusions within turf material used to fuel the kiln. The hazel roundwood pieces from samples <31> and <34> appear to fit together and it is possible these have derived from the burning of two small structural elements such as stakes posts. The hazel charcoal from <33> also appears to have derived from a single element and the presence of willow within this context could be indicative of a wattle screen, although there was no surviving evidence of this material having been woven. The remainder of the charcoal is typical of mixed fuel debris.

Context (214) Sample <32>

A single bulk sample was submitted for processing from an accumulated fill within the kiln.

Macroplant: The cereal species numbered 105 and were identified as hulled barley (1%), barley (2%), wheat/rye (1%), oat (90%) and cereal (6%). The weed taxa included 68 remains which were dominated by corn spurry. There were low numbers of buttercup hemp nettle, common nipplewort and sedge.

Charcoal: The charcoal assemblage was small (0.1g) and was identified as one piece of hazel and two of pine.

Synthesis: The cereal remains are waste from the kiln and the weed taxa are agricultural contaminates. The charcoal is probably a small deposit of mixed fuel debris.

Context (243) Sample <37>, <38>, <41>, <43>

From context [243] which was the primary deposit from the kiln floor, four samples of grain, charcoal and a material described as clay like lumps were collected.

Macroplant: The charred macroplant was concentrated within this context with a sub sample of 8070 remains counted. The species identified were rye, wheat/rye, black oat, wild oat, oat and cereal. The greatest number was oats which accounted for 99% of the assemblage. A small proportion of the oat caryopses from sample <43> were either not carbonised or only partly charred. The plant remains from <37>, <38> and <41> were entirely charred. A large number of oat caryopses from sample <38> were embedded within what appeared to be a peat ash type material. Sample <41> also contained a small quantity of clay fragments which on closer analysis had inclusions of cereal, charcoal and mortar which had been exposed to extended periods of burning. The only other evidence of food remains was a single pea, The weed assemblage was composed of nine remains identified as black bindweed, corn spurry, hemp nettle and sedge.

Charcoal: Charcoal fragments (18.0g) were recovered from all four samples but these remains were concentrated within sample [41] which accounted for 12.4g. The charcoal was identified as alder

(4%), birch (4%), hazel (63%) and willow (29%). The hazel and willow were composed of large roundwood pieces which accounted for 92% of the fragments identified.

Synthesis: This large concentration of cereal remains in particular oats is evidence of long term use of the corn drying kiln. The presence of large fragments of burnt peat indicates that this was an important source of fuel used within the kiln alongside a smaller proportion of charcoal. The clay fragments appear to be part of the kiln lining in which organic matter has been burned onto the surface. This accumulation of material in which cereal and fuel had the opportunity to become incorporated within these kiln layers suggests that this feature was not fully cleaned in-between use.

Context (251) Sample <40>

A small container of charcoal was submitted for species identification from this post hole which is believed to have formed part of the architecture of the kiln within the flue.

Charcoal: A single fragment of birch (0.6g).

Synthesis: This material may have formed part of a post burnt in situ.

Context (252) Sample <42>

This was a clay type sample composed of three distinct burnt affected layers which was collected from the kiln floor. The first layer is made up of a light yellow grey sandy stone with iron type inclusions within the sediment. The layer overlying this is a mid gray sandy type material with inclusions of burnt material such as charcoal and cereal caryopses and overlying this are patches of loose mortar. This material is friable and delicate to the touch. It is likely this material is part of the kiln lining which has been exposed repeatedly to burning which has allowed layers of charcoal and cereal to become attached. .

Context (256) Sample <39>

A small container of charcoal was submitted for species identification from this deposit.

Charcoal: The charcoal (58.3g) was identified as large fragments of hazel.

Synthesis: The fragments were not obviously worked but given the relatively large concentration of a single species within one feature it suggests it could have derived from the burning of a small discrete structural element such as a stake or post.

Context (265) Sample <45>

A mixed sample of grain and charcoal was collected from a posthole [263] cut into the floor of the kiln.

Macroplant: The macroplant assemblage was large and 637 remains were recovered. These were dominated by 636 cereal which were identified as barley, rye, black oat, oat and cereal. Oat formed 97% of the assemblage followed by black oat which accounted for 2%. The only other find was a single poorly preserved seed which could not be identified further.

Charcoal: There was a large quantity of charcoal (58.3g) identified as birch (90%) and hazel roundwood

(10%). A portion of the birch charcoal was submitted for carbon-dating.

Synthesis: The cereal is probably redeposited waste from the kiln floor which was reworked into this posthole. The large concentration of birch does suggest that a stake or other wooden support constructed from this species was burnt in situ. There is no evidence that hazel formed a structural element within this posthole and it is likely this species is intrusive along with the cereal caryopses.

Context (246) Sample <44> - Foundation deposit for overlying structure

This sample is a light yellow grey sandy clay friable to the touch. This material is heat affected and has inclusions of organic residue such as oat caryopses and charcoal fragments. This material given the presence of organic remains may have originally derived from the superstructure of the corn drying kiln before being recycled at a later date as a foundation deposit.

Discussion

Cereal

The dominant cereal species within this assemblage was oat. A small number of these caryopses still had the palea and lemma attached and it was possible to identify both black oat and a smaller number of wild oat. While the majority of the oat could not be identified further they are more likely to be black oat rather than wild oat which was probably a weed contaminant of the main cultivated crop. Black oat tended to be the dominant crop in many regions during the medieval and later periods in Scotland (Hastie 2011; 58). This is due to soil and climate conditions which favour the cultivation of species such as oat and barley over wheat species which require very specific conditions to thrive. Barley and rye were also present in small numbers and these were either cultivated as a companion crop to the black oats or like the wild variety were contaminates. It is more likely they were secondary companion crops of less economic importance than the oats.

Vegetable Remains

The only possible evidence of vegetable remains was a single pea, but it is was not possible to identify if this was of the cultivated variety or was instead a weed contaminate of the main cereal crop which was accidently harvested and then charred. The recovery of vegetable remains within the archaeobotanical record is rare as these remains tend to be fragile and tend not to survive the charring process.

Wild Food

Wild food remains comprised a single hazelnut shell fragment. The recovery of hazelnut shell from archaeological sites is common place given their ready availability in the landscape coupled with their ability to survive the charring process.

Weed Taxa

The weed taxa are composed of agricultural contaminants and heathland plants which tend to favour acidic soils and or damp habitats. These plants were either growing alongside the main crops and brought to site as accidental inclusions or were inclusions within the peat turves which were used to fuel the kiln.

Fuel

There is evidence from context (213) and (243) that turfs were used to fuel the kiln as heather and peat were concentrated within these contexts. Peat turfs tended to be favoured over wood within drying kilns in an effort to prevent the kiln catching fire (Hastie 2011; 58). It does however appear that wood species such as alder, birch, hazel and pine were also used to fuel the kiln in small quantities.

Structural Elements

There was evidence of small discrete structural elements such as posts and stakes made from birch and hazel in contexts (213), (251), (256) and (265).

Environmental Analysis Conclusion

It is obvious that oats were the most economically important species at Druminnor Castle with hulled barley and rye having only a secondary role. The post medieval kiln at Lockerbie Academy also demonstrates oats as the favoured species (Hastie 2011;57). Fuel sources used for the kiln were peat turfs along with a smaller proportion of mixed wood species. There is also evidence of surviving small discrete posts and or stakes burnt *in situ* within the charcoal assemblage. The ecofact assemblage recovered from Druminnor castle is similar to other corn drying kiln sites in medieval and post medieval Scotland.

Site Discussion

Colin Shepherd

A problem that bedevils discussion of kilns in the north of Scotland is an inability to accurately quantify the number of them within the area throughout the Medieval. Although, after the onset of the mini ice-age, every fermtoun may have had a communal kiln, as appears to have been the case in the 18th-century, it is not safe to backwardly-project that view to the 12th-century. Agricultural and tenurial management regimes were not static prior to the 18th-century industrialisation of the landscape (Whyte, 1980, 118). During the 17th century in Strathbogie, agricultural productivity was well-managed and ecologically-targeted (Shepherd, 2011). The mid 16th-century Forbes rental (MS 588) also demonstrates a range of management and tenurial techniques, including demesne management of Druminnor at that time (Shepherd, 2015). The custom of thirlage is well recorded for pre-modern times in the area: "…sall punctuallie keep such millis as they ar bound succken to and pey their moulter and knaiship and do dutie yairto…" (Forbes Baron Court Book, 1663, Scot. Hist. Soc, 1919, 239-240). This requirement of using the laird's mill might be assumed to have its origin, along with service obligations, in a 'manorial' type of environment. In other words, the evidence for a manorial-type management of the landscape in the North-east is documentarily fairly well-attested. Yeoman noted in 1998 that a class of, "middle status defended residences of this period is largely missing from the archaeological record" (1998, 614) and Murray & Murray note (2012, 31) how very few such sites have even now been excavated in the North of Scotland. Difficult questions concern how and when that 'manorial' structure developed in the area. It does not need to have been externally-introduced by a late 12th-century 'feudalisation' of the area, but may have occurred earlier under native influence. Dransart's work raises the question of how the the economic structure of the local church may have interacted in this respect. 12th-century pottery found at the site of the Bishops' of Aberdeen palace at Fetternear indicates high status use - including a chapel - at that time (2016a,

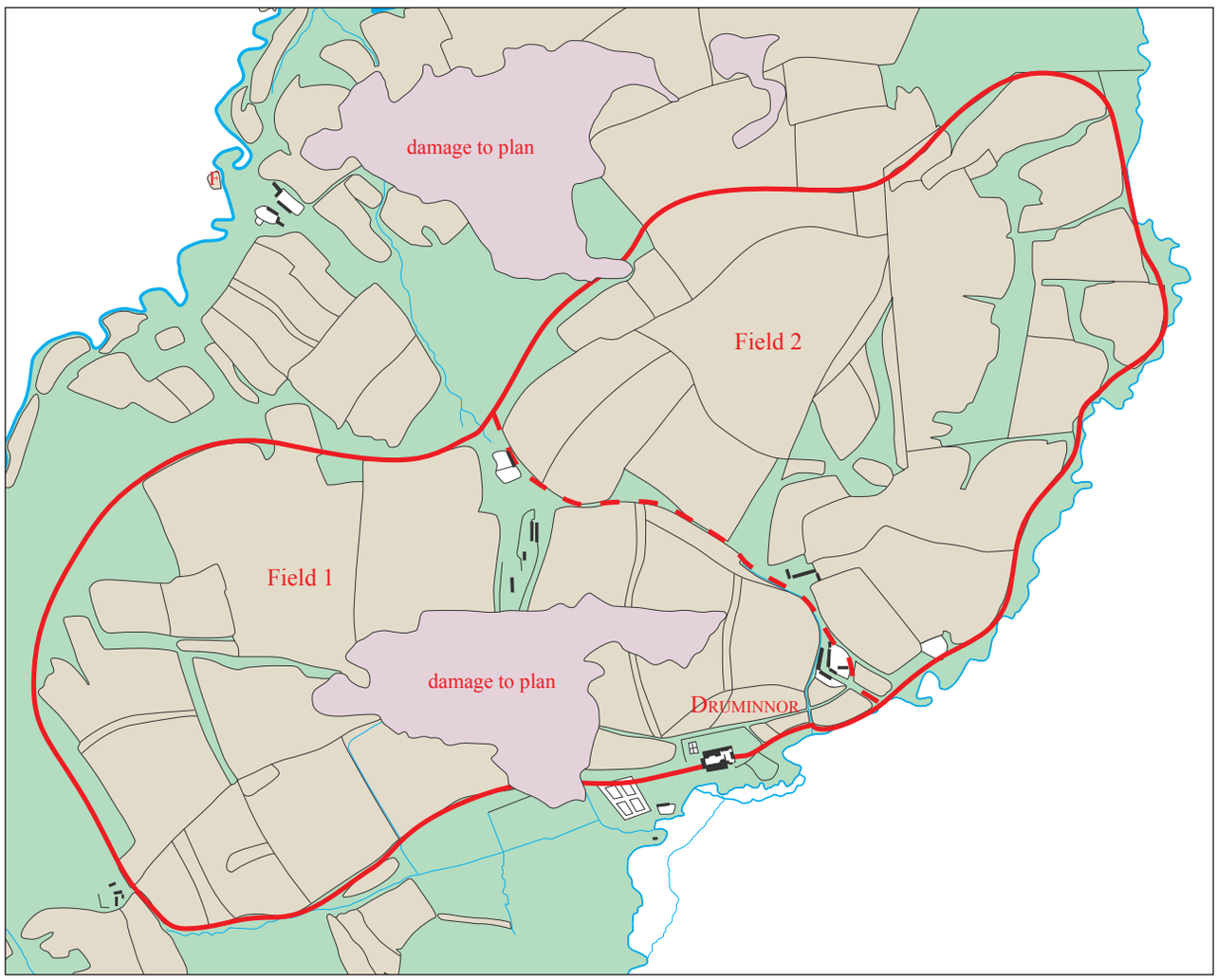

Figure 6. 18th-century estate plan (RHP260/1) showing the two former open fields fossilised within later enclosures lying either side of the dotted red line.

123). A papal bull assigning the *villam de Fethirneir* to the diocese is dated to 1157 (Reg. Episc. Aberdon., I, 7). Similarly, 12th-century pottery from the fill of a ditch associated with a ringwork at Spynie may also be relevant (Dransart, 2016b, 74). The evidence from Druminnor is pertinent to this discussion.

Figure 6 shows cartographic evidence taken from an 18th-century estate plan (RHP260/1) that appears to depict two former large (120 acres each) open fields pertaining to Druminnor. It has been argued at length elsewhere that such open fields utilising a two- or three-course rotation were not uncommon in the area during the later Medieval (Shepherd, 2007) and that, at Druminnor, aspects of the demesne management of such a landscape appears to have persisted until at least the mid 16th-century (Shepherd, 2015). Campbell's work (2008) highlighting the importance of sheep to the North-east's economy during the 13th-century would supply a further factor underpinning a well-integrated agricultural economy. Direct evidence for the importance of sheep in the region is only apparent through the financial records assessed by Campbell. However, ocassional hints remain, such as the reference to Sir John Broun's sheep cotes and shepherd's houses on the hills of Correen overlooking Druminnor in the first half of the 14th-century (Reg. Episc. Aberdon., I, 249; Stodart, 1887, 2). This was not long after the demise of the heyday of the North-east's wool production and export trade. The development of the Bishops' palace at Fetternear during the 13th- and first half of the 14th-century (Dransart, 2016b, 67-8) also suggest a strong, local agricultural economy that underpinned these architectural aggrandisements.

The cartographic and tenurial evidence may, therefore, suggest an open field system the

instigation of which is unlikely to date to later than 1300 on socio-economic and climatic grounds. It may well date to an earlier horizon. The 1270s may supply a possible timeframe related to the granting of the Forbes charter and the suggested construction-date of the tower. However, an earlier date supplied by the kiln raises the possibility that the introduction of kiln and attendant mill technology may have been coterminous with the development of the field systems at an earlier time. Dried grain is essential for milling by power. A later estate watermill was based at Barflat on the River Bogie and it is not inconceivable that an earlier one may have lain closer to the kiln on the Kearn Burn. That burn's suitability for providing power is demonstrated by a later 19th-century sawmill working on that burn within the castle grounds. An increase in agricultural production allied to the laying out of a new field system may have required the provision of a kiln and watermill. Turned on its head, the large fieldscape of Druminnor is likely to have been unworkable without a kiln and watermill. It would be hard to understand the need for a single farm to suddenly acquire a kiln when it hadn't needed one before - especially during a climatic warm phase. Arguments that, "every farm or small group of farms from the medieval to early-modern period in Scotland had its own grain-drying kiln," (Ellis, 2002, 435) requires clarification. The North-east prior to the late 18th century comprised a landscape of fermtouns, usually composed of a number of small tenant farmers. The settlement pattern appears to have been one of small, 'hamlet'-like nucleations set within small open-field systems. These were associated with 'outsets' sited within the wider geographical landscape. These smaller – usually secondary – 'outsets' would rarely have had kilns of their own. In other words, even as late as the 18th-century, kilns were communally-held structures embedded within a system of thirlage to the laird's mill[1]. The evidence for rye found in the kiln at Druminnor (see below) may suggest such agricultural expansion onto more marginal demesne lands, it being able to "fare better on dry and light land or upland marginal areas that produce inferior crops of oats, barley and wheat" (Hastie, 2008, 17). If so, it was clearly being brought to a centralised kiln for processing.

The kilns at Nottingham and Inverness were presumably built to process crops from the extra-mural fields of their respective burghs and, in that pre-capitalised age, either to have been communally-managed, to have been under lordly control or, as appears to have been usual at the time, under a combination of shared responsibilities (Evans, 2004, 161). The 'keyhole' kilns at Hoddom may have formed part of the management structure of a monastic foundation but their siting outwith the main enclosure containing the other kilns suggests a different régime (Holden, 2006, 108) - perhaps of a more secular nature. This is re-inforced by the two certain kilns of this type lying within a separate enclosure, apparently associated with the secular settlement of Pellestells. At Ashford the kilns may have been associated with a manorial site (Atkins and Webster, 2012, 287). The evidence from Druminnor suggests the kiln superstructure to have been possibly stone-built. It should be noted that such use of stone appears to have been very rare at this time in the North-east. Even at the royalty-sponsored castle of Strachan, Yeoman notes the use of timber in the construction of a hall in the mid 13th-century (1984, 323-330). And, at Rattray, at the castle and burgh site of the Earls of Buchan, timber construction of hall-type buildings were in use up until the 14th-century (Murray & Murray, 1993, 121-124). Neither of the comparative structures at Inverness or Nottingham appear related to subsistence fermtoun usage as became common in later centuries. They are more readily explicable in terms of managing a surplus within an economically-determined landscape. At this period it would be improper to speak in terms of a capitalist approach but may be seen as a 'manorialised' approach to managing production. This may be pertinent to the situation at Hoddom were the enclosure at Pellestells to be seen as 'manorial' and , similarly, at Ashford. However, that this production and trade of surplus occurred within a different field of reference based upon 'the just price' and the regulation of market prices for the 'common good' has been well argued by Kaye (1998) and Firth Green (2007). This approach stood in stark contrast to the capitalised approach which developed in the post-plague period (de Moor & van Zanden, 2010). It is important to bear these social distinctions in mind when comparing the two eras.

Note 1. In some instances, one fermtoun would have its mill located in a neighbouring fermtoun's land owing to the lack of a viable burn in its own lands. Such a situation pertained to Kincraigie which had the 'Nether Miln' of Keig on the Forbes estate (RHP 859) though the rent for it was included in the rental for Kincraigie (CS313-1045).

How far back in time this socio-political structuring of the demesne landscape in the North-east of Scotland occurred is, at the moment, unclear. Any evidence indicating the date of inception of this structuring is, therefore, very important. The introduction of kilns, mills and developed open field systems may well be linked features of this development. Williamson notes these technological co-respondents and underlines the importance of the development and use of large, framed mouldboard ploughs in this suite of technological changes (2013, 16-20). Roberts draws attention to the creation of the newly planned village and fields of Ednam, Roxburghshire shortly preceding the reign of David I (1124-53) (Roberts, 2008, 246-7). Holden (2006, 108) notes how the earlier kilns at Hoddom suggest a development from subsistence-based 'home-drying' of 'piece-meal corn', defining a change in scale of operation to one associated with high-status settlement and almost 'industrial-scale' production. He does, however, also suggest that the later 'keyhole' kilns may be more representative of communal ownership, though this does not negate the possibility of manorial control, as noted above.

It may be necessary to review our understanding of agricultural practices in the north of Scotland and to allow a much earlier floruit of open field agriculture. It might also be necessary to question whether this development was necessarily associated with the arrival of an Anglo-Norman knightly-caste in the area some time after 1178 x 1182 (Stringer, 1985, 30). David I's castle and burgh, commerce-based royal expansion into the North-east may have been a spur to agricultural development and may even have played a part in necessitating the building of the Inverness kiln. Parallel ecclesiastical changes to monastic, parish and diocesan structures also may have played a part in altering social economic expectations within the region. The native house of Mar, from whose lands Druminnor was carved and to whom the Lords of Forbes remained affiliated, appear to have refounded the earlier *Céli Dé monasterium* of Monymusk as an Augustinian priory by c.1200 (Oram, 2003, 52). Also, the increasing agricultural wealth of the region might further explain the desires of William the Lion to extend his reach there. That expansion was mediated and consolidated by granting to his brother the lucrative Lordship of the Garioch (*ibid*.). The North-east, by the mid 13th-century, may be seen to have been challenging many parts of England economically (Campbell, 2008, 933). If Campbell's figures are correct, this would be a remarkable development from a standing start c.1180 when the Garioch was granted to David Earl of Huntingdon and a new knightly class introduced. On balance, it must be considered likely that new strategies were put in place earlier.

Regarding the environmental evidence from the kiln, there are some frustrating elements that merely hint at possibilities. The discovery of the single pea is interesting – especially as such archaeological survival is so unusual. Sadly, it is not possible to determine whether it formed part of a field crop, vegetable crop or simply contamination from a wild species. However, its occurrence on the kiln floor in a context with minimal weed taxa suggests that it may well have formed part of a crop rather than an intrusive element. But, sadly, this cannot be proven. The question of whether legumes were grown at this time in the North-east still remains open to question. They were certainly grown at the very beginning of the 17th century as shown by their inclusion in the Aberdeen Fiars Prices at that time (Miscellany of the New Spalding Club, 2, 1908). The evidence for wheat being grown in the area at this time is also inconclusive and awaits corroboration from further yet-to-be-discovered sites. The occurrence of rye within the kiln may attest the expansion of arable practices upon more marginal land, as suggested for its evidence at Dornoch by Hastie (2008, 17). If this were the case, the crop would have been carried a considerable distance from the margins of the estate to the demesne centre for processing. The tree species noted in the kiln may be instructive. The absence of oak, elm and ash may suggest that the wood used came from a managed environment. Were wood to have been simply opportunistically collected, it seems unlikely that those major species would not have been represented. Managed woodland itself suggests manorial policing, even if such resources may have included customary rights of appropriation within the wider population.

The two radiocarbon dates would appear to suggest a window for the end of the Druminnor kiln to lie between c.1160 and c.1200 with the grain giving an earlier date range than the burnt post

and, perhaps, suggesting a date nearer to 1160 than 1200. Whilst this range is clearly only an exercise in probability, it does lay a reasonable foundation for suggesting a pre Anglo-Norman inspiration for a revised landscape and technological restructuring of the estate. Regarding the ancestry of the Forbeses: as the Lordship of Forbes lay within the perimeter of the historic Earldom of Mar, it is noteworthy that families of recognisably Anglo-Norman descent do not figure within that area before the second quarter of the 13th-century (Oram, 2003, 50). Even if the occupants overseeing the suggested redesigned landscape were predecessors of the Forbes' overlordship of Druminnor, they are equally likely to have been of local descent.

Conclusion

Whilst it is not possible to demonstrate a positive connection between the development of an enclosed lordly caput at Druminnor and the construction of the kiln, an apparent congruence of dating is quite noteworthy. Similarly, it is not possible to date the laying-out of the open fields forming the later demesne of the lordship, nor to demonstrate a connection between that event and either the construction of the kiln, the development of the castle, or the emergence of a manorial-like environment. However, the coincidence of temporal and spatial positioning is suggestive.

That the North-east of Scotland appears to have been economically-active and relatively wealthy by the middle of the 13th-century at the latest, suggests that a robust agricultural management regime was in place well before that time. The environmental evidence emerging from Druminnor would not seem to be out of place within such a socio-economic landscape. And, whilst much of the wealth of the North-east undoubtedly resulted from the management of sheep, such an industry would not have been viable without a broader agro-economic infrastructure.

At its most optimistic, the environmental and landscape evidence suggests an open-field system producing predominantly oats but with barley and, perhaps, wheat during this climatic warm spell. The presence of rye may attest the expansion of arable practices onto more marginal land. Peas may have been grown as a crop as well as for nitrogen-fixing qualities. The structural wood found in the kiln hints at a managed, coppiced woodland providing species appropriate to differential building requirements. The high forest trees - oak, elm and ash – were seemingly reserved for more appropriate constructional tasks. That the grain required drying suggests that a mill was being used to grind corn. The kiln appears to have been positioned within an enclosed, seigneurial setting that, within a short time, witnessed the construction of a tower as impressive as anything else in the North-east at that period.

It is difficult not to consider the possibility that Druminnor was witnessing the economic development of a lordly estate that was in tune with agricultural and landscape management regimes as appropriate to the times as anything across the northern half of Britain. Also, that this development fore-shadowed subsequent (post-1178) Anglo-Norman influences in the area and occurred within a 'native' estate.

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