Rathfarnham Castle
Plant and animal remains

GIACOMETTI 10-06-2016 E4468

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

archaeology plan
HERITAGE SOLUTIONS

SITE NAME

Rathfarnham Castle, Phase 6 renovation works, Rathfarnham Road, Dublin 14

CLIENT

Office of Public Works, 52 St. Stephen's Green Dublin 2

LICENCE

Ministerial Consent E4468 (C562)

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DATE

10 June 2016

RATHFARNHAM CASTLE 2014 EXCAVATIONS REPORT SERIES

I Rathfarnham Castle Excavations 2014: **Preliminary Stratigraphic Report**. Giacometti, A. 2014. Archaeology Plan.
II Rathfarnham Castle Excavations 2014: **Glass**. Giacometti, A. 2016. Archaeology Plan.
III Rathfarnham Castle Excavations 2014: **Ceramics**. Giacometti, A. 2016. Archaeology Plan.
IV Rathfarnham Castle Excavations 2014: **Metal**. Giacometti, A. 2016. Archaeology Plan.
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Archaeological work funded by Office of Public Works.

Contents

Introduction

Antoine Giacometti

This report describes the analysis of the environmental samples and faunal remains from the Rathfarnham Castle 2014 excavations.

Penny Johnston describes the result of her analysis of the plant remains from four environmental samples. She identifies large amounts of fruit, including some exotic (probably imported or grown by specialists in a greenhouse) fruits such as grape, melon and fig, are indicative of the high status. She emphasises the role of plant remain analysis in describing not only the diet, but also changing fashions for gardening among elites.

Stephen Davis analyses the insect remains from three environmental samples from the washpit. He identifies structural pests associated with wooden structural timbers and floors, and insects associated with moving water, both of which correlate well with the archaeological findings. Steve also identifies a group of insects associated with herbivore dung, which is more surprising considering the location and overall context of the deposit.

Ruth Cardon assesses the animal remains (excluding fish and bird). She identifies a wide range of wild (including deer and rabbit) and domestic (including lamb) species interpreted as food remains, suggesting the occupants of the castle had a rich diet. Remains of smaller animals that would have crawled in through the drain are also present. She suggests the remains are indicative of specific periods/meals rather than representative of the daily diet. This conclusion correlates with the interpretation of the ceramic and glass vessel assemblage, and may be comparable also to a contemporary animal remain assemblage excavated at Tunsgate, Guilford, where the remains were interpreted as deriving from a single large feast.

Sheila Hamilton Dyer describes the bird and fish bone. Fish species comprised cod (with heads), ling (without heads) and flatfish (turbot and plaice), salmon, gunard, eel and bream. The identification of bream (cyprinid) is of particular interest as it is a freshwater species possibly introduced in c. 1700 and rarely identified archaeologically. Bird species comprise chickens (mostly very young chicks), turkey, quail, geese, duck, waders (woodcock, lapwing, golden plover and snipe), corncrake, gull, songbirds and a barn owl. Butchery marks on most of the species established they were eaten, with the exception of the barn owl. Crab was also identified.

Niall Hatch from bird watch Ireland analysed the eggshell remains. Alva Mac Gowan has described his findings. Niall suggests that the eggshells may include pheasant or partridge, and pigeon. The latter may represent evidence of carrier pigeons kept at Rathfarnham Castle.

Mollusc remains are described by the author and include oyster, cockle, scallop, mussel, periwinkle and limpet.

A banana skin was one of the most surprising discoveries from the 2014 excavations. This is the only find of a banana from an archaeological context in Ireland to my knowledge. The banana skin was radiocarbon dated by Poznań Radiocarbon Laboratory, and their conclusion (probably 225+/-30 BC) places it in the 17th century.

A human tooth is examined by dentist Jack Grennan. He concludes it is a molar with three cavities from a mature (40+) man, which likely fell out as a result of gum disease.

Ellen O'Carroll identifies the wood types from samples of the wooden artefacts. She identifies oak, willow, elm, birch and pomoideae (apple, pear, hawthorn or mountain ash).

Environmental samples

Thirty environmental samples were taken during the excavation. A number of these are in storage for potential future research, and the following are described in this report.

The remaining environmental material was fully collected rather than sampled. All bone and shell from the excavation was retained. All material was sieved through 1.4mm mesh so even small bones were recovered.

Plant remains			
	Sample 4	C2	(10l bulk sample)
	Sample 5	C6	(10l bulk sample)
	Sample 6	C7	(10l bulk sample)
	Sample 25	C10	(10l bulk sample)
Insect remains			
	Sample 1	C6	(chamber pot 6:15)
	Sample 2	C6	(10l bulk sample)
	Sample 3	C7	(10l bulk sample)
Eggshell			
	Sample 17	C2	
	Sample 18	C6	
	Sample 19	C2	

Faunal remains excl. fish/bird	2,158 bones or bone fragments. C1-4 and C6-11. MNI 18 (16 mammals, 1 amphibian, 1 crustacean)
Fish remains	299 bones or bone fragments. All from C2-C9
Bird	234 bones or bone fragments, 213 from C2-C9 and 21 from C1, C10 & C11
Mollusc	337 shells
Human	1 tooth
Banana skin	Sample 10 C4 Two fragments (radiocarbon dated)
Sponge	E4468:6:8040 C6 Marine sponge *Spongia officinalis*, described in organic artefacts report.

A further six samples are still being analysed by Jessica Smith at Bristol University.

Samples at Bristol University

Sample 11	Red pigment (rouge?)
Sample 12	Red pigment (rouge?)
Sample 13	Glass phial (6:4477) liquid contents
Sample 14	Ointment Jar (6:8039) residue
Sample 15	Red Soft Stone/rouge?
Sample 16	Red Soft Stone/rouge?

Samples were also taken from structural timbers in the washpit (Samples 9 and 24). These were identified by Ellen O'Carroll and described in the wooden artfacts report.

Plant remains

Penny Johnston

Introduction

Excavations at Rathfarnham Castle, Co. Dublin (E4468) were conducted by Antoine Giacometti on behalf of the Office of Public Works over six months in 2014 and 2015.

A total of four samples were taken for full archaeobotanical analysis (C2, C6, C7 and C10). Three of the samples (C2, C6 and C7) were from artefact-rich fills in a washpit, excavated in the southwest flanker tower, in the southwest corner of the basement. All three samples were taken from a layer of black organic sediment. Despite having three separate context numbers, these contexts have been understood, tentatively as being from the same stratigraphic event (Giacometti 2015, 70). Most of the artefacts from these deposits have been identified as dating to the late seventeenth century or the very early eighteenth century (1690 plus or minus 30 years). The remaining sample (from C10) was taken from a charcoal rich layer in the south-eastern flanker.

This report describes the results of archaeobotanical analysis of these samples, concentrating in particular on the seed and fruit remains.

Methodology

Samples were taken as bulk soil on site and each one was processed by wet sieving in order to extricate waterlogged plant remains. The samples were washed through a stack of sieves, with meshes of large, medium and small sizes, with the smallest measuring 250µm. All the samples were sub-sampled, and 1 litre of each sample was processed. Samples from the site were processed by Nikolah Gilligan. The waterlogged material (from C2, C6 and C7) was retained in waterlogged conditions (jars) whereas the charred material (from C10) was dried out and then stored in a dry state in plastic bags after sorting.

The residues were sorted, identified and analysed by Penny Johnston. The retained fractions were sorted using a low-powered binocular microscope (magnification x4.8 to x56). Any plant remains found were identified using the same magnification. Identification was based on experience and on seed keys and illustrations from Stace (1997), Berggren (1981) and the online version of the *Digital Seed Atlas for the Netherlands*.

The raw results and seed counts from each sample are presented in Table 1. Comparative results (seed density for 1 litre of soil) are presented in Table 2. Both tables are presented at the end of this report. Nomenclature and taxonomic order follows Stace (1997).

Results (Samples)

A total of four samples were examined for plant remains: C2, C6, C7 and C10. Three of these were taken from a washpit excavated in the southwest flanker tower of the castle. All three of these samples contained waterlogged (organic) plant remains. The final sample (from C10, in the southeastern flanker) was taken from a charred layer (this contained charcoal but no charred seeds). The waterlogged plant remains are dated to the seventeenth/early eighteenth centuries and were probably from occupation associated with the life of Adam Loftus, the first Viscount of Lisburne (Giacometti 2015, 3). A drain ran through the washpit (entering the washpit from the east and exiting at the west. The contents of all the samples are rich in household waste (food remains) and presumably accumulated in the washpit having come

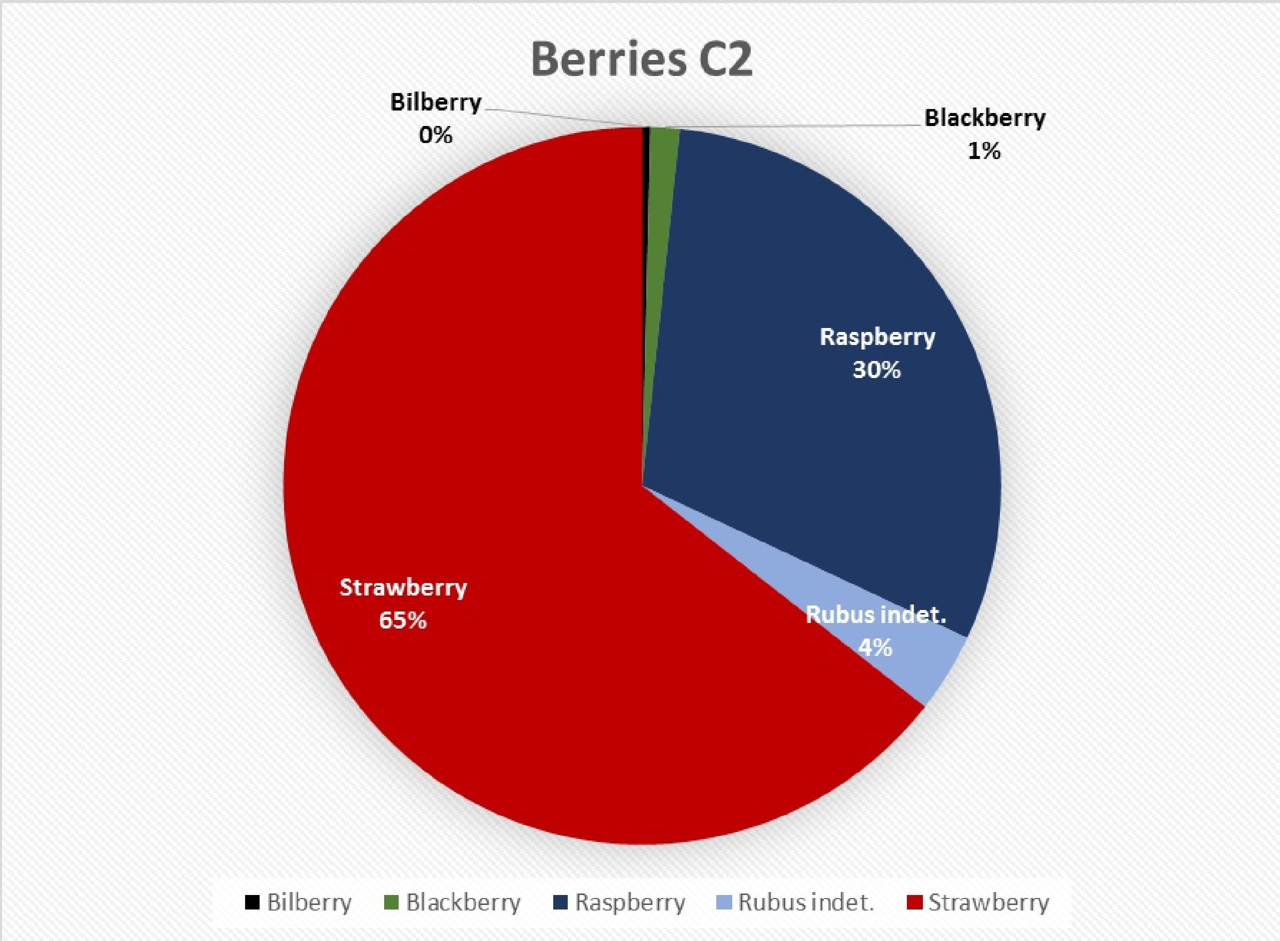

Figure 1: Percentage diagram of incidence of seeds from berries in C2 (E4468)

from the house, via the drain. The excavator's opinion is that this drain and washpit filled up quickly, and that all of these deposits, although spatially distinct, date to a relatively short period of occupation at the castle (and are therefore, all part of the same event or context). There were noticeable differences between the seed assemblages in all the samples, but this may simply be down to the way that the deposit accumulated in the washpit (i.e. it is a spatial, rather than a chronological or a contextual difference).

C2

This sample had the greatest seed density of all the samples taken from Rathfarnham Castle. The volume of the total flot (sieved residue) from this 1 litre sample was 350ml, of which 50ml was sorted. Extrapolating density from this fraction of the flot suggests a rate of 12,3382 seeds per litre. This is roughly 50 times more seed dense than the remaining two samples.

There were large quantities of fruit and food remains in this deposit including berries (blackberry, raspberry, bilberry and strawberry) with strawberry the most common type found in this sample (Figure 1). The ratio of strawberries to raspberry/blackberry was 13:7.

As well as these home grown fruits there were imported/dried fruits such as figs. The single grape pip in this sample may have come from a dried or a home grown grape (see below). Other fruit remains, such as cherry stones, were present in small quantities and there was also a haw stone (not usually considered a food as it is unpalatable and bland). Other foods included nuts (cobnuts, probably from a walled garden),

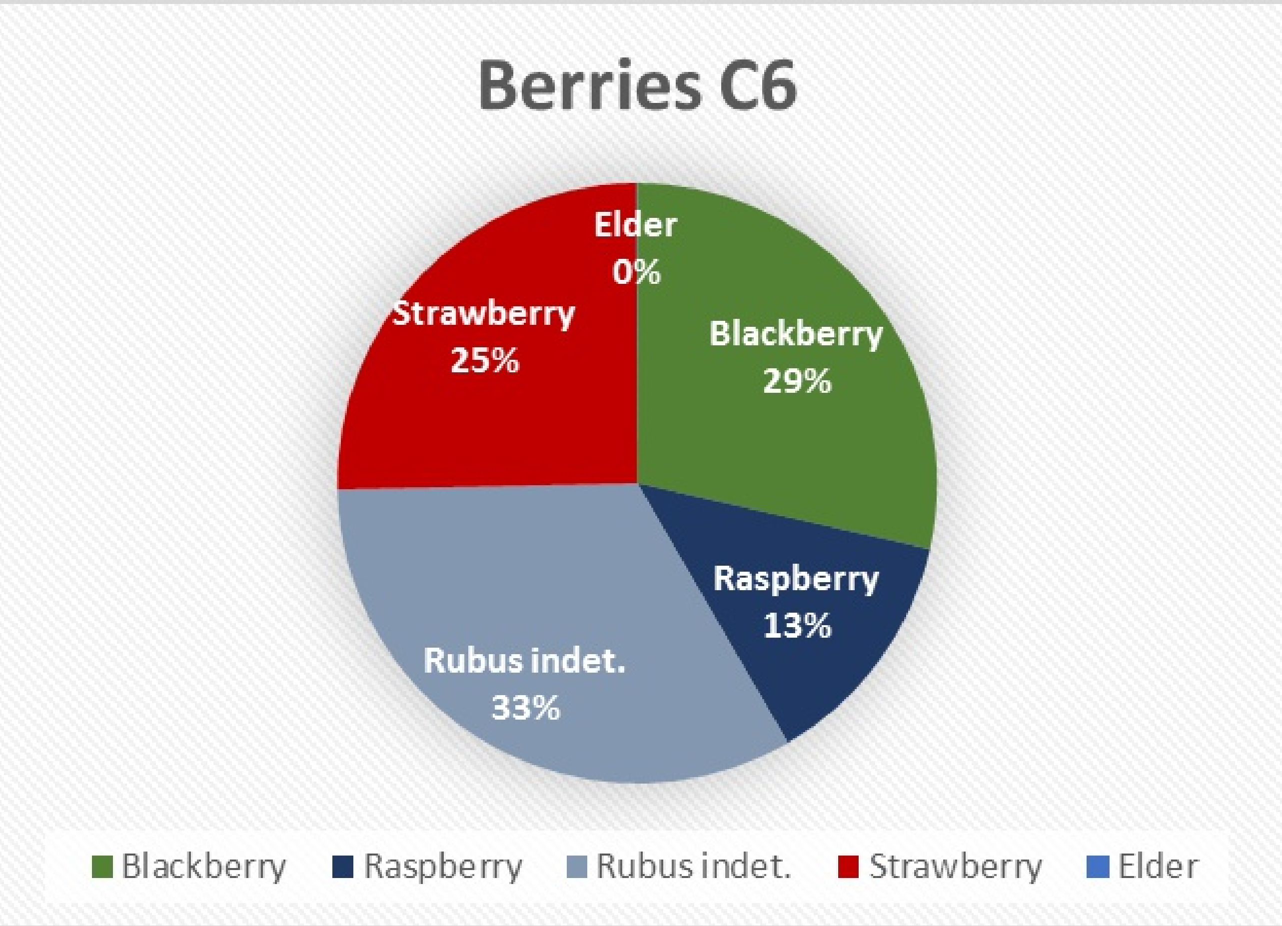

Figure 2: Percentage diagram of incidence of seeds from berries in C6 (E4468)

hops, cannabis and flax seeds (the latter two both likely to have been used as oil plants).

The remaining seeds represented seeds from plants growing in the background and they included nettle, goosefoots, campions, dock family, plants from the cabbage family, many seeds from the daisy family, water plantain and seeds from sedge family. These were present in very low quantities and represent background vegetation, including several wind-dispersed seeds (such as the seeds from the daisy family).

C6

This sample was split into three separate flots (small, medium and large) – the entire flot of the medium and large flots were sorted, and a small fraction (25ml of a total 675ml) of the small flot was sorted.

This sample contained mostly food remains, including berry fruits (Figure 2). Like C2, these were primarily strawberry, blackberry and raspberry, but they are present in different proportions, with strawberry much less prominent than blackberry/raspberry (Rubus). In this sample, the ratio of strawberry to raspberry/blackberry seeds was 1:3 (in contrast to 13:7 in C2).

The other fruits include several grape pips, seeds from figs, a relatively large collection of cherry/plum stones, apple/pear pips and a single haw stone. A small amount of cobnuts were found, as well as a small quantity of hops and the remains from a single achene of cannabis (this was present in much smaller quantities than in C2).

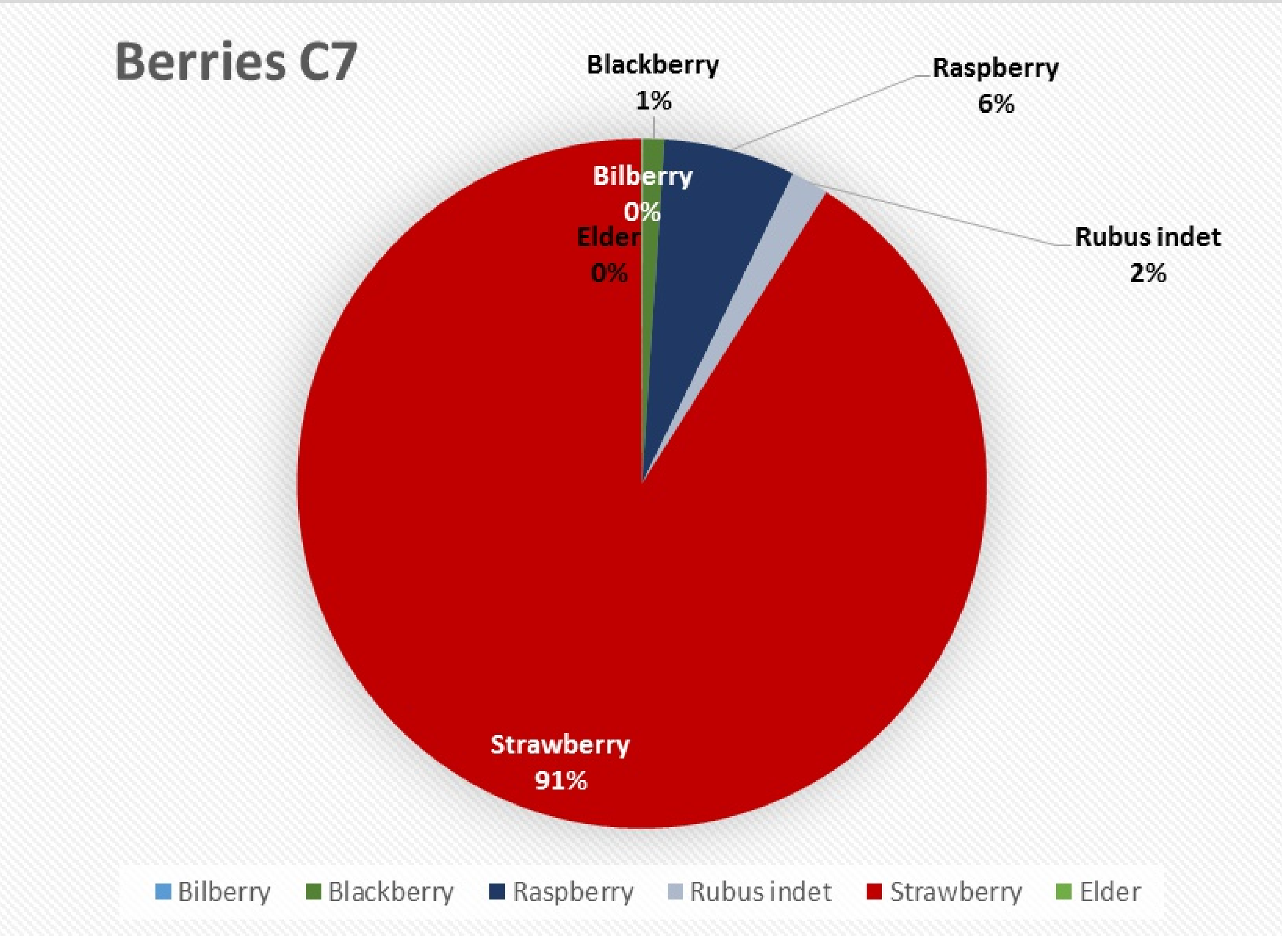

Figure 3: Percentage diagram of incidence of seeds from berries in C7 (E4468)

The remaining seeds in this sample included weeds such as being from the buttercup family, goosefoots, docks/knotgrasses, water plantain, seeds from the sedge family and wind-dispersed seeds (such as *Alnus/Betula* and several different seeds from the carrot and daisy families). These are found in low levels throughout the sample and represent background flora growing at or around the site.

C7

The flots from C7 were split into a large/medium flot and a small flot. The large flot was sorted in its entirety and 100ml of the small flot (of a total 600ml) was sorted.

The fruits from this sample were primarily strawberry (Figure 3), with a much smaller proportion of raspberry and blackberry in this sample as compared to C2 and C6. The ratio of strawberry to raspberry/blackberry is roughly 10:1 (as compared to 13:7 in C2 and 1:3 in C6).

The other fruits included cherry/plum stones, haw stones, a single melon pip and many grape pips. The melon pip probably indicates the cultivation (or at least the consumption) of exotic fruit plants at Rathfarnham, something that was a trend amongst owners of landed estates in Ireland and Britain in the late seventeenth and eighteenth centuries (see below).

As with the other samples, the remaining food plants in C7 included oil plants, such as cannabis, hop (for beer) and cobnuts (cultivated

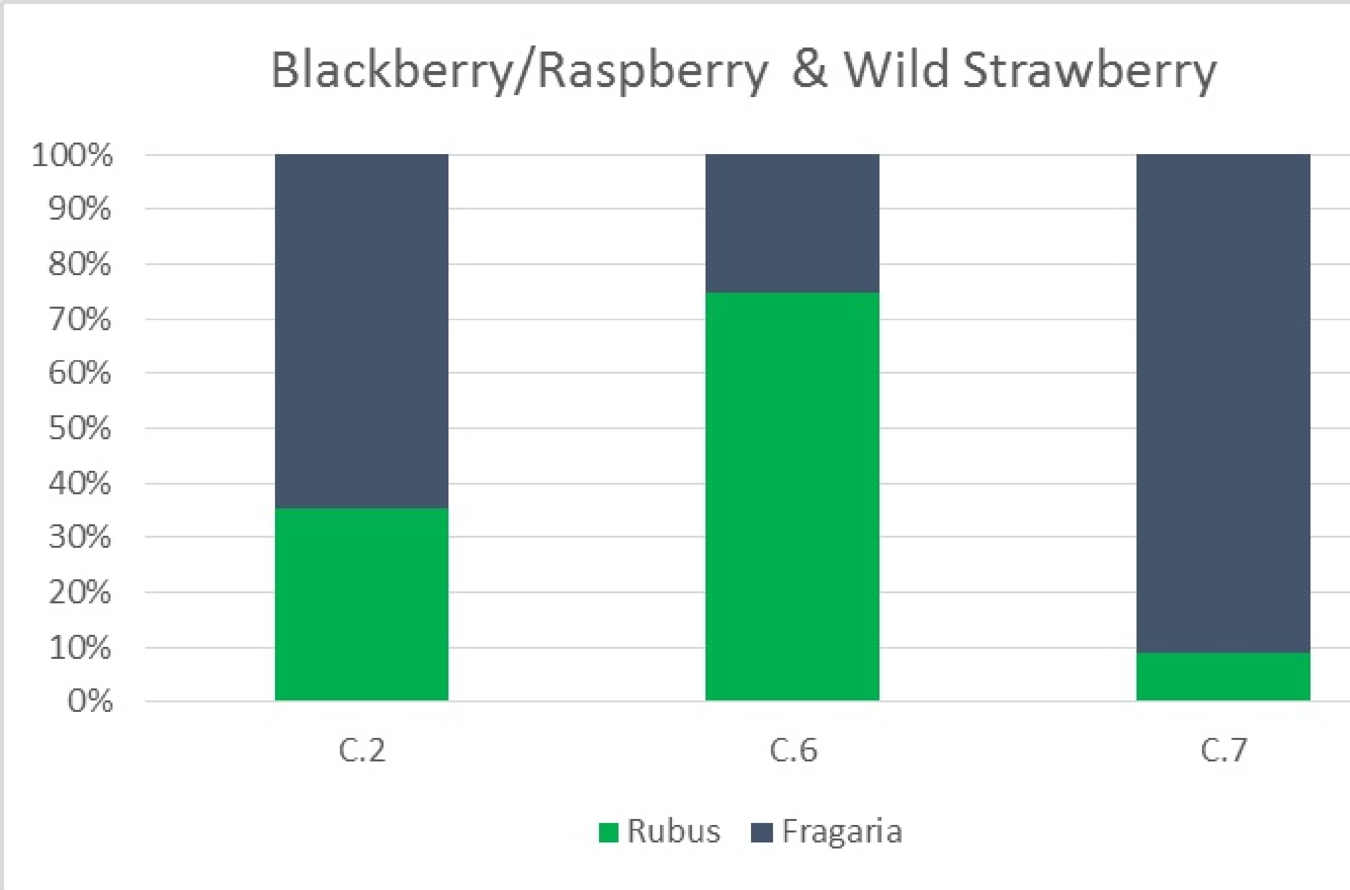

Figure 4: Percentage diagram – relative proportion of Rubus to Fragaria (E4468)

hazelnuts). Wild plants were very rare in this sample, with only seeds from plants from the buttercup and the dock/knotgrass families. This is significantly different to the results from C2 and C6.

C10

This sample was taken during excavation of the south-east flanker. The entire sample was sorted under binocular magnification (x8) but no seeds were found. The sample was characterised by moderate frequency of charcoal fragments, most of this was very vesicular (possibly indicating high firing temperatures). There was a small amount of charred and un-charred bone, from both small and large animals (with the small bones possibly representing intrusive material/foraging small animals). Small quantities of snail shells were also noted when sorting under magnification.

Results (Plant Remains)

Fruits

The deposits were dominated by fruit seeds, often the most numerous remains recovered by archaeobotanists from ancient sewage deposits (Greig 1982). The fruits recovered included strawberry (*Fragaria*), blackberry/raspberry (*Rubus*), grape (*Vitis*), bilberry (*Vaccinium*), melon (*Cucumis*), fig (*Ficus*), pear/apple (*Pyrus/Malus*), cherry/plum and apricot (*Prunus*).

The most common fruits were blackberry/raspberry and strawberry. These are native fruits and have a long history of exploitation (for example, remains of these fruits are relatively common in medieval urban deposits, such as Fishamble St. (Geraghty 1996). A percentage diagram (Figure 4) indicates that the relative proportions of these two seed types indicates

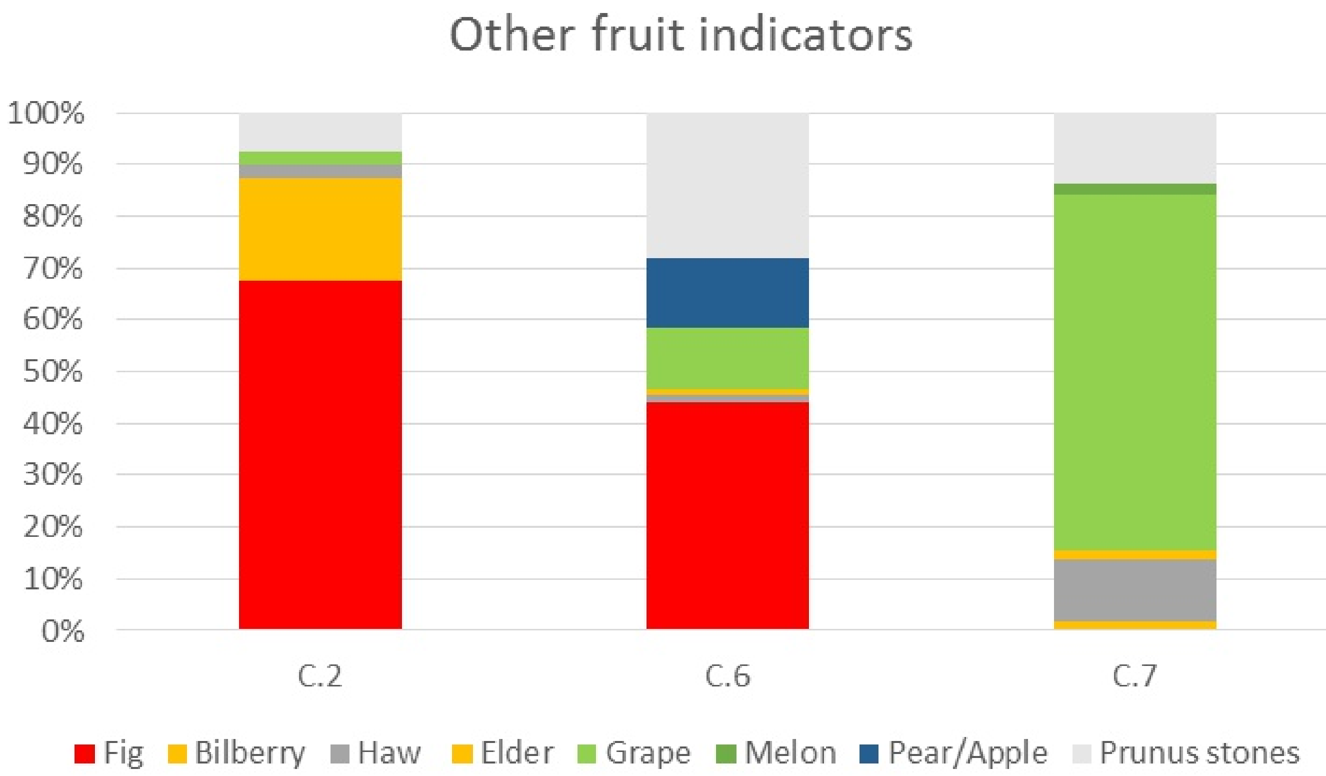

Figure 5: Proportions of other fruit seeds (not Rubus or Fragaria). Indicating variety in each sample, with no similarities identified in distribution patterns.

that C2 and C7 are quite similar, whereas C6, with a much higher proportion of blackberry/raspberry seeds, was somewhat different.

Grape pips were found in all three samples, in varying proportions. These could have been imported (as dried or fresh fruit) or perhaps may have been cultivated in a greenhouse; there are records that indicate that grape vines were grown in the 1600s at Palmerstown, Co. Dublin (Barnard 2004, 232) and at Lismore, Co. Waterford (Barnard 2004, 224-5). Grape pips have been found in archaeobotanical assemblages in Dublin from the later medieval period (Mitchell 1987), and they are often found (albeit in small quantities) in post-medieval archaeological deposits, including sites in Dublin such as Tram Street (01E0229) and Moore Street/Parnell Street (98E0357)[1]

A small quantity of bilberry seeds were found in C2 and C7. This is an edible berry and the seeds here are presumably the remains of consumption at the site.

A single seed from a melon was found in these deposits; it is possible that this was from fruit that was grown in or around the site. Exotic fruits, including melons, were a relatively new aspect of cultivation in Ireland in the seventeenth and eighteenth century. These fruits (and other vegetables that were difficult to grow) were not only grown to eat, but also to impress, and melon-growing was seen as a fashionable accomplishment (Barnard 2004, 223 and 226).

Relatively small quantities of fig seeds were counted in the Rathfarnham Castle deposits. This is significant as each fig fruit produces quite a large amounts of seeds, with seed quantities usually ranging from 30 to 16,000 per fruit (Morton 1987, 47–50). There are records from the early to mid-seventeenth century that indicate that exotic fruit trees (including fig) were being imported into Ireland (Sexton 1998; Clarkson and Crawford 2001, 23). However, it is most likely that the seeds in this deposit were probably from imported fruits (figs can be dried). This is because although fig fruits can ripen on trees grown in Britain and Ireland, the fruits they produce tend to be parthenocarpic, i.e. they are seedless, they produce fruits without fertile pips (Dickson and Dickson 1996). There is evidence to suggest that the history of fig importation into Ireland goes back several centuries: Lyons (2014, 258) and McClatchie (2014, 437) both found fig seeds in 12th century deposits from South Main Street in Cork, and Mitchell (1987) reported the occurrence of Ficus carica in a thirteenth century drain and a seventeenth century forge from the Wood Quay/Fishamble St./Winetavern St. excavations in Dublin. Figs were also found in samples taken from excavations at Drogheda in deposits dating to the sixteenth century and later (Mitchell and Dickson 1985).

Pear/apple pips were found in relatively small quantities in C6. It is likely that these were grown in the area around Rathfarnham Castle. Apples and pears may well have been used for making cider and perry, as well as being eaten as fresh fruit.

Apricot stones were discovered in the coarse-sieved material that was retrieved from the excavation.[2] Apricot trees are listed amongst the trees imported into Ireland in the seventeenth century by ambitious gardeners such as John Percival in Cork (Clarkson and Crawford 2001, 23) and records show that apricots were also grown in the gardens of John Temple at Palmerstown in Dublin (Barnard 2004, 232). The plant remains indicate that apricots were eaten at Rathfarnham Castle, it is possible (or likely) that they were also grown in the lands surrounding the establishment. Similarly, the many cherry/plum stones that were found in all three of the samples are likely to have been home grown. Barnard suggests that orchards were "dotted irregularly over Ireland" (2004, 217) and that although these suffered from neglect and destruction in the 1640s and in 1689–91, nevertheless, "apple, pear and cherry trees were reasonably common in the more settled parts of late seventeenth century Ireland" (Barnard 2004, 232).

Hops

Relatively small quantities of hops (*Humulus*) were recovered from all of the samples. This is an interesting find since historical records suggest that hopped beer was not common in Ireland until a fairly late period. Sixteenth century military records suggest that army victuallers for the English army found it difficult to find hopped beer in Ireland that was acceptable to their garrisoned soldiers, and there are historical records from 1580 that indicate the "gravest want of hoppes" (although the Lord Lieutenant's household accounts from Kilmainham in 1562 indicate that hops were included with the malt) (Clarkson and Crawford 2001, 18 and 21).

The suggestion is that hopped ales were an imported, English taste, but that it was one that became relatively common in Ireland quite quickly:

> "The English preference for hopped beer is best understood as a cultural feature affecting society as a whole; consumers developed a liking for hops relatively quickly from the 1540s following centuries of drinking unhopped ale." (Clarkson and Crawford 2001, 27.)

Hops have also been recovered in small numbers from other Irish post-medieval deposits, including from excavations at King's Island and Broad Street in Limerick.[3] While hops were cultivated in Ireland from this period (Clarkson and Crawford 2001, 18 and 26), historical evidence suggests that they may have been quite difficult to grow (Barnard 2004, 215)[4] and it is possible that some of the hops recovered from Irish archaeological deposits were from imported crops: hops can be stored in sacks for over a year, but are strongest when fresh (Hartley 2006, 541). In general, the discovery of hops from the Rathfarnham Castle deposits suggests that, whether imported or home grown, hops were used to brew beer in the English style, probably at or near the site.

Oil plants

Small quantities of hemp seeds (*Cannabis*) were found in all the deposits from Rathfarnham Castle. These were usually recovered, not as entire seeds/nutlets, but as the outer casing of the seeds, split in half. This *may* be because the seeds were being used for oil extraction. Hemp is not a common find in Irish archaeological deposits, but it is known from urban deposits across Europe.[5] Tomlinson and Hall note that findings are most common in urban deposits and suggest that this is because hemp became "a ruderal in the vicinity of habitation sites, as it is today, and it is notable that most of the records are for very small numbers of remains" (Tomlinson and Hall 1996, 7.6 Oil Plants).

A single seed of flax (*Linum*) was found in C2 (the total in Table 2 (49) is a cumulative one based on the seed density in the sample). This may represent flax/linseed that was used for preparation of oil or an ingredient in baking, for example in bread, or simply the seed of a wild plant growing in the vicinity, as flax is a frequent casual plant (Stace 1997, 465). However, the large size of this seed may denote cultivation, rather than casual growth. Flax seeds are relatively common in Irish archaeological deposits, but they are usually found in relatively small numbers since they do not necessarily preserve well/easily, and tend to be become broken/fragmented if they are used for oil (they are crushed to extract oil).

Nuts

Cobnuts (cultivated hazelnuts, producing much larger nuts than the wild variety) were discovered in abundance in the deposits excavated from Rathfarnham Castle.[6] Other nuts included the remains of walnuts, found only in very small amounts.[7] These latter variety of nuts could have been imported or may, perhaps have grown in Ireland. It is possible that both cobnut and walnut trees were planted in walled gardens and orchards associated with the Castle (although most historical accounts of gardening of this period concentrate on the records of imported fruit, rather than nut trees).[8]

Summary

Archaeological evidence from these deposits indicate an occupation period between 1660 and 1720. The large amounts of fruits, including some exotic (probably imported or grown by specialists in a greenhouse) fruits such as grape, melon and fig, are indicative of the high status nature of the food consumed at this high status site. This is a period where diets were marked more by class rather than, as had been the case in an earlier period, ethnic/cultural origins:

> "During the sixteenth and seventeenth centuries the dietary patterns of the Old English, the Gaelic Irish, and the new settlers merged and the eating habits of the middling and upper levels of society in Ireland came to resemble those in England…dietary patterns amongst the Irish poor became simpler and different from those of the more prosperous members of society. By 1800 the population of Ireland divided, gastronomically, almost into two distinct groups." (Clarkson and Crawford 2001, 29).

By the eighteenth century in Ireland, "Every estate of even modest substance cultivated gardens for pleasure and profit" (Clarkson and Crawford, 2001, 48) and this included the use of hothouses where even exotic fruits such as lemons and oranges could be grown. The melon pip found at the site is possibly an example of a plant that was grown in a greenhouse nearby. Plant remains assemblages such as this from Rathfarnham Castle tell us not only about diet, but also hint at the fashion for gardening amongst elite settlers in the seventeenth and eighteenth centuries in Ireland. Barnard sees gardening (a "civilizing" of the landscape) as an integral part of the Anglicization of Ireland in this period "an essential adjunct of the houses of the gentry" and notes that gardening "tells us something of the values and accomplishments, some of which, by influencing and altering what was grown, may have changes diet, fostered trade and hastened social and demographic change" (Barnard 2004, 208-9).

Notes

[1] Deposits from Tram Street/Phoenix Street in Dublin (http://www.excavations.ie/report/2001/Dublin/0006353/, accessed 11 February 2016) and Moore Street/Parnell Street, also in Dublin (http://www.excavations.ie/report/2003/Dublin/0009892/, accessed 11 February 2016).

[2] These were identified by Matthew Jebb from the National Botanic Gardens, Dublin.

[3] Deposits from Harry's Mall, King's Island 05E0292, (see http://www.excavations.ie/report/2006/Limerick/0016044/, accessed 8 February 2016) and Broad Street, 98E0581 (http://www.excavations.ie/report/1999/Limerick/0004415/, accessed 8 February 2016) both in Limerick, also contained hop seeds. Harry's Mall deposits were post-medieval, Broad Street deposits may have been earlier, but this seems unlikely as hops were not widely used before the seventeenth century.

[4] Evidence suggests that hops were difficult to grow in many parts of England also, see Barnard 2004, "Gardening diet and improvement in later seventeenth century Ireland", footnote 24 on page 215.

[5] For example, there are 77 entries of finds of *Cannabis sativa* published archaeobotanical reports from across Europe in "Literature on archaeological remains of cultivated plants 1981-2004", an online database (http://www.archaeobotany.de/database.html, accessed 9 February 2016) compiled by the renowned archaeobotanist, Helmut Kroll. There are 34 instances of *Cannabis sativa* in the Archaeobotanical Computer Database (Tomlinson and Hall 1996) where it is listed as an oil "seed".

[6] Cobnuts are common in hand-picked material from the site, i.e. from the deposits that were sieved for artefacts (using a coarse mesh). Much of this material was examined and identified by Matthew Jebb from the National Botanic Gardens, Dublin.

[7] Walnuts were also found in the hand-picked material and identified by M. Jebb.

[8] For example, an account in Clarkson and Crawford (2001, 23) describes John Percival importing apricot, cherry, peach, pear, plum, nectarine and fig trees in large quantities, but no nuts are listed. Similarly, Barnard's account (2004) of historical records of ascendancy gardens in Ireland in the seventeenth and eighteenth centuries talks of fruit trees as well as plants for hedges and wind-belts (see pp.230-1) but does not mention the cultivation of nut-bearing trees like cobnuts and walnuts.

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Table 1: Waterlogged plant remains, samples C2, C6 and C7 Rathfarnham Castle, Co. Dublin (E4468)

Flot	Combined	Large	Medium	Small	Large & medium	Small	Hand-picked
Volume sorted	50ml	all	all	25ml		100ml	
Volume unsorted	300ml	0ml	0ml	650ml	all	500ml	
Fraction sorted	1/7	100%	100%	1/27	100%	1 / 6	
Context no.	**C.2**	**C.6**	**C.6**	**C.6**	**C.7**	**C.7**	**C.7**
Meadow/Creeping Buttercup (*Ranunculus acris/repens* L.)			3		2		
Possible Celandine (cf *Chelidonium* species L.)			2				
Cannabis nutlet half fragments (*Cannabis* cf *sativa* L.)	13 (MNI - 7)	2			40 (MNI-20)		4
Cannabis entire nutlet (*Cannabis* cf *sativa* L.)	1				8		1
Possible Cannabis entire nutlet (*Cannabis* cf *sativa* L.)	2						
Possible Cannabis nutlet fragments (*Cannabis* cf *sativa* L.)	14 (MNI - 4)				52 (MNI - 22)		
Hop (*Humulus lupulus* L.)	2		2			1	
Fig seeds (*Ficus* species L.)	27		33				
Common Nettle (*Urtica dioica* L.)	4						
Birch/Alder (*Betula* L./*Alnus* Mill.)			4				
Hazelnut - full nuts (*Corylus avellana* L.)	2	1					
Hazelnut shell fragments (*Corylus avellana* L.) *	7	38			24		48
Hazelnut MNI (based on fragment count above)**	1	5					
Indeterminate nut shell fragments	2	3					
Fat-hen (*Chenopodium album* L.)			1				
Orache (*Atriplex* species L. (Halimione Aellen))	2						
Indeterminate seeds from the goosefoot family (Chenopodiaceae)			1				
Campions (*Silene* spp. L.)	1						
Balck bindweed (*Fallopia convolvulus* (L.(Á Löve)			1				

Flot	Combined	Large	Medium	Small	Large & medium	Small	Hand-picked
Volume sorted	50ml	all	all	25ml		100ml	
Volume unsorted	300ml	0ml	0ml	650ml	all	500ml	
Fraction sorted	1/7	100%	100%	1/27	100%	1 / 6	
Context no.	**C.2**	**C.6**	**C.6**	**C.6**	**C.7**	**C.7**	**C.7**
Probable Sheep's sorrel (*Rumex* cf *acetosella* L.)	1						
Indeterminate seeds from the Knotgrass family (Polygonaceae)	1		5		1		
Possible Melon pips (*Cucumis* L. species)					1		
Indeterminate seeds from the Cabbage family (Brassicaceae)	4		9				
Bilberries (*Vaccinium* spp. L.)	8				1		
Bramble: blackberry drubes (*Rubus fructicosus* L.)	29	19	562		20		
Raspberry drubes (*Rubus idaeus* L.)	668		240	1	102	3	
Raspberry/Blackberry drubes (*Rubus* spp.)	79	1	672			5	
Strawberry (*Fragaria* species L.)	1411		299	8	20	256	
Possible strawberry (cf *Fragaria* L.)	10						
Blackthorn: sloe stones (*Prunus spinosa* L.)							5
Cherries, possible bird cherry (*Prunus* cf *avium* L.)	1				6		
Fragment of a cherry stone, possible bird cherry (*Prunus* cf *avium* L.)	1				15 (MNI - 3)		81
Plum or Damson (*Prunus domestica* L.)	1	5			1		13
Plum/cherry stones (*Prunus* L. species)	1	16					18
Fragments from plum/cherry stones (*Prunus* L. species)		2 (MNI - 1)					
Peach type (cf *Prunus persica* (L.) Batsch)							3
Pear/Apple pips (*Pyrus* L./*Malus* Mill.) fragments		3	7				
Hawthorn: haw stones (*Crataegus monogyna* Jacq.)	1	1			6		
Indeterminate nut/fruit stone fragments	2				20		
Grape pips (*Vitis* L. species)	1	3	6		32		

Flot	Combined	Large	Medium	Small	Large & medium	Small	Hand-picked
Volume sorted	50ml	all	all	25ml		100ml	
Volume unsorted	300ml	0ml	0ml	650ml	all	500ml	
Fraction sorted	1/7	100%	100%	1/27	100%	1 / 6	
Context no.	**C.2**	**C.6**	**C.6**	**C.6**	**C.7**	**C.7**	**C.7**
Possible Grape pips (cf *Vitis* L. species)					3		
Flax seed fragments (*Linum* L. species)	1						
Possible Wild Celery (cf *Apium graveolens* L.)			7				
Possible Caraways (cf *Carum* species L.)			2				
Hogweeds (*Heracleum* species L.)		2					
Selfheal (*Prunella vulgaris* L.)			1				
Balm (*Melissa officinalis* L.)			2				
Elder (*Sambucus nigra* L.)			1		1		
Nipplewort (*Lapsana communis* L.)	2		4				
Possible Oxtongues (cf *Picris* L. species)		1	14				
Prickly Sow-thistle (*Sonchus asper* (L.) Hill)	2						
Hawkbits/Sow-thistles (*Leontodon* species L./*Sonchus* specis L.)	2						
Dandelions (*Taraxacum* F.H. Wigg.)	2		1				
Possible Chamomiles (*Anthemis* species L.)	1		1				
Crown Daisies (*Chrysanthemum* species L.)	2						
Indeterminate daisy family seeds: marigold type (Asteraceae)			3				
Indeterminate seeds from the daisy family (Asteraceae)	1						
Water plantain (*Alisma plantago-aquatica* L.)	3		5				
Dock/Sedge seeds (Polygonaceae/Cyperaceae)			1				
Indeterminate seeds from the sedge family (Cyperaceae)	1		7				
Indeterminate grass seeds (Poaceae)	98	9	152		53		1

Flot	Combined	Large	Medium	Small	Large & medium	Small	Hand-picked
Volume sorted	50ml	all	all	25ml		100ml	
Volume unsorted	300ml	0ml	0ml	650ml	all	500ml	
Fraction sorted	1/7	100%	100%	1/27	100%	1 / 6	
Context no.	**C.2**	**C.6**	**C.6**	**C.6**	**C.7**	**C.7**	**C.7**
Indeterminate weed seeds	122	5	84		83	5	1

* Most hazelnuts are from the cultivated variety (i.e. they are cobnuts)

** MNI (Minimum number of individuals) refers to the likely minimal number of seeds that fragments represent. In all cases this is calculated subjectively.

Table 2: Extrapolated seed density per 1 litre of sieved soil

Context no.	C.2	C.6	C.7
Meadow/Creeping Buttercup (*Ranunculus acris/repens* L.)	0	3	2
Possible Celandine (cf *Chelidonium* species L.)	0	2	0
Cannabis nutlet half fragments (*Cannabis* cf *sativa* L.)	343	2	20
Cannabis entire nutlet (*Cannabis* cf *sativa* L.)	49	0	8
Possible Cannabis entire nutlet (*Cannabis* cf *sativa* L.)	98	0	0
Possible Cannabis nutlet fragments (*Cannabis* cf *sativa* L.)	196	0	22
Hop (*Humulus lupulus* L.)	98	2	7
Fig seeds (*Ficus* species L.)	1323	33	0
Common Nettle (*Urtica dioica* L.)	196	0	0
Birch/Alder (*Betula* L./*Alnus* Mill.)	0	4	0
Full nuts (*Corylus avellana* L.)	98	1	0
Hazelnut shell fragments (*Corylus avellana* L.) Most of these are from the cultivated variety, cobnuts	343	38	24
Corylus MNI (based on fragment count above)	49	5	0
Indeterminate nut shell fragments	98	3	0
Fat-hen (*Chenopodium album* L.)	0	1	0
Orache (*Atriplex* species L. (Halimione Aellen))	98	0	0
Indeterminate seeds from the goosefoot family (Chenopodiaceae)	0	1	0
Campions (*Silene* spp. L.)	49	0	0
Balck bindweed (*Fallopia convolvulus* (L.(Á Löve)	0	1	0
Probable Sheep's sorrel (*Rumex* cf *acetosella* L.)	49	0	0
Indeterminate seeds from the Knotgrass family (Polygonaceae)	49	5	1
Possible Melon pips (*Cucumis* L. species)	0	0	1
Indeterminate seeds from the Cabbage family (Brassicaceae)	196	9	0
Bilberries (*Vaccinium* spp. L.)	392	0	1

Context no.	C.2	C.6	C.7
Bramble: blackberry drubes (*Rubus fructicosus* L.)	1421	581	20
Raspberry drubes (*Rubus idaeus* L.)	32732	267	123
Raspberry/Blackberry drubes (*Rubus* spp.)	3871	673	35
Strawberry (*Fragaria* species L.)	69139	515	1812
Possible strawberry (cf *Fragaria* L.)	490	0	0
Cherries, possible bird cherry (*Prunus* cf *avium* L.)	49	0	6
Fragment of a cherry stone, possible bird cherry (*Prunus* cf *avium* L.)	49	0	3
Wild Plum or Damson (*Prunus domestica* L.)	49	5	1
Plum/sloe/cherry stones (*Prunus* L. species)	49	16	0
Fragments from plum/sloe/cherry stones (*Prunus* L. species)	0	1	0
Pear/Apple pips (*Pyrus* L./*Malus* Mill.) fragments	0	10	0
Hawthorn: haw stones (*Crataegus monogyna* Jacq.)	49	1	6
Indeterminate nut/fruit stone fragments	98	0	20
Grape pips (*Vitis* L. species)	49	9	32
Possible Grape pips (cf *Vitis* L. species)	0	0	3
Flax seed fragments (*Linum* L. species)	49	0	0
Possible Wild Celery (cf *Apium graveolens* L.)	0	7	0
Possible Caraways (cf *Carum* species L.)	0	2	0
Hogweeds (Heracleum species L.)	0	2	0
Selfheal (Prunella vulgaris L.)	0	1	0
Balm (Melissa officinalis L.)	0	2	0
Elder (*Sambucus nigra* L.)	0	1	1
Nipplewort (*Lapsana communis* L.)	98	4	0
Possible Oxtongues (cf *Picris* L. species)	0	15	0
Prickly Sow-thistle (*Sonchus asper* (L.) Hill)	98	0	0

Context no.	C.2	C.6	C.7
Hawkbits/Sow-thistles (*Leontodon* species L./*Sonchus* specis L.)	98	0	0
Dandelions (*Taraxacum* F.H. Wigg.)	98	1	0
Possible Chamomiles (*Anthemis* species L.)	49	1	0
Crown Daisies (*Chrysanthemum* species L.)	98	0	0
Indeterminate daisy family seeds: marigold type (Asteraceae)	0	3	0
Indeterminate seeds from the daisy family (Asteraceae)	49	0	0
Water plantain (*Alisma plantago-aquatica* L.)	147	5	0
Dock/Sedge seeds (Polygonaceae/Cyperaceae)	0	1	0
Indeterminate seeds from the sedge family (Cyperaceae)	49	7	0
Indeterminate grass seeds (Poaceae)	4802	161	53
Indeterminate weed seeds	5978	89	118
Seed density per 1 litre	***123382***	***2490***	***2319***

Insects

Stephen Davis, UCD School of Archaeology

Introduction and methodology

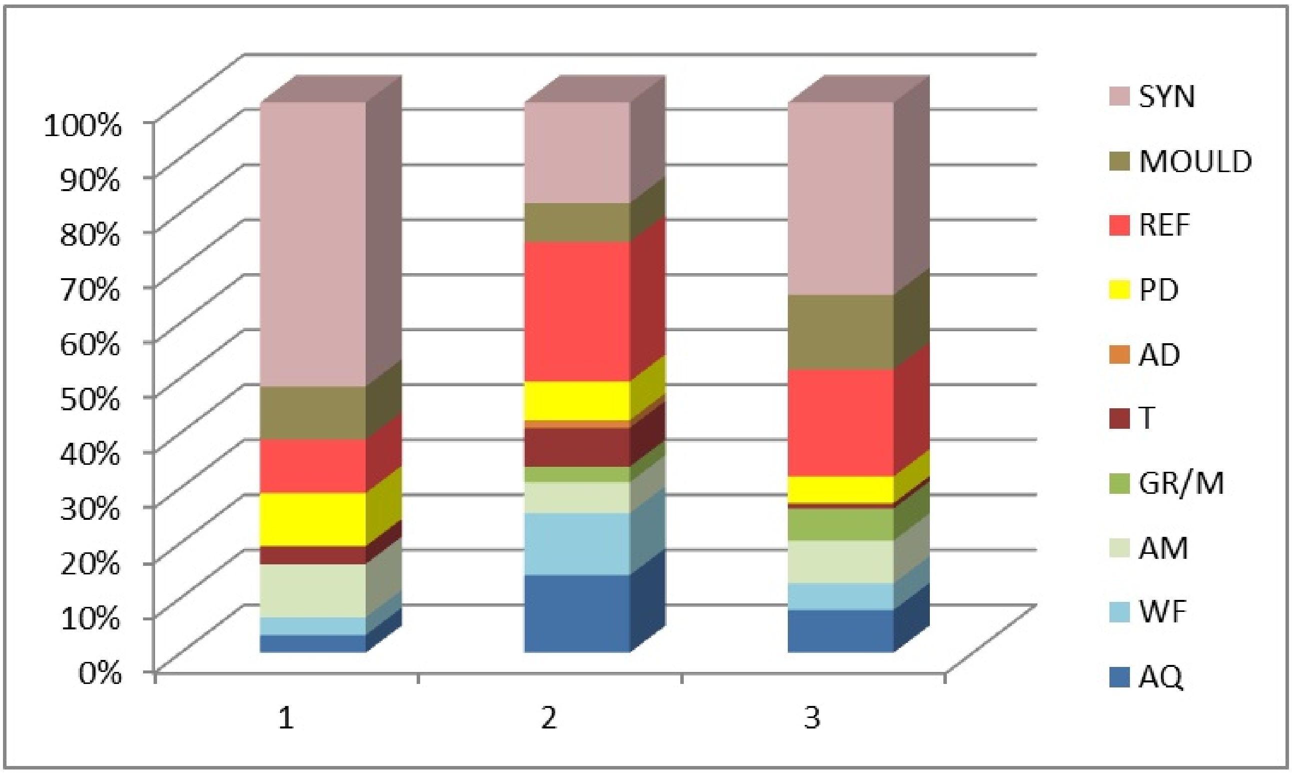
Three samples were examined as part of the programme of post-excavation analysis at Rathfarnham Castle. Sample 2 (C6) and Sample 3 (C7) were derived from the fill of Washpit C5, and may represent the same phase of deposition into which drain C3 was cut. The third sample (Sample 1) comprised the fill of a chamber pot. The material is described as 'Waterlogged dark brown and black organic sediment that was extremely soft and spongy, resembling drain fill or cess'; however, processing revealed a significant alluvial component in the form of pea gravel which comprised perhaps 60% of the entire fill. Even prior to the insect analysis this suggested the presence of fast flowing water. In the case of Samples 2 and 3, 5 litres was processed but in practice the insects from the equivalent of c. 2l only were examined. While concentrations of insect remains were high, within sample diversity was relatively low. In Sample 1 (the chamber pot fill) the entire sample (c. 5l) was processed and analysed, given the far lower concentrations of insect remains present.

Insect remains were extracted using a standard paraffin flotation technique as described by Kenward *et al.* (1980). Briefly, samples were disaggregated and washed using a 300µ sieve, drained and the residues mixed well with a small quantity of paraffin. The addition of cold water was followed by decanting and washing with detergent to remove excess paraffin. The resultant flots were examined for insect remains which were stored in absolute ethanol, and identified with reference to standard entomological literature and comparative material. Numbers recorded represent Minimum Number of Individuals.

Taxonomy follows that adopted by Lucht (1987) with revisions by Böhme (2005). The computer package BugsCEP (Buckland and Buckland 2006) was utilised to provide correct taxonomic order and ecological information for individual taxa. For the purpose of interpretation, insects were assigned.to one of the following ecological groupings (modified from Robinson 1981; 1983) using ecological information derived from Koch (1989, 1989a 1992): arable or disturbed ground taxa (AD), waterside or marsh taxa (AM), aquatics (AQ), grassland taxa (M/GR), mould beetles (Latridiidae and similar - MOULD), pasture or dung indicators (including indicators of nitrophile weeds - PD), refuse taxa (REF), synanthropic taxa (those which are strongly favoured by anthropogenic environments - SYN), obligate woodland taxa (excluding in this case structural pests such as woodworm - T). Taxa which could not clearly be assigned an ecological grouping were deemed 'unclassified' and not counted in the final sum for percentage calculations. Specific modifications from the original grouping criteria were made both to limit the numbers of 'unclassified' taxa and hence draw the maximum amount of ecological information from the assemblage, and also because in this instance structural pests are almost certainly behaving as synanthropes rather than components of a natural woodland fauna.

Results

All three assemblages are broadly similar and are dominated by synanthropic taxa, taxa of mouldy substrates and taxa of decomposing vegetable matter. Especially common in Sample 3 is the spider beetle *Tipnus unicolor*, generally a species of barns and stables where it is often found in hay and straw waste (e.g. Horion 1961). *T. unicolor* has also been recorded as breeding in decaying timber (Alexander 1994a), perhaps related to the presence of woodworm (*Anobium punctatum*) as a regular find throughout



Percentage breakdown of ecological categories within the Rathfarnham Castle insect assemblage. SYN = synanthropic; MOULD = mould taxa; REF = refuse; PD = pasture/dung; AD = arable/disturbed; T = trees/woodland; GR/M = grassland/meadow; AM = aquatic/marsh; WF = water (fast); AQ = aquatic.

the samples and also 'Deathwatch Beetle' – *Xestobium rufovillosum* – in all three samples. Deathwatch beetle is characteristic of timber which has been subjected to fungal attack (Fisher 1940), especially oak or willow. It has also been recorded as a serious pest of constructional oak, especially in wood near the ground (Horion 1953). The preponderance of rotting timber may also have been home to the mould beetles, which are especially common in Sample 3, and to the cerambycid *Alosterna tabacicolor*, which lives in fungoid wood of a variety of types (Bílý and Mehl 1989).

Also recovered from Sample 2 was a single individual of the blind, flightless colydiid *Aglenus brunneus*. *A. brunneus* is a typical taxon of early medieval compost-like flooring material (Coope 1981; see also Kenward 1975). Such material can also provide the home for *Mycetaea subterranea* (Horion 1961). Both *M. subterranea* and especially *A. brunneus* were common in Coope's (1981) analysis of the Type 1 Viking house at Christchurch Place, Dublin. In this case it is possible that *A. brunneus* is also associated with heavily decayed and fungoid timber, noted by Kenward (1975) as one of its original (i.e. pre-synanthropic) niches.

Single individuals of the stored grain pests *Oryzaephilus surinamensis* (the 'saw toothed grain beetle') and *Sitophilus granarius* (the 'grain weevil') were also recovered. In such low numbers these are likely to be derived from the dung of herbivores that have eaten infested crop and may represent an allochthonous (non-local) rather than autochthonous (local) presence given the evidence of flooding within the deposit.

Refuse taxa are common, although never especially abundant across the three samples. The most frequently encountered were a range of staphylinids typical of decomposing plant material, dung and occasionally carrion. These include *Omalium allardi* - a particularly common find among poultry litter (Hammond 2007d; Lane and Forsythe 2000) and *Gyrohypnus fracticornis*, a common species of rotting grass heaps, haystacks and herbivore dung (Atty 1983). Several hydrophilids characteristic of similar environments were also found, such as *Cercyon melanocephalum*, characteristic of herbivore dung and decaying plant matter (Hansen 1987) and *C. ustulatus*, typical of wet litter at the edge of water bodies (Merritt 2006). A number of more typical dung taxa were also present, in particular two generalist species of *Aphodius, A. ater* and *A. contaminatus.*

A number of aquatic taxa were present in Samples 2 and 3. Most of these are generalist, with no clear preference for fast- or slow-flowing water. However, all three samples include the elmid 'riffle beetle' (Elmidae) *Esolus parallelopipedus* generally considered characteristic of fast-flowing water (Atty 1983) with both Samples 2 and 3 also including two species of *Hydraena* characteristic of fast flowing streams (*H. flavipes; H. pygmaea*). Sample 2 also includes the taxon, *Hydraena testacea*, typical of Duckweed (*Lemna*)-covered stagnant waters (Lohse 1971). Several typical floodplain phytophages are also present, in particular the two 'flea beetles' *Phyllotreta cruciferae* and *P. nigripes.* Both of these are indicative of the presence of *Brassica* sp. usually in waterside locations (cf. Bullock 1993). This is also the home for the small weevil *Ceutorhynchus contractus* (ibid.) which is oligophagous on members of the Brassicaceae.

Woodland taxa were poorly represented within the samples, but include the weevils *Tropiphorus elevatus,* which lives upon low vegetation in wooded environments (Duff 1993) and *Phloeophagus lignarius*, which lives in the decaying heartwood of deciduous trees (Alexander 2002).

Discussion

All three samples include elements which are most likely related to the built structure of the castle itself – the so-called 'House Fauna' (cf. Hall and Kenward 1990; Kenward and Hall 1995). This comprises synanthropic taxa, taxa of structural timbers and mould taxa, including occasional finds associated with compost-like floor layers. These taxa – including structural pests such as woodworm and Deathwatch Beetle, are abundant enough that they most likely are derived from the structural elements of the castle itself. These elements are quite closely paralleled by a late medieval assemblage from Stone, Staffs, UK (Moffett and Smith 1996) where they are interpreted as being derived from a combination of structural and flooring elements. A range of other taxa are, however, less clearly associated with the local environment. These include the wide range of aquatic taxa, especially those of faster flowing waters, in addition to the diverse waterside taxa present, including some more usually associated with floodplain environments. These are quite closely related to Kenward and Hall's (1997) 'Stable Manure' association - indicative of foul open-textured rotting material. The presence of dung from stalled animals offers a ready explanation for a group of insects comprising floodplain phytophages, low numbers of stored product pests, dung beetles and abundant mould taxa. The fast water beetles, in addition to the gravel-rich substrate, suggests the strong possibility that some of these deposits may also have derived from periodic flooding.

Sample 1, the chamber pot fill, seems on the insect evidence unlikely to represent a primary fill. The overall composition of this sample is very much in keeping with the other two samples examined. It is likely that the Samples 2 and 3 are derived from very similar conditions to one another, although Sample 2 includes a larger component of fast water and woodland taxa, perhaps indicating a greater input from non-local sources. In essence it appears that the assemblages represent a mixed deposit, comprising locally derived structural pests, flood trash and most likely herbivore dung. While the presence of human excrement is not precluded by this, it is unlikely that it was a major part of the overall fill.

Table of insect remains identified from Rathfarnham Castle. S1 & S2 are from [C6], S3 is from [C7]

	S1	S2	S3
Carabidae			
Nebria brevicollis (F.)	1		
Trechus rubens (F.)		2	
Trechus fulvus Dej.		2	1
Bembidion lampros (Hbst.)		1	
Bembidion properans (Steph.)	1		
Pterostichus strenuus (Panz.)		1	
Pterostichus sp.			1
Haliplidae			
Haliplus sp.	1		
Dytiscidae			
Hydroporus sp.		1	
Agabus sp.			1
Ilybius sp.			1
Hydraenidae			
Hydraena riparia Kug. Type			1
Hydraena pygmaea Water.			1
Hydraena testacea Curtis		1	
Hydraena flavipes Sturm		2	
Limnebius truncatellus (Thun.)		1	1
Hydrophilidae			
Helophorus grandis Ill.		1	
Helophorus brevipalpis Bedel		1	3
Cercyon ustulatus (Preys.)		1	
Cercyon melanocephalus (L.)		1	1
Cercyon sp.	1	2	
Megasternum obscurum (Marsham)		2	1
Cryptopleurum minutum (F.)		1	
Laccobius sp.			1
Silphidae			
Silpha sp.		1	
Catopidae			
Choleva sp.		1	1
Staphylindae			
Megarthrus bellevoyei Saulcy			1
Omalium allardi Fairm. & Bris		1	5
Lesteva punctata Er.			2
Carpelimus elongatulus (Er.)	1		
Oxytelus sculptus Grav.		1	
Anotylus rugosus (F.)		1	
Anotylus sculpturatus (Grav.)			1
Anotylus nitidulus (Grav.)			1
Anotylus tetracarinatus Block		2	1
Platystethus arenarius (Geoff.)	1	1	
Medon sp.		1	
Leptobium gracile (Grav.)		1	
Gyrohypnus liebei Scheer.			2
Megalinus glabratus (Grav.)		1	
Philonthus sp.		3	4
Staphylinus sp.			1
Quedius sp.	1		
Tachyporus sp.		1	
Tachinus pallipes Grav.			1
Tachinus rufipes (L.)	1	1	1
Tachinus laticollis Grav.		1	
Aleochara bipustulata (L.)		1	
Aleocharinae indet.	7	4	4
Elateridae			
Agriotes sp.			1
Scirtidae			
Cyphon sp.			1

	S1	S2	S3
Elmidae			
Esolus parallelepipedus (P. Müller)	1	1	1
Limnius volckmari (Panz.)		1	1
Heteroceridae			
Heterocerus sp.			1
Nitulidae			
Meligethes sp.		2	2
Cucujidae			
Oryzaephilus surinamensis (L.)	1		
Cryptophagidae			
Cryptophagus sp.	1	1	5
Atomaria sp.	1		
Ephistemus globulus (Payk.)	1		
Latridiidae			
Latridius minutus (L.)	1		5
Dienerella filum (Aubé)			2
Corticaria sp.		4	2
Colydiidae			
Aglenus brunneus (Gyll.)		1	
Endomychidae			
Mycetaea subterranea (Marsham)	1	3	4
Anobiidae			
Xestobium rufovillosum (Deg.)	1	1	1
Anobium punctatum (Deg.)	10	2	8
Ptinidae			
Tipnus unicolor (Pill. & Mitt.)	2	4	18
Ptinus fur (L.)	1		4
Geotrupidae			
Geotrupes sp.			1
Scarabaeidae			
Aphodius contaminatus (Hbst.)		1	2
Aphodius ater (Deg.)	1		1
Aphodius sp.	1	3	
Cerambycidae			
Alosterna tabacicolor (Deg.)		1	
Chrysomelidae			
Phyllotreta cruciferae (Goeze)		1	
Phyllotreta nigripes (F.)	1		
Phyllotreta sp.			1
Longitarsus sp.		1	
Chaetocnema concinna (Marsham)			1
Apionidae			
Apion sp.		2	1
Oxystoma pomonae (F.)			2
Curculionidae			
Otiorhynchus singularis (L.)		1	1
Polydrusus pterygomalis Bohe.			1
Sitona lineatus (L.)			1
Sitona hispidulus (F.)			1
Tropiphorus elevatus (Hbst.)		1	
Phloeophagus lignarius (Marsham)		3	
Hypera sp.			1
Sitophilus granarius (L.)		1	
Ceutorhynchus contractus (Marsham)		1	1
Ceutorhynchus sp.	2	1	
Gymnetron sp.		1	
Others			
Trichoptera indet.		5	
Myrmica sp.			1

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Faunal remains (excluding fish and birds)

Ruth F. Cardon

Introduction

Archaeological monitoring and excavations (Licence E4468) were conducted at Rathfarnham Castle from June 2014 – January 2015 by Archaeology Plan Heritage Solutions. A total of 2,158 animal bones (excluding fish and bird) were recovered from 10 excavated contexts (C1-4 and C6-11; see Appendix 1 for summarised descriptions of each of these Contexts). Out of the total number, 1,398 or 64.8% could be identified as to a taxonomic category (28 categories in total). The faunal remains included 16 species/genus of wild and domestic mammals, one amphibian species and one crustacean (Table 3, Figure 1). Excavations were conducted outside of the Castle, within the main block of the Castle, the southern flanker towers. The majority of the faunal remains were recovered from the southwestern flanker tower (Tables 1, 3, 4). The location and identity of individual bone fragments is provided in the accompanying electronic Microsoft Excel file to this report.

Methodology

Amongst other artefacts and deposits, bones were recovered by hand-excavation by a team of archaeologists, removed in bulk large bags and subsequently sieved through a fine mesh. Bird and fish bone remains were separated from the other faunal remains, as these were sent to a zooarchaeological specialist for identifications (S. Hamilton-Dyer).

Bones were identified using the author's personal animal skeletal reference collection of domestic and wild faunal (known) species; reference skeletal collections available within the National Museum of Ireland, Natural History Division; a reference loan collection from the National Museums of Scotland, Edinburgh; and published literature (e.g. Pales & Lambert 1971; Schmid 1972). Sheep and goat bones were differentiated where possible using the criteria of Boessneck (1969), Payne (1985) and Zeder & Lapham (2010). Where separation was not possible sheep/goat (Ovis/Capra) was recorded. Differentiation between domestic pig and wild boar (or wild pig) were not attempted due to inherent difficulties (see Rowley-Conwy et al., 2012 for discussions).

A generalised figure of a skeleton (an adult male deer) is provided in Figure 1, which provides an overview of the various main parts of the skeleton and aspects to the reader and are used within this report.

Recorded information

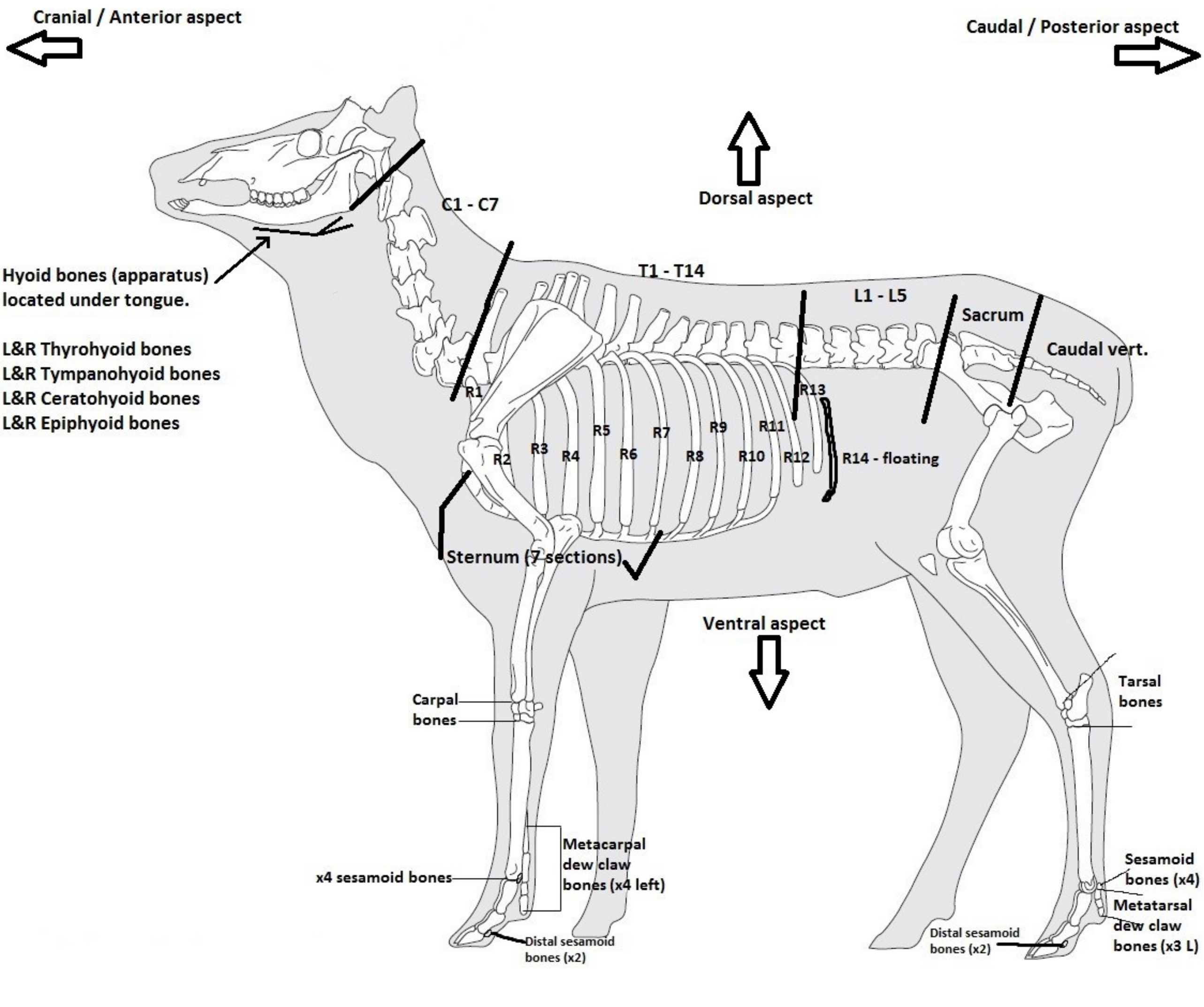
The following information was recorded for each bone or fragment where possible: context, minimum taxonomic unit, type of bone element, left or right side, whole or partial, the state of the epiphyseal fusion, evidence of carnivore and rodent scavenging, gnawing and digestive processes, evidence of human agency (worked, burned/subjected to high temperatures, butchery marks), condition, evidence of bone arthropathies (or bone pathology), estimated age or developmental stage, weight (g) and other noteworthy observations. All data were recorded in an excel workbook. An electronic excel workbook file of the faunal assemblage with all recorded data accompanies this report. An O'HAUS Pioneer ™ Digital weighing electronic scales accurate to 0.01g was used to weigh every bone fragment.

All osteometric data were recorded where possible from the skeletal material, followed standards, methods and abbreviations of von den Driesch (1976). These are presented in the accompanying electronic Excel workbook file.

Estimating developmental life stages or ageing of mammals is based on the fusion of epiphysyses of the bones and the developmental tooth eruption patterns and subsequent wear pattern of teeth (e.g. Silver 1969). Age estimation was recorded per bone if suitable anatomical features were present as adult (adult dentition, suture fusion stages; abbreviated as 'A' ical bone related characteristics (Lyman 1994; O'Connor 2008).

MNI was calculated examining the most commonly occurring skeletal element of a taxonomic grouping, whilst taking consideration

Figure 1. A simplified herbivore skeleton in which a generic adult male deer (without antlers showing) is used. There are anatomical differences between taxa such as carnivores and herbivores in carpal/tarsal and other bones, but this is used to simply indicate location of the bones within the skeleton. A generic adult male deer skeleton (lateral aspect) highlighting selected skeletal elements and regions not normally illustrated. The fourteenth rib (R14, left and right) was drawn in. The hyoid bones (or hyoid apparatus – the bones that support the tongue muscle) lie ventrally to the tongue but was simply drawn in here just below the mandible to illustrate the approximate location. The distal sesamoid and proximal sesamoid bones were also drawn in to illustrate their respective anatomical positions within the lower fore- and hind-legs. L, denotes left side of the animal and R, denotes right side of the animal. Cervical vertebra (C1-C7), thoracic vertebra (T1-T14), lumbar vertebra (L1-L5) and ribs (R1-R14 for one side, total of 28 ribs in total per deer). Skeletal elements of the foreleg from dorsal to ventral aspects: scapula, humerus, radius and ulna, carpal bones, metacarpal, sesamoids and phalanges. Hindleg skeletal elements from dorsal to ventral aspects: femur, patella, tibia, tarsal bones (include astragalus, calcaneum etc), metatarsal, sesamoids and phalanges.



gical analyses.

Recorded body-size classes

Bone size characteristics were used only as a guide since these are problematic when dealing with differences between the ontogenetic (developmental) stages and male/female traits, where males are often larger than females within the same species, but there are exceptions.

The number of long bone shaft fragments, bone fragments and rib fragments that could not be identified to species were grouped into body size classes of mammal or animal:

Small-sized, Sm (e.g. mice, shrew, lemming, rat, vole, bat, stoat, frog, toad, lizard and some fish and bird species)

Small/Medium-sized, Sm/Mm (e.g. larger body sized range of the small category and the lower body-sized range of the medium category)

Medium-sized, Mm (e.g. hare, rabbit, red fox, cat, badger, squirrel, otter, certain breeds of domestic dog and some fish, marine mammals and bird species)

Medium/Large-sized, Mm/Lm (e.g. sheep, goat, deer (excl. red deer), pig/wild boar, certain breeds of domestic dog, wolf and some marine animals and bird species)

Large-sized, Lm (e.g. cattle, horse, brown bear, red deer, reindeer, giant deer and certain marine animals)

Very large-sized, LLm (e.g. mammoth, whales, other larger marine animals).

Taphonomy

Taphonomic processes such as natural weathering (above-surface), sun bleaching (unburied bones on surface), and plant root etching (chemicals exuded from plant roots can cause weathering processes to accelerate) were recorded where relevant. Colouring, or staining, of the bone fragments and any encrusted/other type of residue on the bone fragments were recorded.

Locations and descriptions of butchery related cut marks (human-modifications) were documented, if present. Carnivore and rodent modifications (tooth pits and gnawing) to bones were recorded, including any that may have passed through the digestive tracts (which often exhibit a glazed or smooth polished surface that is pock-marked). Such modifications may suggest predator-prey relationships between carnivores and their kill and/or human activities. Bones were examined for signs of burning, scorching and/or cremation; thus blackened, calcined and partially calcined bones were recorded. Such bones exhibit characteristic external and internal properties including certain types of surface fracture morphologies and colouring associated with the severity of temperature exposure (roasting versus burning of bone waste for example).

Unidentifiable bone and unidentified bone

The term unidentifiable (UNF) bone fragment was used when the bone fragment in question, despite much effort, could not be identified to a skeletal element (whole or part thereof) or to a minimum taxonomic level. This was primarily due to lack of any anatomical or recognisable morphological features on the bone fragment that allowed for identification other than mammal or animal bone, where 'animal bone' included any taxa (bird, amphibian, mammal, reptile etc.).

The term *unidentified* (UNID) bone fragment indicates bones that eluded identification due to lack of distinguishing anatomical features and/or highly fragmentary state at the current time, but may be identified in the future with additional time using different applied techniques (any fragment may be identified by ancient DNA extractions, if viable collagen is present) and/or by a different animal osteologist or zooarchaeologist.

Levels of uncertainty, in terms of identification, was indicated by the inclusion of a question mark before the identified fragment or by information provided in the comment field within the excel worksheet. Herein, numbers within parentheses in tables indicated a possible taxonomic identification.

Context	Interpretation	Description
C1	SW Flanker 18th-20th Century demolition rubble	Between modern 20th Century tiled floor to top of early 18th Century paved stone floor. Most of material dates to construction of 1770s floor level. Material is mixed.
C2	SW Flanker washpit deposit (sealed)	Fill of washpit C5: above C7 & timbers, below sterile construction rubble of early 18th Century floor, north of drain. Waterlogged. Deposit overlays timbers from construction of c.early 18th Century drain.
C3	SW Flanker washpit deposit (unsealed)	Fill of washpit C5 within rebuilt brick & stone-lined drain. Waterlogged. A small manhole through early 18th Century floor into drain indicates it was not sealed deposit.
C4	SW Flanker washpit deposit (sealed)	Fill of washpit C5: upper dry layer piled up to south over C6. Not waterlogged.
C6	SW Flanker washpit deposit (sealed)	Fill of washpit C5: above C7 & timbers, below sterile construction rubble of early 18th Century floor, north of drain. Waterlogged.
C7	SW Flanker washpit deposit (sealed)	Fill of washpit C5: on floor, below C2 & timbers, north of drain. Waterlogged.
C8	SW Flanker Drain running into washpit	Fill of 1583 drain (still in use 18th Century), west of washpit C5. Waterlogged.
C9	SW Flanker washpit deposit (unsealed)	Final clean of washpit.
C10	SE Flanker 18th Century demolition rubble	Demolition rubble between modern tower floor & 1583 floor, including 18th Century floor.
C11	SE Flanker 18th Century cellar	Fill of early 18th Century brick-lined sub-floor space.

Table 1. Summarised descriptions of each Context (C) where animal bone remains were recovered from the deposits (see Giacometti 2015 for further details).

Results and discussion

Overview

As stated in the preliminary report by Giacometti (2015), contexts numbers were only assigned to deposits that contained artefacts. Table 1 presents summary descriptions of each of the contexts that yielded animal bone remains. A total of 2,158 (total weight of 14.18kg) skeletal fragments (excluding fish and bird skeletal remains) were recovered and examined from the excavation from 10 different contexts (C1-4, C6-11).

Of the full 2,158 recovered fragments, 760 of these were unidentifiable fragments (35.2%). Thus, almost two thirds (1,398 or 64.8%) of the assemblage was assigned to a taxonomic category. At least 18 animal genus/species were identified within the assemblage from 583 bone fragments (27.0%) (Tables 2, 3a, 3b; Figure 2):

Identified species from assemblage
16 mammals (n=537, 25.0%)
1 amphibian (n=40, 1.9%)
1 crustacean (n=6, 0.3%)

Of the 18 animals identified, in terms of numbers of bone fragments (NISP) two domestic and one wild species predominated within the assemblage, in particular within C6: sheep (n=167 or almost 29% of the identified taxa), rabbit (n=124, 21%) and pig/wild boar (n=107, 18%). Only 64 cattle bone fragments were identified and these represented almost 11% of the identified animals. More detailed accounts of the identified taxa within the contexts are presented in later sections within this report.

Six body-size categories were recorded, representing 37.5% (n=809) of the full assemblage (including the 'ungulate' category) and a further three possible taxonomic identifications: ?ivory (n=3), ?cow (n=1), ?fallow deer (n=2).

Wild and commensal/domestic mammals are indicated within Table 4; brown rat and rat sp. may be considered as wild as well as a commensal species within human-inhabited areas. Figure 2 provides a broad summary of the proportions of the recovered faunal remains identified to the taxonomic categories from Rathfarnham Castle. For ease of visual interpretation, 'General ID' category in this figure is comprised of the body-sized categories and the possible identifications.

The majority of the faunal remains (80%) came from two contexts, C6 and C4; the abundance

Table 2. Identified faunal taxonomic categories identified within Rathfarnham Castle faunal assemblage, vernacular and full taxonomic names used where possible. Unidentifiable mammal or animal bone fragments were grouped as 'Unidentifiable' category. ? denotes possible identification to that taxonomic category/grouping.

Order	**Family**	**Genus and Species**	**Vernacular name**
Artiodactyla	Suidae	*Sus scrofa*	Pig/Wild boar
		Ovis aries	Sheep
		Ovis/Capra sp.	Sheep/Goat
	Cervidae	*Dama dama*	Fallow deer
	Bovidae	*Bos* sp.	Cow
	n/a	n/a	Ungulate sp.
Carnivora	Felidae	*Felis* sp.	Cat
	Canidae	*Canis familiaris*	Dog
		Vulpes vulpes	Red fox
Rodentia	Muridae	*Mus musculus*	House mouse
		Apodemus sylvaticus	Woodmouse
		Rattus norvegicus	Brown rat
		Rattus sp.	Rat sp.
	Sciuridae	*Sciurus vulgaris*	Red squirrel
Lagomorpha	Leporidae	*Oryctolagus cuniculus*	Rabbit
		Lepus sp.	Hare
Proboscidea	Elephantidae	*Loxodonta/Mammuthus*	Ivory (worked elephant/mammoth bone)
Anura	Ranidae	*Rana* sp.	Frog
Decapoda	Cancridae	*Cancer* sp.	Crab
Body-size categories			Large mammal
			Medium/Large mammal
			Medium mammal
			Small/Medium mammal
			Small mammal
Possible identifications			?Cow
			?Fallow deer
			?Ivory/?Bone
			Unidentifiable

Table 3a. The numbers of identified bone fragments (NISP) by taxonomic category as per each excavated context (C) and associated weight of faunal remains totalled from each context from the Rathfarnham Castle faunal assemblage.

	Context	C1	C2	C3	C4	C6	C7	C8	C9	C10	C11	Total
	Weight (g)	491.1	417.4	195.2	860.0	8838.0	121.5	1129.1	231.2	1055.4	838.4	13122.1
	Unidentifiable	23	12	16	113	527	12	14	35	8		760
Body-size categories	**Large mammal**	6	7	5	35	158		8	2	11	7	239
	Medium/Large mammal	4			2	19	12		1	41		79
	Medium mammal	5	12	10	55	375		5	13		4	479
	Small/Medium mammal				3		3					6
	Small mammal								4			4
	Ungulate sp.					2						2
Possible IDs	**?Cow**					1						1
	?Fallow deer				1	1						2
	?Ivory/?Bone			1		1	1					3
Mammal – commensal or domestic	**House mouse***				2							2
	Cat*					1			1	2		4
	Dog*					2			1	1		4
	Pig/Wild boar*		2	1	8	92		1	1	2		107
	Sheep*	6	4	1	19	95			3	31	8	167
	Sheep/Goat*					24		2				26
	Cow*	1	2	2	2	37	2	8	5	3	2	64
	Brown rat*		1	1	1	11	2		1			17
	Rat sp.*					2	2					4
Mammal – wild	**Woodmouse***						1					1
	Red squirrel*					2						2
	Hare*					1				1		2
	Rabbit*	2	5	1	26	77	6		4	3		124
	Red fox*					1						1
	Fallow deer*					4	2			2	2	10
	Elephant or Mammoth Ivory*		1			1						2
Amphibian	**Frog***		1		1	18	20					40
Crustacean	**Crab***				2	4						6
	Total	47	47	38	270	1456	63	38	71	105	23	2158
	NISP of Genus/Species only*	9	16	6	61	372	35	11	16	45	12	583

of bone within C6 is pronounced (Table 4), almost 68% of the full assemblage was found within this context alone. Apart from C4 and C10, all other contexts yielded total skeletal fragment counts of less than 100 in number (Table 4).

Contexts 1, 10 and 11 appear to be later deposits relative to the other contexts and C1 was located in the SW Flanker, whereas C10 and C11 were in the SE Flanker. C1 yielded 47 post-cranial bone fragments which included two rabbit, 6 sheep and 1 cow bone fragments, as well as a tooth brush made from animal bone (E4468:1:53). 105 bone fragments were recovered from C10, including cat, dog, pig/wild boar, sheep, cow, hare, rabbit and fallow deer

Table 3b. The percentage values (rounded to two decimal places) of the identified bone fragments (%NISP) by taxonomic category as per each excavated context (C) from the Rathfarnham Castle faunal assemblage.

	Context	C1	C2	C3	C4	C6	C7	C8	C9	C10	C11	Total %NISP	%NISP* (n=583)
	Unidentifiable	1.07	0.56	0.74	5.24	24.42	0.56	0.65	1.62	0.37		35.22	
Body-size categories	Large mammal	0.28	0.32	0.23	1.62	7.32		0.37	0.09	0.51	0.32	11.08	
	Medium/Large mammal	0.19			0.09	0.88	0.56		0.05	1.90		3.66	
	Medium mammal	0.23	0.56	0.46	2.55	17.38		0.23	0.60		0.19	22.20	
	Small/Medium mammal				0.14		0.14					0.28	
	Small mammal								0.19			0.19	
	Ungulate sp.					0.09						0.09	
Possible IDs	?Cow					0.05						0.05	
	?Fallow deer				0.05	0.05						0.09	
	?Ivory/?Bone			0.05		0.05	0.05					0.14	
Mammal – commensal or domestic	House mouse*				0.09							0.09	0.34
	Cat*					0.05			0.05	0.09		0.19	0.69
	Dog*					0.09			0.05	0.05		0.19	0.69
	Pig/Wild boar*		0.09	0.05	0.37	4.26		0.05	0.05	0.09		4.96	18.35
	Sheep*	0.28	0.19	0.05	0.88	4.40			0.14	1.44	0.37	7.74	28.64
	Sheep/Goat*					1.11		0.09				1.20	4.46
	Cow*	0.05	0.09	0.09	0.09	1.71	0.09	0.37	0.23	0.14	0.09	2.97	10.98
	Brown rat*		0.05	0.05	0.05	0.51	0.09		0.05			0.79	2.92
	Rat sp.*					0.09	0.09					0.19	0.69
Mammal – wild	Woodmouse*						0.05					0.05	0.17
	Red squirrel*					0.09						0.09	0.34
	Hare*					0.05				0.05		0.09	0.34
	Rabbit*	0.09	0.23	0.05	1.20	3.57	0.28		0.19	0.14		5.75	21.27
	Red fox*					0.05						0.05	0.17
	Fallow deer*					0.19	0.09			0.09	0.09	0.46	1.72
	Elephant or Mammoth Ivory*		0.05			0.05						0.09	0.34
Amphibian	Frog*		0.05		0.05	0.83	0.93					1.85	6.86
Crustacean	Crab*				0.09	0.19						0.28	1.03
	Total	2.18	2.18	1.76	12.51	67.47	2.92	1.76	3.29	4.87	1.07		
	% NISP of Genus/Species only*	1.54	2.74	1.03	10.46	63.81	6.00	1.89	2.74	7.72	2.06		

remains. Whereas, just 23 bone fragments including eight sheep, two cow and two fallow deer were found within C11. One of the two fallow deer bone fragments was a partial radius, where the proximal portion of the shaft was modified to form a crude point which also showed evidence of partial burning/charring (Tables 3a, 3b).

The SW Flanker washpit deposits (C2, 3, 4, 6, 7, 8, 9) yielded a combined total of 1,983 bone fragments (almost 92% of the full assemblage).

Figure 2. Summary proportions of the recovered faunal remains from Rathfarnham Castle expressed in percentages (%) of the total number of fragments. 'General ID' combines body-size categories and possible identifications (denoted by '?').

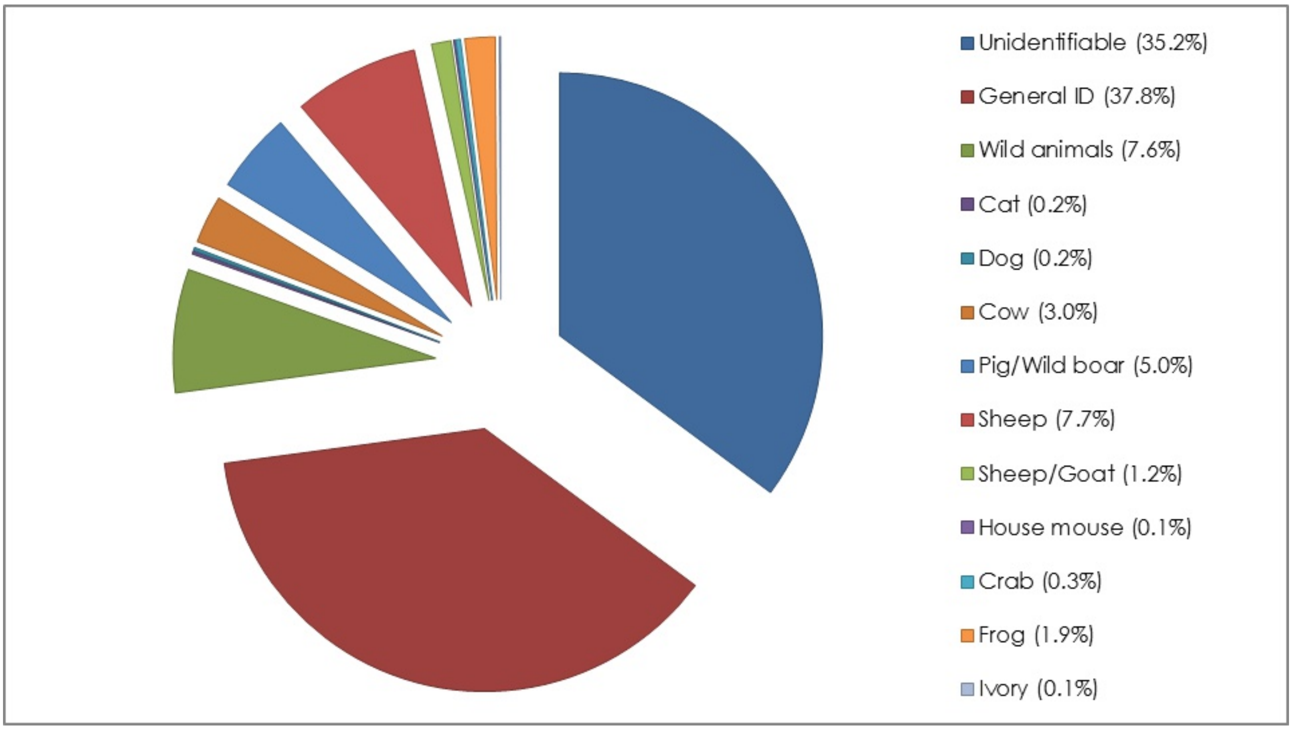


Table 4. The numbers of bone fragments (NISP) and relative percentage (%NISP; rounded to two decimal places) by excavated context (C) of the Rathfarnham Castle faunal assemblage, along with associated weights (g). *Taxonomic grouping includes the body-sized taxonomic groupings, excludes possible identifications as denoted by '?' in Table 2.

Order	**Family**	**Genus and Species**	**Vernacular name**
Artiodactyla	Suidae	*Sus scrofa*	Pig/Wild boar
		Ovis aries	Sheep
		Ovis/Capra sp.	Sheep/Goat
	Cervidae	*Dama dama*	Fallow deer
	Bovidae	*Bos* sp.	Cow
	n/a	n/a	Ungulate sp.
Carnivora	Felidae	*Felis* sp.	Cat
	Canidae	*Canis familiaris*	Dog
		Vulpes vulpes	Red fox
Rodentia	Muridae	*Mus musculus*	House mouse
		Apodemus sylvaticus	Woodmouse
		Rattus norvegicus	Brown rat
		Rattus sp.	Rat sp.
	Sciuridae	*Sciurus vulgaris*	Red squirrel
Lagomorpha	Leporidae	*Oryctolagus cuniculus*	Rabbit
		Lepus sp.	Hare
Proboscidea	Elephantidae	*Loxodonta/Mammuthus*	Ivory (worked elephant/mammoth bone)
Anura	Ranidae	*Rana* sp.	Frog
Decapoda	Cancridae	*Cancer* sp.	Crab
Body-size categories			Large mammal
			Medium/Large mammal
			Medium mammal
			Small/Medium mammal
			Small mammal
Possible identifications			?Cow
			?Fallow deer
			?Ivory/?Bone
			Unidentifiable

	ID	Weight (g)	NISP	Comments
E4468: 1:53	Animal bone	7.80	2	18th Century double ended tooth brush. Abrasive working marks visible on the surfaces.
E4468: 2:200	Ivory	55.80	1	Appears to be ivory (schrenger lines visible; cannot tell if elephant or mammoth) handle with polish and smooth finish, residue on partial attached blade (silver plaited).
E4468: 2:204	Animal bone	5.87	1	Bone handle of carved folding tooth brush. Abrasive working marks visible on bone.
E4468: 3:188	?Ivory/?Animal bone (turtle shell)	1.44	1	Possibly ivory (?faint schrenger lines); working marks visible. ?turtle shell - bone plate/inlay with tiny screw.
E4468: 6	Fallow deer	48.10	1	Partial right metacarpal. Prox shaft worked into point (bevelled edges and wear visible). Tool. Polish on bone evident, as is striations associated with fashioning tool.
E4468: 6:8038	Mm	3.17	1	Worked long bone object (?apple corer), semi rounded at one end of the long bone shaft with rounded/worked edges (point). Bone edges (worn) thinned down relative to remainder shaft bone. ?sheep/goat/pig long bone shaft frag.
E4468: 6:4782	Animal bone	11.90	1	Bone handle. Lamellae of bone layers visible but may be artefact of manufacture of bone handle. Burnt.
E4468: 6:4702	Animal bone	15.46	1	Bone handle. With polish and smooth finish, residue within handle space but blade absent.
E4468: 6:4701	Ivory	14.30	1	Bone handle. Appears to be ivory (schrenger lines visible; cannot tell if elephant or mammoth), with polish and smooth finish, residue within handle space but no blade.
E4468: 6:4793	Animal bone	11.87	2	Abrasive working marks visible; two pieces in 'square/rectangle' artefact, residue still attached to both fragments. ?toothbrush.
E4468: 6:4786	Animal bone	1.03	2	Bone cog wheel and peg shaft. Abrasive working marks evident and visible in both wheel and peg.
E4468: 6:4781	Animal bone	3.82	1	Bone marrow spoon. Abrasive working marks visible, one piece of bone (long bone of some sort); highly ornate with polished finish.
E4468: 6:4794	Animal bone	0.48	1	Bone inlay fragment? Abrasive working marks visible on rough surface, polished smooth surface on other side with rounded edge.
E4468: 6:4795	?Ivory/?Animal bone (turtle shell)	1.28	1	Bone inlay plate. Possibly ivory (?faint schrenger lines); working marks visible and v-shaped indentation. (?turtle shell).
E4468: 7:628	Animal bone	0.40	1	Bone peg. Clearly worked (small bevelling and abrasive marks observed under microscope).
E4468: 7:613	Animal bone	n/a	1	Bone (polished and smooth finish) handled knife with residue encrusted metal blade that is partially broken and bent. No weight taken.
E4468: 7:624	?Ivory/?Animal bone	2.39	1	Bone plate inlay (?razor blade handle). Abrasive working marks visible on inner rough surface; outer surface smooth with polish and decorated motifs; possible schrenger lines visible on polished decorated side but faint.
E4468: 9:427	Animal bone	0.23	1	Circular bone object. Clearly worked (small bevelling and abrasive marks observed under microscope.)
E4468: 9:429	Animal bone	2.08	1	Bone handle. Working marks on rough side clearly visible, smooth polished surface on reverse; very thin, no visible schrenger lines.
E4468: 11	Fallow deer	44.55	1	Partial left radius, distal plus about 2/3 shaft, but (prox) shaft is worked (unnatural) into point, the edges of which show some working - with small area of black/white residue (burning/charred).

Table 5. Details of the identified worked pieces of animal bone.

Worked bone artefacts

In total 23 worked pieces of partial animal bone were identified within the assemblage (Table 5). Two worked pieces of ivory (E4468: 6:4701 and E4468: 2:200) were identified as indicated by the visible characteristic schrenger lines (Es-

	C1	C2	C3	C4	C6	C7	C8	C9	C10	C11	TOTAL
Semi-porous bone	8	8	2	55	272	3	4	7	12	1	372

Table 6. Number of semi-porous bone (immature bone) fragments counted within each context.

pinoza & Mann 1999); however, it was not possible to distinguish between either elephant or mammoth ivory. The pieces were modified into polished (cutlery/knife) handles, with a smooth finish and some residue encrusted within handle space but no blade present. A further three worked pieces of bone inlays may possibly be worked ivory (E4468: 7:624; E4468: 6:4795 and E4468: 3:188) but this was uncertain. Additionally, four other animal bone cutlery handles were identified: two within C6 and one within C7 and C9. Three worked bone objects or artefacts were also identified within C6 (cog wheel and peg), C7 (peg) and a circular object within C9. Two, with the possibility of a third, modified animal bone toothbrush objects were identified within C1, C2 and C6. A possible apple corer made from a long bone shaft of a medium-sized mammal was identified in C6. A highly ornate carved piece of animal bone fashioned into a bone marrow spoon was found in C6. The shafts of two fallow deer long bones were modified into bone points, both found within C6.

Preservation, fragmentation and Recovery

A number of factors may affect the preservation and representativeness of the faunal assemblage. These include destructive human and animal activities upon the bones themselves and additionally natural pre- and post-depositional physical and chemical degradation, may affect the skeletal material differently.

Excavations at Rathfarnham Castle were meticulous. Bones were recovered by hand-excavation and subsequently sieved through a fine mesh. This screening produced a large number of small fragments, increasing the unidentifiable portion of the faunal assemblage. Bone recovery was to a high standard as reflected by the very small skeletal fragments (mice remains, along with the fish and bird bone fragments which were separated from the other animal skeletal remains).

The unidentifiable portion of the assemblage were various sizes of bone fragments which could only be assigned to either mammalian bone or animal bone with no anatomical characteristics present that could have eluded to a specific skeletal element or a taxonomic category.

In general, the level of preservation of the skeletal material was relatively good. Although some of the bones show evidence of waterlogging and a high degree of severe bone surface erosion. The presence of 372 fragile juvenile bones (semi-porous fragments of unfused epiphyses and long bone shaft fragments without distal/proximal epiphyses; Table 6) from very young individuals of domestic and wild species as well as unidentifiable taxa indicates good level of preservation, since these bones may degrade faster due to their inherent porous and fragile nature.

The number of complete bones was low. Of the total excavated bone material, only 74 (or 3.4% of the full assemblage) individual bones were complete (whole) skeletal elements whilst the remaining were fragmented to varying degrees. The whole bones comprised of teeth (n=30), cuboid bones (n=13), limb bones (n=4), vertebrae (n=2), metapodia (n=10), ribs (n=2) and phalanges (n=13) and the majority of these (n=55/74) were found within C6. Compact and dense bones, such as aforementioned, have a much higher survival rate within archaeological contexts relative to other more fragile skeletal elements. Additionally juvenile (not fully developed) bones may remain intact depending on post-mortem practices and uses of the carcase. Thus, there appears to be no size-bias towards size of recovered bone fragments from the excavation.

Taphonomic agents

It is important to note that a single individual bone fragment may show multiple taphonomies. Of the total faunal assemblage, at least a quarter of the faunal assemblage (n=651) of the skeletal remains exhibited some sort of evidence associated with a taphonomic causal agent (Table 7, Figure 3; and also see Appendix I for a more detailed examination per each context). There was a preponderance of burned bone fragments (or fragments that had been subjected to high temperatures) where charring, burned bone and calcined micro-fractures and associated distortion were evident. Additionally, numerous fragments bore evidence of butchery tool-related cut/chop marks and also weathering where external bone surfaces were partially or fully eroded away.

Burned and calcined bones

Depending on the level of temperature, burned bones may show evidence of charring, partial burning and are associated with colour changes (grey, black and white colours) to the outer and inner bone matrices (Table 8). These characteristics are affected by moisture content of the bone, temperature of the heat/fire source and the duration of heat exposure. Charred bone from roasting is generally black-blue-grey, whereas calcined bone is grey-white in colour. Calcination is associated with relatively clean bones (of meat) that have been disposed of in a fire in terms of refuse or ritualistic cremation; sustained high temperatures for a long duration. The difference between weathered (exposed to environmental elements) and calcined bone is that a fine powder is produced when the bone surface is scratched with a fingernail in the case of calcined bone.

Additionally, very high temperatures (>420°C) associated with long burning duration causes distortion of the bone surfaces and micro-frac-

Table 7. Quantification of the taphonomic agents (n and %) observed on the skeletal fragments per each context. Some fragments displayed evidence of multiple different taphonomic agents.

	C1	C2	C3	C4	C6	C7	C8	C9	C10	C11	TOTAL
Burning/High temperatures	22 (1.02%)	1 (0.05%)	1 (0.05%)	51 (2.36%)	333 (15.43%)	2 (0.09%)	-	10 (0.46%)	2 (0.09%)	-	422 (19.56%)
Carnivore	12 (0.56%)	11 (0.51%)	3 (0.14%)	27 (1.25%)	103 (4.77%)	1 (0.05%)	3 (0.14%)	8 (0.37%)	29 (1.34%)	9 (0.42%)	206 (9.54%)
Rodent	4 (0.19%)	3 (0.14%)	4 (0.19%)	8 (0.37%)	45 (2.09%)	1 (0.05%)	3 (0.14%)	-	62 (2.87%)	3 (0.14%)	133 (6.16%)
Plant-root etching	-	-	-	2 (0.09%)	9 (0.42%)	-	3 (0.14%)	-	2 (0.09%)	-	16 (0.74%)
Arthropathies / pathology	-	-	-	-	7 (0.32%)	2 (0.09%)	-	-	-	1 (0.05%)	10 (0.46%)
Decalcified	1 (0.05%)	1 (0.05%)	-	10 (0.46%)	69 (3.20%)	-	-	4 (0.19%)	6 (0.28%)	4 (0.19%)	95 (4.40%)
Calcined	2 (0.09%)	-	-	33 (1.53%)	190 (8.80%)	1 (0.05%)	-	8 (0.37%)	-	-	234 (10.84%)
Weathered	6 (0.28%)	8 (0.37%)	4 (0.18%)	44 (2.04%)	186 (8.62%)	3 (0.14%)	12 (0.56%)	7 (0.32%)	23 (1.23%)	13 (0.60%)	306 (14.18%)
Residue	-	5 (0.23%)	-	5 (0.23%)	26 (1.20%)	-	-	-	3 (0.14%)	-	39 (1.81%)
Butchery marks	15 (0.70%)	8 (0.37%)	8 (0.37%)	60 (2.78%)	366 (16.96%)	10 (0.46%)	8 (0.37%)	17 (0.79%)	50 (2.32%)	11 (0.51%)	553 (25.63%)
TOTAL	62 (2.87%)	37 (1.72%)	20 (0.93%)	240 (11.12%)	1334 (61.82%)	20 (0.93%)	29 (1.34%)	54 (2.50%)	177 (8.20%)	41 (1.90%)	

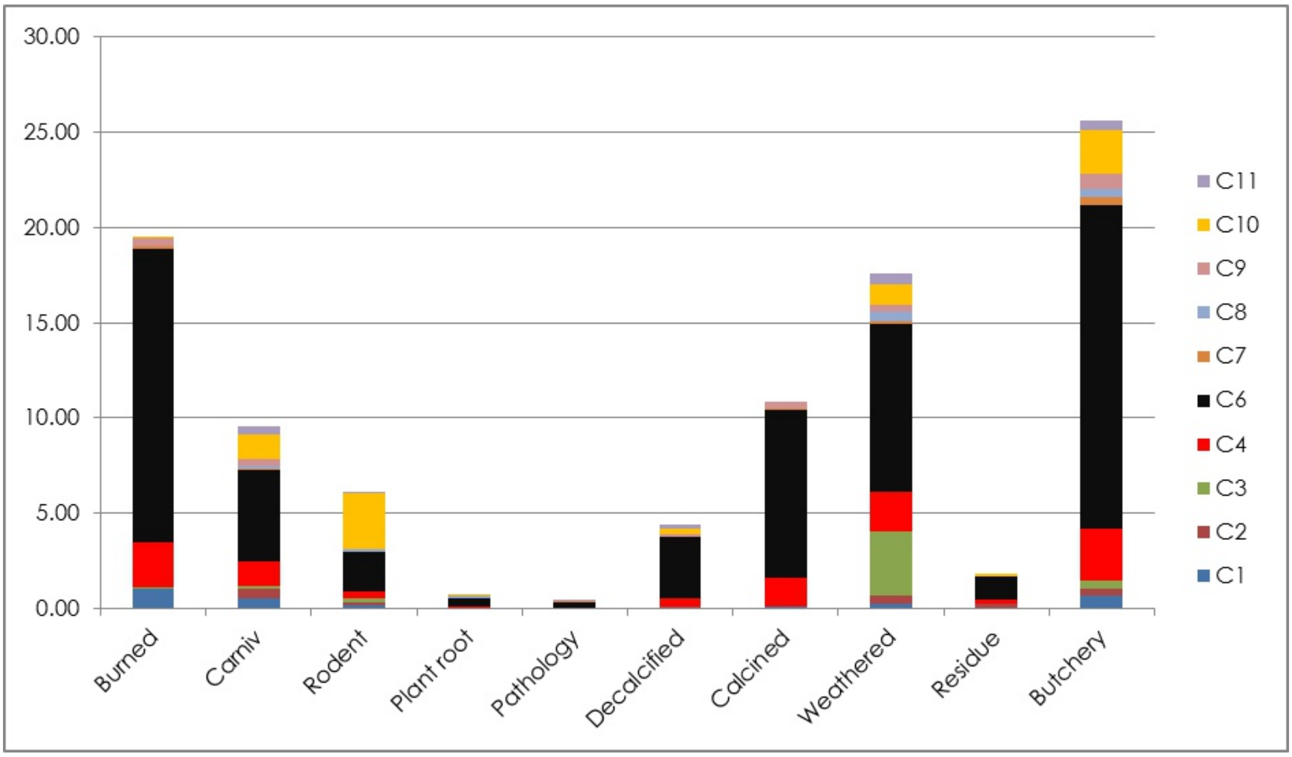


Figure 3. Frequency (%NISP) of the recorded taphonomic causal agents within each context.

tures within the (calcined) bone and can lead to full decalcification and render the bone to a chalk-like substance and/or ash. These anatomical characteristics associated with short and long duration burning events may occur with cooking and the purposeful burning of refuse within a fire (or in layers directly below a fire pit).

Table 8. General descriptions of the colours of burned bone associated with varying temperatures (degrees Celsius, °C), after Gilchrist & Mytum (1986).

Temp. (°C)	Colour description
200	Very pale brown
300	Brown to dark reddish brown
350	Dark brown to black
420	Bluish grey
500	Light grey
600	Pinkish grey
700	White

Between 10 and 50% of bone when heated may be totally destroyed (Gilchrist & Mytum 1986) or become extremely fragmented (Knight 1985) which results in recovered bone pieces that are unidentifiable due to their small size (Lyman 1994). Within the Rathfarnham Castle faunal assemblage, numerous bone fragments, unidentifiable to species/genus taxa, showed evidence of being subjected to high temperatures/heat and charring and the majority of these were excavated from C6 (Table 7; Figure 4).

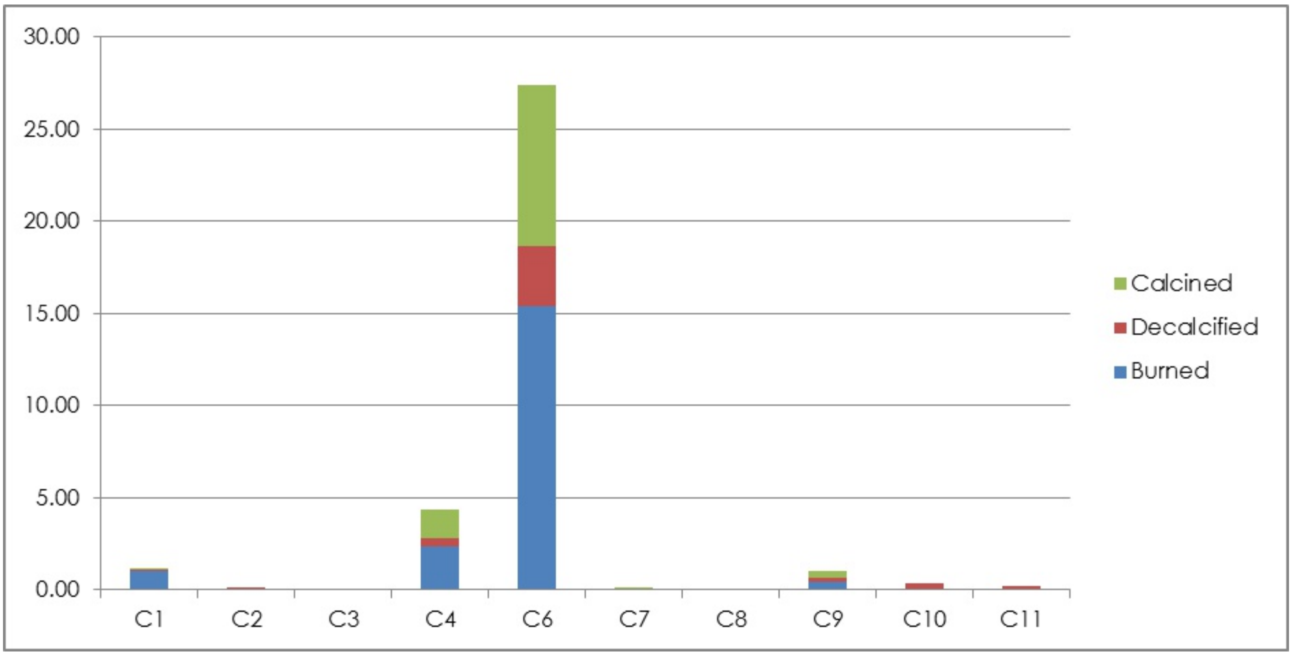
Burned bone fragments within the full assemblage accounted by 19.6% and 10.8% of the assemblage showed evidence of calcined bone whereas only 4.4% were completely decalcified (chalky) (Table 7, Figures 3, 4). Thus, almost 35% of the bone fragments within the full Rathfarnham Castle faunal assemblage had been affected by burning to varying degrees with the majority associated with roasting of meat joints/carcass parts and the high sustained temperatures.

Bone fragments affected by high temperatures (burned, calcined and decalcified fragments) were most frequent within C6 (c.27% incidence; Figure 4), the majority of these were unidentifiable bone fragments (c.12%) and three cattle bones (axis, tibia and calcaneum), two rabbit humeri and a sheep tibia. The hindleg bones (tibia, calcaneum and humerus) suggest the preparation of these joints that contain the greater volume of meat relative to the foreleg joint within any of the aforementioned taxa. The presence of the burned cow axis (the second cervical vertebra posterior to the skull) may indicate the use of the cervical or neck region of the carcass due to the amount of viable edible meat present within this region on the cow carcass. Within C4, 4.4% of the bone fragments were affected by high temperatures: the majority being unidentifiable fragments. A single partial rabbit mandible displayed evidence of being burned which may suggest whole rabbit carcasses used due to their overall smaller size. A single crab claw was completely decalcified. Only 1% of the bone fragments in C9 were affected by high temperatures, and these were all unidentifiable fragments. In C2, C3, C7 and C8 the incidence of bone fragments affected by high temperatures were very infrequent (<0.1%).

Within C1, only 1.2% of the bone fragments were affected by high temperatures and these were unidentifiable to taxa. The incidence of high temperatures affecting bone fragments was very low within C10 and C11, 0.4% and 0.2% respectively. Within C10, a forelimb bone (radius) and hindlimb bone (femur) of sheep were decalcified and two forelimb bones (radius and humerus) of sheep within C11 were also decalcified. These incidences indicate the use of meat-bearing joints of the foreleg and hindleg regions of the sheep within these contexts.

Within various contexts, large-sized and medi-

Figure 4. %NISP of bone fragments displaying visible evidence of being affected by high temperatures as evidenced by burning, calcined, decalcified fragments within each context.



um-sized mammalian fragments also showed evidence of burning and being effected by high temperatures, since no horse or other larger sized mammals were found other than cattle, the large-sized mammalian fragments may be those of cattle. Whereas, medium-sized mammals may be sheep, sheep/goat, fallow deer and/or pig/wild boar as these taxa were identified within the assemblage.

Carnivore and rodent gnawing

Overall, there were 206 incidences of carnivore gnawing activity evident on the bone fragments and 133 incidences of rodent activity noted (Table 7). The greatest numbers of bone fragments that displayed evidence of tooth pits and gnawing by carnivores was within C6 (4.8%) where there was a larger volume of excavated skeletal material, but evidence of carnivore damage on the recovered skeletal material was also found infrequently in other contexts (0.05% to 1.34%; Table 7, Figure 5).

Although the incidence of evidence of rodent gnawing on bone fragments in C6 was also relatively high (2.09%), there was a higher incidence of rodent activity within C10 (2.87%). Domestic/feral dogs, foxes, cats, mustelid species all may scavenge bones if left lying around a site/area. Additionally, rodents such as rats and mice, as well as some herbivore species such as sheep, goats, deer and cattle may also gnaw bones mainly to increase intake of various minerals including calcium that do not occur frequently within the natural environment. All taxa leave characteristic and identifiable teeth marks by their gnawing activities. Chewing of the bones and actual consumption may lead to a higher incidence of bone fragmentation but with associated gnawing marks and tooth pits.

The rodent gnawing marks observed on the bone fragments within the Rathfarnham Castle assemblage were those of mice and rats. Due to the overall low levels of occurrence of rodent/carnivore gnawing marks observed within the Rathfarnham Castle faunal assemblage suggests that the bones (and their fragmented remains) were disposed up relatively quickly. Although the higher frequency of rodent activity within C10 may be a product of the depositional environment of the bone fragments (the rodents may have been attracted to discarded waste), which were found within the SE Flanker floor.

Figure 5. Frequency of incidences of evidence of carnivore and rodent gnawing activity on the recovered bone fragments based on %NISP (Table 7).

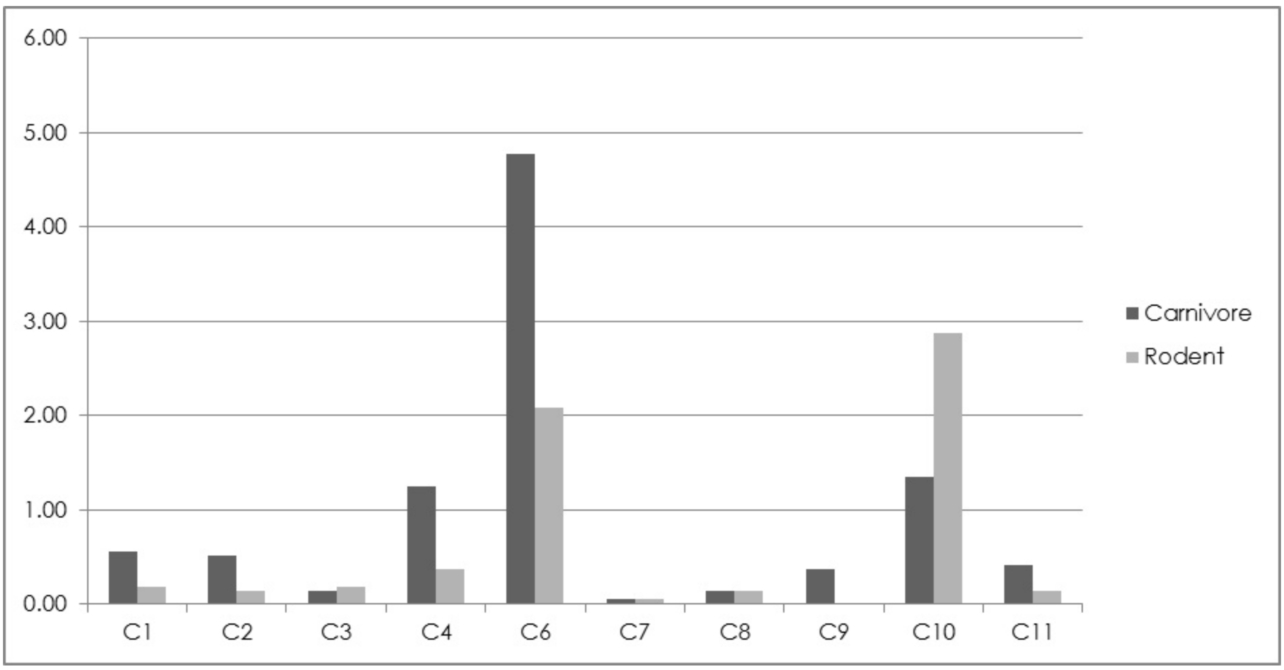


Figure 6. NISP of incidences of carnivore gnawing on bone fragments from the identified taxonomic categories, see Table 9

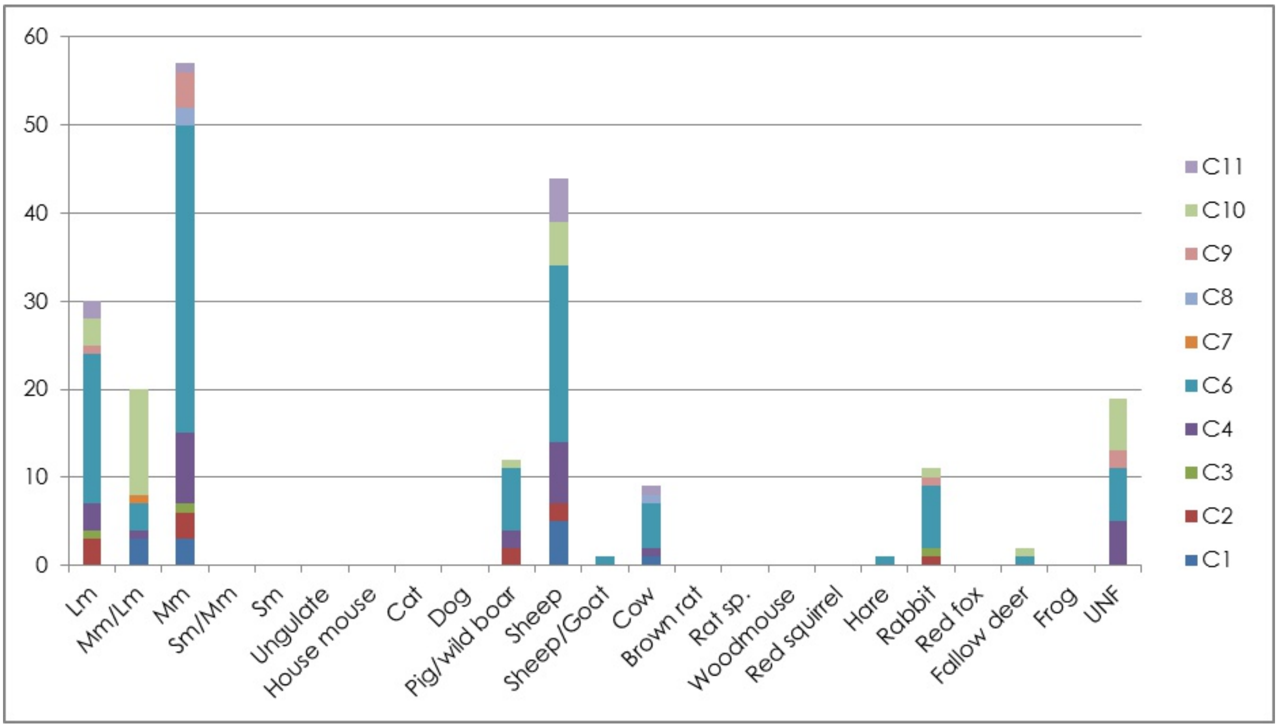


Table 9. NISP of incidences of carnivore gnawing on bone fragments from the identified taxonomic categories (see Fig. 6)

	C1	C2	C3	C4	C6	C7	C8	C9	C10	C11	TOTAL
Lm		3	1	3	17			1	3	2	**30**
Mm/Lm	3			1	3	1			12		**20**
Mm	3	3	1	8	35		2	4		1	**57**
Sm/Mm											**0**
Sm											**0**
Ungulate											**0**
House mouse											**0**
Cat											**0**
Dog											**0**
Pig/wild boar		2		2	7				1		**12**
Sheep	5	2		7	20				5	5	**44**
Sheep/Goat					1						**1**
Cow	1			1	5		1			1	**9**
Brown rat											**0**
Rat sp.											**0**
Woodmouse											**0**
Red squirrel											**0**
Hare					1						**1**
Rabbit		1	1		7			1	1		**11**
Red fox											**0**
Fallow deer					1				1		**2**
Frog											**0**
UNF				5	6			2	6		**19**
TOTAL	12	11	3	27	103	1	3	8	29	9	**206**

Figure 7. NISP of incidences of rodent gnawing on bone fragments from the identified taxonomic categories (see Table 10)

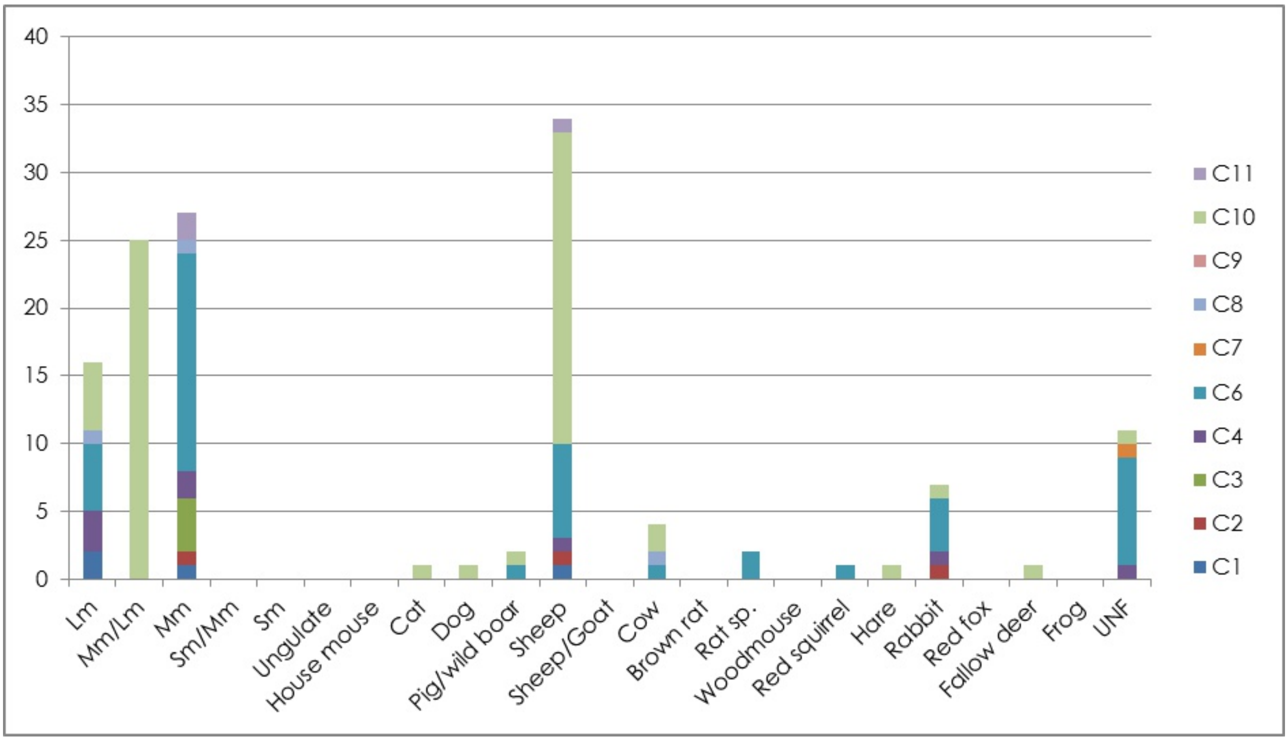


Table 10. NISP of incidences of rodent gnawing on bone fragments from the identified taxonomic categories (see Figure 7)

	C1	C2	C3	C4	C6	C7	C8	C9	C10	C11	TOTAL
Lm	2			3	5		1		5		**16**
Mm/Lm									25		**25**
Mm	1	1	4	2	16		1			2	**27**
Sm/Mm											**0**
Sm											**0**
Ungulate											**0**
House mouse											**0**
Cat									1		**1**
Dog									1		**1**
Pig/wild boar					1				1		**2**
Sheep	1	1		1	7				23	1	**34**
Sheep/Goat											**0**
Cow					1		1		2		**4**
Brown rat											**0**
Rat sp.					2						**2**
Woodmouse											**0**
Red squirrel					1						**1**
Hare									1		**1**
Rabbit		1		1	4				1		**7**
Red fox											**0**
Fallow deer									1		**1**
Frog											**0**
UNF				1	8	1			1		**11**
TOTAL	4	3	4	8	45	1	3	0	62	3	**133**

As indicated by the NISP of the occurrences of the carnivore and rodent gnawing on bone fragments of the predominant species associated with cooking and eating include sheep, pig/wild boar, rabbit and cow taxa, as well as other species and taxonomic categories (Tables 9 and 10, Figures 6 and 7). Given the presence, albeit limited presence, of canid and rodent species, there was relatively low frequencies of gnawing of the animal bone (with the exception of C10 rodent gnawing) observed on the fragmented bone material.

Plant root etching

Only 16 incidences of plant root etching on the bone fragments was observed and only in four of the 10 contexts:

C4 1 limb bone of large-sized and 1 vertebra of a large/medium-sized mammal
C6 2 cow (tibia and rib), 1 pig/wild boar (humerus), 2 sheep (skull), 3 large-sized mammal (two vertebrae and pelvis) and 1 medium-sized mammal (rib)
C8 1 sheep/goat (pelvis), 1 cow (mandible) and 1 large-sized mammal (pelvis)
C10 1 sheep (tibia) and 1 large/medium-sized mammal (cervical vertebra)

Some of these fragments also displayed evidence of being effected by high temperatures and also butchery cut/chop marks. This may indicate that the bone fragments were discarded after the carcass was butchered into meat joints and post-cooking. The overall incidence of plant root etching is very low which also suggests that not many of the bone fragments were left lying around the habitation site exposed to the elements and natural environs, but rather were covered/disposed into pits or buried quickly and not near the ground surface where plant roots could reach the fragments to leech any remaining minerals from the bone matrix.

Pathology/Arthropathies

Only 10 bone pathologies were observed within the full assemblage examined. Of these seven occurred within C6, two within C7 and one within C11:

C6 (n=7) 2 medium-sized mammal (partially healed fracture of lumbar vertebra and two caudal vertebra that were partially fused together), 2 large-sized mammal (2 ribs with healed fractures/swelling and remodelling), 1 pig/wild boar (atlas with pathology), 1 sheep/goat (radius with pathology on the shaft; also displayed cut marks), 1 frog (a limb bone with pathology)
C7 (n=2) 1 medium/large-sized mammal (rib with pathology and cut marks), 1 frog (pelvis with pathology)
C11 (n=1) 1 cow (humerus with pathology on distal condyle articular surface, with cut marks)

The very low incidence of bone related pathologies on the examined material may be indicative of healthy animals, not the old and weaken animals slaughtered for consumption but rather prime young, healthy animals. Also, the occurrences of bone pathologies may be linked to genetic inherited diseases. Numerous cut marks associated with butchery practices on some of these fragments which exhibited the pathologies indicate these joints/animals were deemed suitable for consumption by the inhabitants of Rathfarnham Castle.

Weathering

Weathered bone, whereby the bone surface was partially or wholly eroded away (and absent), was the third most frequent taphonomic causal agent observed on the Rathfarnham Castle faunal assemblage. There was 306 (14.2% of full assemblage) incidences of weathered bone recorded from all of the contexts, with the most frequent occurrence found within C6 (n=186 incidences) (Table 11, Appendix I). Weathered bone is usually the result of exposure to the natural elements within an environment, but may also be due to a combination of other casual agents associated with, for example, the depositional environment conditions, water logging and burning and then subsequent or further exposures to other factors. The processing of an animal carcass during butchering may also affect the degree a bone may be affected by weathering agents. Notwithstanding the depositional processes, since many of the bone fragments show evidence of more than one taphonomic causal agent, there was a complex suite of factors involved that affect the surfaces and matrices of the fragmented material which was not species-specific or bone element-specific.

Presence of residue

The presence of any residue on the bone fragments was recorded. Such residue consisted of either a hard to clean clay-dirt thin layer, a dark brown-orange hard matrix that was probably burned slag and in one incidence contained amongst an aggregate of various bits of burned ash/dirt, egg-shell fragments. Associated residue was only recorded from 39 bone fragments from four contexts (C2, C4, C6 and C10).

C2 (n=5) 3 large-sized mammal (1 rib, 2 unidentifiable), 1 medium-sized mammal (1 rib, with hard brown matrix containing egg shell fragments amongst burned ash/dirt) and residue was also recorded on the carved folding toothbrush (E4468: 2:204)

C4 (n=5) 3 unidentifiable (with cut marks), 2 sheep (1 pelvis and 1 humerus, with cut marks)

C6 (n=26) 8 unidentifiable, 3 large-sized mammal (1 rib, 2 limb bone), 7 medium-sized mammal (1 vertebra, 6 rib with burned slag attached on 1 rib), 1 cow (skull), 3 pig/wild boar (1 femur, 2 thoracic vertebra) and 4 sheep (calcaneum, atlas, mandible, tibia)

C10 (n=3) 1 large-sized mammal (rib), 1 medium/large-sized mammal (lumbar vertebra) and 1 sheep (radius)

Table 11. Incidences (n) of weathered bone fragments within each context for each taxonomic category.

	C1	C2	C3	C4	C6	C7	C8	C9	C10	C11	TOTAL
Lm	3	2		4	28		2		6	4	**49**
Mm/Lm	2			2		1			7		**12**
Mm		4	1	18	60		2	2		3	**90**
Sm/Mm						1					**1**
Sm											**0**
Ungulate											**0**
House mouse											**0**
Cat											**0**
Dog											**0**
Pig/wild boar		1		2	20		1				**24**
Sheep		1	1	6	22				7	3	**40**
Sheep/Goat					8		1				**9**
Cow	1				9	1	6		2	1	**20**
Brown rat					1						**1**
Rat sp.											**0**
Woodmouse											**0**
Red squirrel											**0**
Hare					1						**1**
Rabbit				1	1			1			**3**
Red fox											**0**
Fallow deer					1				1	2	**4**
Frog											**0**
UNF			2	11	35			4			**52**
TOTAL	6	8	4	44	186	3	12	7	23	13	**306**

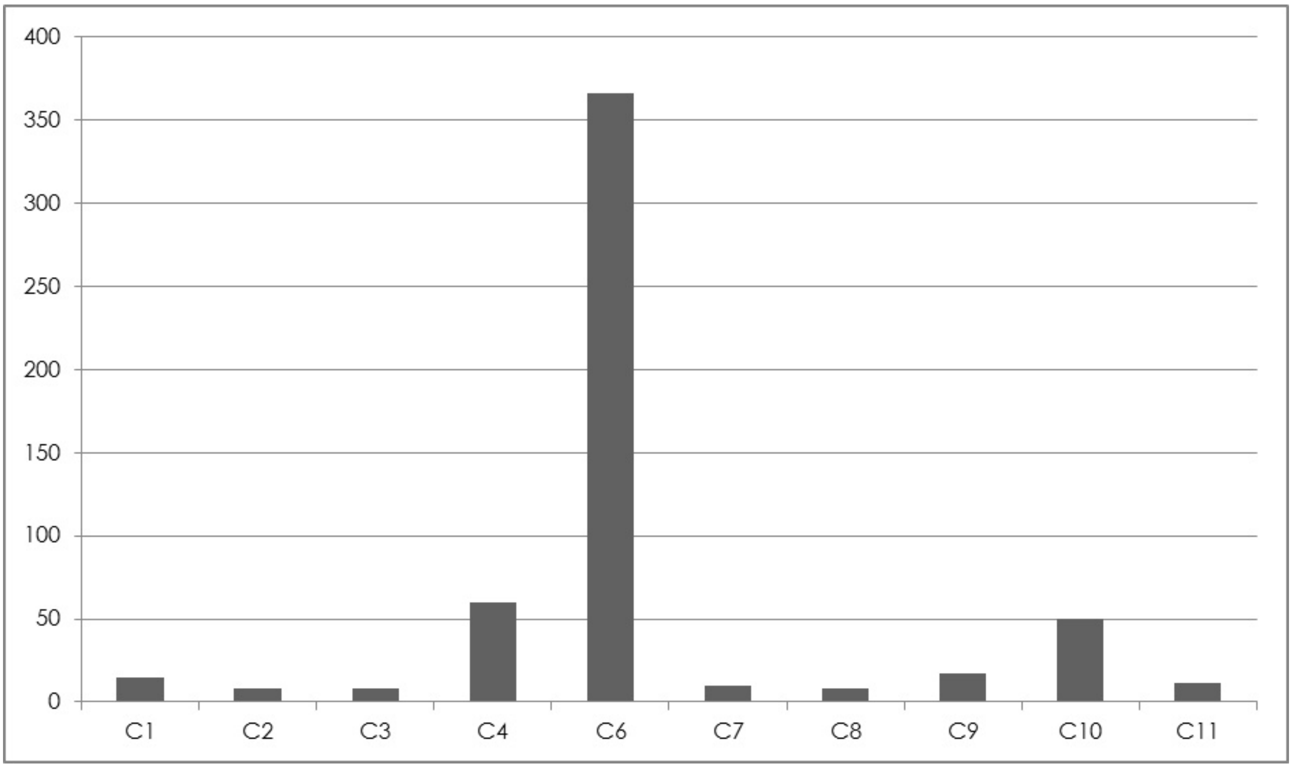


Figure 8. Frequency (NISP) of bone fragments that displayed evidence of butchery per context

Butchery marks, skeletal part representation and age-class estimations

The butchering and processing of animal carcasses for meat acquisition, transportation of small parts and/or skinning of the pelts, leave behind diagnostic marks on the various skeletal elements caused by various implements or tools such as metal knives, axes and saws. The location of such marks on the various bones can indicate whether the animal carcasses were divided into meat joints or simply processed for skins or even the extraction of the highly nutritious marrow found within the interior of long bones in particular.

Almost a quarter (25.6%, n=553) of the bone fragments within the full Rathfarnham Castle assemblage displayed cut/chop butchery related marks (Table 7, Figure 3). This was the most frequently observed taphonomic causal agent.

Butchery bone fragments were found within all 10 contexts and occurred most frequently within C6 and then C4 and C10 (Figure 8, Appendix I). Of the various body-sized mammal categories, there were 338 incidences of butchery marks left on bone fragments (Table 12). A pattern across all contexts was evident - the butchery marks were found on bone fragments from certain identified domestic and wild taxa, thereby reflecting the diet of the Rathfarnham Castle inhabitants (Table 12, Appendix I). Pig/wild boar, sheep, sheep/goat and cow were amongst the domestic species whose partial carcasses showed evidence of being butchered, jointed and prepared for cooking, whereas the predominant wild species was rabbit.

Four fallow deer bones displayed evidence of cut marks; within C6 a piece of the antler main beam had cut marks, whereas within C7, partial remains of an astragalus (tarsal bone of hindleg) and humerus (forelimb bone) displayed cut marks and these bone fragments were of adult size. There were cut marks evident in a partial radius (foreleg bone) and the shaft of this was worked into a bone point. Therefore, of the fallow deer bones (which are infrequent within the assemblage, n=10) that displayed evidence of butchery marks; these cut marks may be associated with the removal of the

	C1	C2	C3	C4	C6	C7	C8	C9	C10	C11	TOTAL
Lm	5		3	7	50		2	2	9	5	**83**
Mm/Lm	2			2	3	6			24		**37**
Mm	2	5	3	20	179		1	7		1	**218**
Sm/Mm											**0**
Sm											**0**
Ungulate											**0**
House mouse											**0**
Cat											**0**
Dog											**0**
Pig/wild boar			1		36		1		1		**39**
Sheep	6	1	1	12	34				14	3	**71**
Sheep/Goat					11						**11**
Cow				1	15		4		1	1	**22**
Brown rat											**0**
Rat sp.											**0**
Woodmouse											**0**
Red squirrel											**0**
Hare											**0**
Rabbit		1		2	3	1		1	2		**10**
Red fox											**0**
Fallow deer					1	2				1	**4**
Frog											**0**
UNF		1		15	34	1		7			**58**
TOTAL	15	8	8	59	366	10	8	17	51	11	**553**

Table 12. Frequency (NISP) of bone fragments that displayed evidence of butcher marks within each context per identified taxonomic categories.

lower leg bones. The cut marks visible on the hard antler piece, may be associated with the removal of the large palmate area of the antler, or due to modification of the antler piece in manufacture of antler objects.

The skeletal elements that displayed butchery related marks within each context for pig/wild boar, sheep, sheep/goat, cow and rabbit identified species were examined in more detail to ascertain if any pattern existed with regards to patterns of carcass preparation (Table 13). Meaty parts of the animal carcass and are usually associated with kitchen and meals waste include: vertebra, scapula, humerus, radius, ulna, pelvis, sacrum, femur, patella, tibia and fibula. Slaughtering waste usually includes the non-meaty carcass parts such as crania (but in some cases whole crania may be cooked and eaten), metapodia, carpals, tarsals and phalanges.

Sheep (and sheep/goat) skeletal remains appear to reflect use of cranial and postcranial portions of the skeleton – removal of brain within the skull is evident through dorsal-ventral clean chops through the skull. Perhaps whole heads were cooked; the brain may have been considered a delicacy as well as cheek and tongue parts. There were no distal lower bones of the fore- or hindlegs, indicating these waste parts

	Rabbit	Pig/wild boar	Sheep	Sheep/Goat	Cow	TOTAL
Skull		C6: 2	C4: 1 C6: 5	C6: 1		9
Mandible	C2: 1		C4: 1 C6: 1 C10: 1	C6: 1		5
Atlas		C6: 2 C10: 1	C3: 1		C6: 2	6
Axis		C6: 1	C6: 1 C11: 1		C6: 1	4
Cervical vertebra		C6: 5	C6: 1	C6: 2		8
Thoracic vertebra		C6: 5	C4: 1 C6: 1	C6: 1		8
Lumbar vertebra		C6: 1	C1: 1 C2: 1 C6: 2	C6: 3	C8: 1	9
Rib		C6: 5	C10: 2	C6: 1	C4: 1 C6: 2 C8: 2	13
Scapula		C6: 3	C6: 4 C10: 2			9
Humerus		C6: 1 C8: 1	C1: 1 C4: 3 C6: 3 C10: 3 C11: 1		C6: 1 C11: 1	15
Radius		C3: 1	C6: 2 C10: 3 C11: 1	C6: 1	C6: 1	9
Ulna	C4: 1		C6: 2 C10: 1		C6: 2	6
Metacarpal			C4: 1			1
Pelvis	C4: 1 C6: 1 C7: 1 C10: 1	C6: 4	C1: 1 C4: 4 C6: 7 C10: 2		C6: 2	24
Sacrum		C6: 1				1
Femur	C6: 2 C10: 1	C6: 3	C1: 3 C10: 1		C6: 2 C8: 1	13
Tibia	C9: 1	C6: 1	C4: 1 C6: 2			5
Tarsal bones		C6: 2	C6: 3	C6: 1		6
Metatarsal					C6: 1	1
Phalange					C6: 1	1
TOTAL	*10*	*39*	*72*	*11*	*21*	*153*

Table 13. The frequency of the skeletal element bone fragments within specific identified taxa that displayed butchery related marks for each context.

had been removed elsewhere as part of the carcass slaughter preparation. The cut marks left on the upper fore- and hindleg bones suggest the use of these joints of meat. Whether the meat was removed prior to cooking from the bone or after is unclear. Removal of meat lying on the dorsal portion of the rib fragments is evident. Also the splitting of the full carcass is evident by the dorso-ventral chops through the vertebra thus separating the carcass into left and right flanks. A similar butchery pattern style is also apparent for the pig/wild boar remains. This pattern of carcass portioning suggests these parts were transported to Rathfarnham Castle or the slaughtering and carcass preparation was performed elsewhere on the estate.

No cranial elements displayed butchery related marks in the cattle remains, but the ribs and neck regions were utilised for meat as were the upper fore- and hindleg joints. No distal or lower leg skeletal remains displayed evidence of butchery. With regards to the rabbit, apart from a single cut on one mandible fragment (perhaps relating to skinning of the pelt), only the upper hindleg joint was utilised since there is far greater mass of muscle on the hindleg are relative to any other portion of the carcass.

There were no loose teeth or teeth in situ on cranial/mandibular fragments within C1 and C2. Within C10, a loose unworn deciduous second incisor of a pig/wild boar and a partial mandible with no teeth in situ from a sheep was found. Contexts within the SW Flanker washpit deposit yielded relatively infrequent amounts of cranial material with teeth in situ. Only C4, C6, C7 and C8 had fragments of the skull (maxillar region) and mandibles that had teeth in situ. The development and eruption of premolar and molar teeth rows in mandibles are used to estimate age or provide an estimate of age category (neonate, juvenile, subadult, adult). Complete mandibular tooth rows (premolars and molars) were infrequent finds within the Rathfarnham Castle assemblage: only 13 mandibles with tooth rows were found and ages were estimated based on the eruption/developmental pattern and degree of wear,

C4	1 brown rat [subadult/adult] 2 rabbits [both adults, >1 year] 1 sheep [immature (6-12 month old lamb)]
C6	2 rabbits [both adults, >1 year] 6 sheep [1 juvenile (2-4 month old lamb; 1 immature (6-12 month old lamb) and 4 subadults; (c.2 to 4 years to age)] 4 sheep/goat [3 juvenile-immature (c.4-12 month old lambs); 1 subadult (c.2-4 years old)]
C8	1 cow [subadult/adult, 1 to 5 years]

From the sheep mandibular tooth rows in C4 and C6, only younger aged remains were present consisting of several lambs and subadult sheep. These age categories represented prime, tender meat and suggest a spring or late spring seasonal feasting of sheep at the Rathfarnham Castle (February to April months). A similar pattern of slaughter age or carcass usage of sheep/goat is evident from the mandibular tooth row data. Only a single cow mandible with teeth does not provide much information other than it was from an animal under 5 years of age but over 1 year (not a calf). Therefore, the cow was probably utilised in terms of meat since it was approaching adult size but too young to have given much in return in terms of milk, used in ploughing or in terms of production of offspring. The rabbit mandibular tooth rows all indicated they were from adult individuals.

Due to the infrequent occurrence of mandibular tooth rows present within the faunal assemblage, the maximum number of a single bone element from one side of the animal and a subjective evaluation of the ontogenetic age of the various bone elements from an individual species (including the stage of epiphyseal suture fusion, presence of semi-porous bone and dental data derived from the mandibular/cranial fragments with teeth in situ) was examined in order to determine whether there was a broadly consistent pattern of age estimations/categories evident within the assemblage.

Within the full faunal assemblage, an estimated 54 individual animals of various taxa was identified (Table 14). If we examine sheep,

	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	House mouse	Cat	Dog	Pig/Wild boar	Sheep	Sheep/Goat	Cow	Brown rat	Rat sp.	Woodmouse	Red Squirrel	Hare	Rabbit	Red fox	Fallow deer	Frog	NISP
Teeth	1					1			2	24	20		16	1					9				74
Skull	5	6	7							14	26	8	3	1					11				81
Cervical vertebra	2	5	3							10	5	2	4						6				37
Thoracic vertebra	2	3	7							5	3	1							1				22
Lumbar vertebra	2	7	2	1						1	4	3	1						8				29
Rib	55	35	282							9	2	1	6		2								392
Foreleg	3		3		1			2	1	18	51	4	10	1			1	1	31	1	5	7	140
Hindleg			3	2	2		1	2	1	13	34	4	10	12	3	1	1	1	43		3	1	137
Long bone	63	4	40	3	1	1					1		1									28	142
Phalanges										7	5		10						1				23
Pelvis	4	1	3				1			5	16	3	3	2					14			4	56
Sacrum		1								1													2
Caudal vertebra																							0
Vertebra	12	5	125																				142
Antler																					2		2
Total	149	67	475	6	4	2	2	4	4	107	167	26	64	17	5	1	2	2	124	1	10	40	1279
Estimated MNI	1	-	2J/SA	-	-	-	1	1J	1J 1A	3J 1SA	6J/SA 6A	3J 1A	2J 2SA/A	3J	1	1	1J	1A	6J 3A	1	1 (male)	4	54

Table 14. Comparison of the number of skeletal elements (NISP) between identified taxa and the estimation of minimum number of individuals (MNI) and age categories based on the combination of mandibular dental data, presence of left/right bones and epiphyseal fusion data for the Rathfarnham Castle faunal assemblage. J= juvenile, 2-12 months; SA=subadult, 1-4 years; A=adult, 4 years+

sheep/goat, cattle and rabbit data in conjunction with the estimates provided by the mandibular dental data only, we see a broadly similar pattern in terms of estimated minimum number of individuals (MNIs) and associated age categories. There were differences in terms of overall MNIs and aging, but not unexpected given the infrequent occurrence of mandibles and associated teeth (Table 15). There were no pig/wild boar mandibles with associated teeth present within the assemblage. Using the mandibular dental data only causes an underestimation of the MNI of these taxa within the assemblage and there are some differences between age categories using the combined methods versus mandibular dental data alone.

These data represent the slaughtering and utilisation of prime-aged meat joints from these domestic and wild game species contributing to the diet of the Rathfarnham Castle inhabitants. Overall, there is a pattern evident within these data that illustrates the consistent utilisation of juvenile and subadult carcasses (meat joints) from sheep, sheep/goat, cow, rabbit and pig/wild boar rather than adults or older aged animals. There was a predominance of sheep and rabbit in terms of MNI, followed by sheep/goat, pig/wild boar and cow. However, in terms of volume of meat associated with the taxa and meat joints, the less numerous cattle would have contributed more to the diet than the smaller sheep and rabbit. Pork meat would have also been relatively more important than rabbit in terms of meat volume in the inhabitants' diet.

Table 15. Comparison between minimum number of individuals (MNI) and age categories based on combination of suture fusion, dental data and left/right skeletal element numbers with mandibular dental data only. J=Juvenile, SA=Subadult, A=Adult

Taxa	Combination of all methods MNI and Age categories	Mandibular dental data MNI and Age categories
Sheep	6J/SA; 6A	7SA
Sheep/Goat	3J; 1A	3J; 1SA
Cow	2J; 2SA/A	1 SA/A
Rabbit	6J; 3A	4A
Pig/Wild boar	3J; 1SA	n/a

Skeletal measurements

Measurements were recorded (following von den Driesch (1976)), where possible, from fragmented bones of sheep, sheep/goat, pig/wild boar, cow, fallow deer and rabbit. These are presented within the electronic Excel file that accompanies this report. The resulting dataset is relatively small for the various partial bones per identified taxa: cow (n=7 bones), fallow deer (n=7 bones), pig/wild boar (n=12 bones), rabbit (n=10 bones), sheep (n=36 bones) and sheep/goat (n=7 bones). Although the dataset is small and statistical analysis was not possible, comparisons of similar measurements within each species in Rathfarnham Castle to those excavated in Trim Castle, Co. Meath (Murray & McCormick 2011) revealed broadly similar skeletal sizes which may be accounted by utilisation of different stock/breeds and/or resulting from presence of different ontogenetic ages and sexual dimorphic traits.

Due to the inherent difficulties associated with the separation between wild boar, wild pig, domestic pig and hybrids, the limited measurement dataset available from this species at Rathfarnham Castle (or indeed on any other contemporary site in Ireland) did not indicate what type of pig these remains were. The natural history of the 'pig' is incomplete and ambiguous within Ireland (Carden 2012). Many zooarchaeologists use overall skeletal measurement size to indicate separation between wild pig (feral domestics), wild boar and domestic pig, however this is incorrect and the separation issues are fraught with inaccuracies and problems (see Rowley-Conwy et al., 2012 for further discussions).

Comparison between the Rathfarnham Castle fallow deer (adult) skeletal measurements and measurements from a large modern skeletal reference dataset of fallow deer (n=92 female and 118 male individuals) from the Phoenix Park in Dublin (Carden 2006) revealed that the Rathfarnham Castle fallow deer skeletal remains derived from an male that was at least 26 months of age or older. These bones were found within C6, C7, C10 and C11. Two partial antler pieces of male fallow deer were also found within C6, a partial main beam and a partial palmate piece, whether these were from the same individual antler is unclear. These antler fragments were from hard antler that would be present on male fallow deer from September through to March/April months.

Other species

Dog

Four bones of a small sized breed of domestic dog were identified within the assemblage and these occurred in C6 (n=2), C9 (n=1) and C10 (n=1). In C6, one bone was a 5th metacarpal bone from a juvenile (puppy) animal, whilst the other was a worn maxillar canine tooth indicating this was from an adult animal. A worn (adult) mandibular canine was identified in C9 and just a partial shaft of a femur in C10.

Cat

Just four bones of cat were identified and these occurred in C6 (n=1), C9 (n=1) and C10 (n=2). These bones derive from at least one animal – a juvenile (kitten).

Red squirrel

Two partial juvenile bones (open and fusing epiphyseal sutures), a femur and a humerus, of red squirrel were identified within C6. The presence of red squirrel in the Rathfarnham Castle faunal assemblage is noteworthy, mainly due to the natural history of this species within Ireland. The presence of red squirrel skeletal remains within the Irish archaeological record is very poor to non-existent compared to that within Britain (Yalden 1999; Carden unpub. data). There is no evidence of red squirrel remains during the Pleistocene and even within the Holocene there is no actual evidence, but rather information that is anecdotal. The first documented introduction of red squirrel to Ireland occurred between 1815 and 1825, to the Glenmore Estate, Ashford, Co. Wicklow and subsequently to the Castle Howard Estate, Co. Wicklow (Barrington 1880). Apparently the Co. Wicklow population had expanded into Dublin by 1861 and a separate introduction took place in Lucan, Co. Dublin in 1876 (Barrington 1880). By the late 1800s, from other introductions and population expansions (and some escaped pets) red squirrels were found in Counties Carlow, Offaly, Galway, Roscommon, Westmeath, Longford, Louth, Antrim, Down, Donegal and Wexford (Barrington 1880).

There is no documented introduction of red squirrel to Rathfarnham Castle estate. Whether this juvenile individual was a pet or had strayed in from surrounding land is uncertain, but if these remains are dated to the 18th Century then these represent a very early introduction (or even a survivor of an earlier population) of this wild species to Ireland heretofore unknown.

Hare
Two bones from an adult hare from C6 and C10 were identified within the assemblage. These show evidence of gnawing by rodents and carnivores, as well as weathering. This wild species was not utilised in terms of a hunted game species, unlike the numerous rabbit remains found within the Rathfarnham Castle. It is plausible that these remains are those from a hare killed by a fox or dog (predator-prey item) rather than utilised for its meat by the inhabitants of the Castle (no evidence of butchery related marks on the two bones).

Red fox
A single red fox bone (partial 2nd metacarpal) was identified within C6. A wild canid species commonly found in urban and rural geographical areas and the environs of Rathfarnham Castle would have provided suitable habitat.

Woodmouse
One woodmouse bone (partial juvenile femur) was identified in C7. This species would have found suitable habitat within the Castle grounds and been a prey item for birds of prey (e.g. owls) as well as domestic cats.

House mouse
Two bones of a juvenile house mouse were identified in C4. House mice are a common species in rural and urban human dwellings during the historical periods. Additionally, this species would have been prey species to cats and certain birds of prey (e.g. owls).

Brown rat and rat sp.
17 brown rat and four rat sp. bones were identified from C2 (n=1), C3 (n=1), C4 (n=1), C6 (n=13), C7 (n=4) and C9 (n=1). These represented at least 3 juvenile and 1 adult rats. Rats occur in the wild as well as around/in human dwellings, attracted by kitchen/other waste. Rathfarnham Castle environs and waste associated with kitchens and sewage would be suitable habitats for these rodents.

Frog
A total of 40 frog bones were identified from four contexts: C2 (n=1), C4 (n=1), C6 (n=18) and C7 (n=20). Only two amphibians occur in Ireland (extant and historically), the common frog and the natterjack toad. Frogs are adapted to survive in the water and on land, but require water bodies such as ponds or small puddles for breeding. Frogs are prey items for rats, hedgehogs and certain birds (e.g. herons). None of the frog remains identified within the Rathfarnham Castle assemblage showed any evidence of cut/butchery marks, especially on the limb bones. This would indicate that this species was not a food item for the inhabitants but rather a naturally occurring wild species within the Castle estate. Their skeletal remains within the SW Flanker washpit deposit may be the result of partial remains of prey items of the rats or they naturally found their way in to breed if water was available.

Sheep/Goat
Twenty-six skeletal fragments were assigned as sheep/goat remains, majority of these were from C6 (n=24) while only two were from C8. No positively identified goat remains were found within any of the contexts, only (hornless) sheep remains were identified. It is likely that the type of breeding sheep stock as well as the possibility of the presence of castrated males may display sometimes atypical sheep anatomical morphologies. Due to the possibility of goat remains within the context, the author erred on the side of caution as there are documented difficulties associated with the differentiation between sheep and goat skeletal remains for certain individual bones.

Conclusions

The majority of the Rathfarnham Castle faunal assemblage was fragmented and derived from mainly the SW Flanker washpit deposits (C2, C3, C4, C6, C7, C8 and C9). Contexts 1, 10 and 11 appear to be later in terms of archaeological period. Very small quantities of dog, cat, hare, red fox, woodmouse, house mouse, brown rats and red squirrel were present. Little can be discussed of these remains. The bone fragments sizes of the dog remains appear to be those from a small breed of dog, they were comparable in overall size to a reference adult Jack Russell Terrier. The hare remains may be the result of prey-predator relationship and natural mortality rather than a hunted game species within this site. The limited presence of the woodmouse is not unusual given the Castle environs and surrounding habitats and indeed, the presence of the house mouse and rats are not out of place either within the Castle or within the immediate surrounding area. The limited presence of red squirrel is interesting and perhaps indicates a very early introduction of this species to Rathfarnham Castle that heretofore was undocumented, if these remains are indeed 18th Century. Further applied analysis would be beneficial.

A high incidence of sheep (mainly juveniles) and rabbit remains was found at Rathfarnham Castle relative to pig/wild boar and cow and other species, even given the differences between meat volumes of the carcasses, and this differs to the predominant cattle at Trim Castle, Co. Meath (see Murray & McCormick 2011). Sheep (lambs) and rabbit appeared to be preferentially chosen within the Rathfarnham Castle inhabitants' food economy and diet. Dietary preference was biased towards juveniles/young immature animal identified taxa. The lack of older aged skeletal material within the deposits would seem to indicate either lack of older aged animals on site, certain partial butchered carcasses imported to the site at certain times or alternatively, a small stocking breeding herd kept elsewhere on the estate and only a limited number of juvenile animals available for slaughter at certain times of the year. Perhaps slaughter of lambs and hunting of rabbits occurred when the castle inhabitants were in residence with guests of certain status or for special family/calendar celebrations, for example Easter lamb.

The limited presence of male fallow deer remains at Rathfarnham Castle is of note but played a very minor role in terms of the diet or food economy of the inhabitants. The presence of cooked/butchered rabbit carcasses indicates that there was likely limited hunting of wild game within the Castle grounds. Rabbits and fallow deer were introduced during the 12th Century to Ireland to various estates and fallow deer were introduced to Phoenix Park, Dublin in 1662 by the James Butler, Duke of Ormond when the Park was established as a Royal Deer Park (Cullen 2009). The limited skeletal remains of one subadult or adult fallow deer does not provide much information, but we could speculate that this deer may have been the result of a high-status gift of a partial/whole carcass to the Castle inhabitants for a certain occasion (Belgane 2015). Whether this deer was hunted elsewhere or on the Castle grounds is unclear.

The skeletal remains of the identified domestic and wild taxa at Rathfarnham Castle suggests bias towards juvenile animals cooked and consumed by the inhabitants at certain times of the year rather than a daily diet of such high quality foods. These may have been consumed by the Castle inhabitants and invited guests during celebrating calendar feasts and occasions of significance. The predominant (or favoured) taxa were sheep (lambs) and rabbits. These meats were supplement by young cattle and young pigs, and on occasion venison (fallow deer). This diet certainly reflects high status or high social classes feasting events.

Recommendations

It is recommended that these skeletal remains be retained and deposited within the collections of the National Museum of Ireland, following their storage protocols and utilisation of museum standard acid-free cardboard boxes and suitable labels. A copy of the electronic database of the identifications should accompany the skeletal material.

The author has bagged the skeletal remains within each context per identified taxa and used museum acid-free paper inscribed with pencil (and/or indian ink) labels, which were inserted into each zip-lock bag. Information inscribed on these labels include the Excavation number, Context number and taxonomic category.

Acknowledgements

The author is grateful to the assistance provided by NMI-Natural History and the Keeper, Nigel Monaghan and Antoine Giacometti of Archaeology Plan Heritage Solutions.

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Appendix I. Number of taphonomies recorded on bone fragments from each taxonomic category per each Context (excludes ivory and crab). Note: an individual bone fragment may display multiple taphonomies.

C1	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned	21	1						22
Carnivore			3	3				6
Rodent		2		1				3
Calcined	1	1						2
Decalcified	1							1
Weathered		3	2					5
Butchery		5	2	2				9
TOTAL	23	12	7	6				48

C1	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar								
Sheep		5	1				6	12
Sheep/Goat								
Cow		1				1		2
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare								
Rabbit								
Red fox								
Fallow deer								
Frog								
TOTAL		6	1			1	6	14

Appendix I. Contd.

C2	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned								
Carnivore		3		3				6
Rodent				1				1
Calcined								
Decalcified								
Weathered		2		4				6
Butchery	1			5				6
TOTAL	1	5		13				19

C2	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar	1	2			1	1		5
Sheep		2	1			1	1	5
Sheep/Goat								
Cow								
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare								
Rabbit		1	1				1	3
Red fox								
Fallow deer								
Frog								
TOTAL	1	5	2		1	2	2	13

Appendix I. Contd.

C3	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned								
Carnivore		1		1				2
Rodent				4				4
Calcined								
Decalcified								
Weathered	2			1				3
Butchery		3		3				6
TOTAL	2	4		9				15

C3	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar							1	1
Sheep	1					1	1	3
Sheep/Goat								
Cow								
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare								
Rabbit		1						1
Red fox								
Fallow deer								
Frog								
TOTAL	1	1				1	2	5

Appendix I. Contd.

C4	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned	37	13		1				51
Carnivore	5	3	1	8				17
Rodent	1	3		2				6
Calcined	23	9						32
Decalcified	8	1						9
Weathered	11	4	2	18				35
Butchery	15	7	2	20				44
TOTAL	100	40	5	49				194

C4	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar		2				2		4
Sheep		7	1			6	12	26
Sheep/Goat								
Cow		1					1	2
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare								
Rabbit			1	1		1	2	5
Red fox								
Fallow deer								
Frog								
TOTAL		10	2	1		9	15	37

Note: Of the two partial crab claws found within C4, one was decalcified.

Appendix I. Contd.

C6	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned	251	48	3	20			2	324
Carnivore	6	17	3	35				61
Rodent	8	5		16				29
Calcined	139	29	2	11			2	183
Decalcified	51	8	1	6			1	67
Weathered	35	28		60				123
Butchery	34	50	3	179				266
TOTAL	525	185	12	327			4	1053

C6	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar	1	7	1			20	36	65
Sheep	2	20	7	1		22	34	86
Sheep/Goat		1				8	11	20
Cow	4	5	1	3		9	15	37
Brown rat						1		1
Rat sp.			2					2
Woodmouse								
Red squirrel			1					1
Hare		1				1		2
Rabbit	1	7	4	2		1	3	18
Red fox								
Fallow deer		1				1	1	3
Frog								
TOTAL	8	42	16	6		63	100	235

Note: Of the four partial crab claws found within C6, two were decalcified.

Appendix I. Contd.

C7	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned			2					2
Carnivore			1					1
Rodent	1							1
Calcined			1					1
Decalcified								
Weathered			1		1			2
Butchery	1		6					7
TOTAL	2		11		1			14

C7	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar								
Sheep								
Sheep/Goat								
Cow						1		1
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare								
Rabbit							1	1
Red fox								
Fallow deer							2	2
Frog								
TOTAL						1	3	4

Appendix I. Contd.

C8	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned								
Carnivore				2				2
Rodent		1		1				2
Calcined								
Decalcified								
Weathered		2		2				4
Butchery		2		1				3
TOTAL		5		6				11

C8	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar						1	1	2
Sheep								
Sheep/Goat						1		1
Cow		1	1			6	4	12
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare								
Rabbit								
Red fox								
Fallow deer								
Frog								
TOTAL		1	1			8	5	15

Appendix I. Contd.

C9	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned	10							10
Carnivore	2	1		4				7
Rodent								
Calcined	8							8
Decalcified	3	1						4
Weathered	4			2				6
Butchery	7	2		7				16
TOTAL	34	4		13				51

C9	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar								
Sheep								
Sheep/Goat								
Cow								
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare								
Rabbit		1				1	1	3
Red fox								
Fallow deer								
Frog								
TOTAL		1				1	1	3

Appendix I. Contd.

C10	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned		1	1					2
Carnivore	6	3	12					21
Rodent	1	5	25					31
Calcined								
Decalcified		2	2					4
Weathered		6	7					13
Butchery		9	24					33
TOTAL	7	26	71					104

C10	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat			1					1
Dog			1					1
Pig/wildboar		1	1				1	3
Sheep		5	23		2	7	14	51
Sheep/Goat			2			2	1	5
Cow								
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare			1					1
Rabbit		1	1				2	4
Red fox								
Fallow deer		1	1			1		3
Frog								
TOTAL		8	31		2	10	18	69

Appendix I. Contd.

C11	UNF	Lm	Mm/Lm	Mm	Sm/Mm	Sm	Ungulate	TOTAL
Burned								
Carnivore		2		1				3
Rodent				2				2
Calcined								
Decalcified		1		1				2
Weathered		4		3				7
Butchery		5		1				6
TOTAL		12		8				20

C11	Burned	Carnivore	Rodent	Calcined	Decalcified	Weathered	Butchery	TOTAL
House mouse								
Cat								
Dog								
Pig/wildboar								
Sheep		5	1		2	3	3	14
Sheep/Goat								
Cow		1				1	1	3
Brown rat								
Rat sp.								
Woodmouse								
Red squirrel								
Hare								
Rabbit								
Red fox								
Fallow deer						2	1	3
Frog								
TOTAL		6	1		2	6	5	20

Bird and fish bones

Sheila Hamilton-Dyer

Introduction and methodology

Bird and fish bones were hand-collected during excavation along with the mammal bones. All of the deposits were then sieved over 1.4 mm mesh. The bird and fish remains were separated out during the mammal bone recording and made available for this analysis.

Taxonomic identifications were made using the author's modern comparative collections. All fragments were identified to taxon and element where reasonably possible. Measurements mainly follow von den Driesch (1976) for birds and Morales & Rosenlund (1979) for fish and are in millimetres unless otherwise stated. The archive includes metrical, condition and other details of individual specimens not presented in the text.

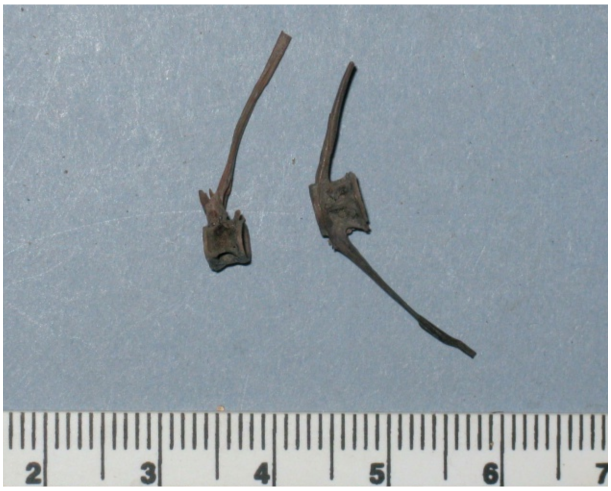
The material comes from ten contexts; 21 bird bones come from the later contexts 1, 10 and 11 and are noted at the end of this report. The bulk of the material has been analysed as a single deposit and is dated between 1685 and 1725.

Fish

Fish remains are more frequent than those of birds, but as is typical of fish a high proportion are of the indeterminate fin rays and other fragments. In total 299 specimens were recorded of which 186 were identified to species or family. At least eight species are present (Table 1).

Cod *Gadus morhua* at 116 bones and 62.4% of the identified specimens is the most common species. Both head bones and vertebrae are present, indicating that at least some of these were whole fresh fish rather than processed (headless) ones. A cut mark was observed on one of the precaudal vertebra. Several bones were measureable and the bones were also com-

Cod and Ling



Cyprinid

Salmon and flatfish

NISP						
Phase	**4**	**6**	**7**	**8**	**9**	**total**
eel, *Anguilla anguilla*		1				**1**
salmon, *Salmo salar*		9				**9**
cyprinid, carp family, Cyprinidae			2			**2**
cod, *Gadus morhua*	9	106		1		**116**
ling, *Molva molva*	4	8			1	**13**
gadid, cod family, Gadidae	5	21			1	**27**
gurnards, Triglidae		1	1			**2**
flatfish, Pleuronectiformes	2	14				**16**
fish, indeterminate	17	84	9		3	**113**
total NISP	37	244	12	1	5	**299**
NISP excl. indeterminate	20	160	3	1	2	186
% of identified NISP						
Phase	**4**	**6**	**7**	**8**	**9**	**total**
eel, *Anguilla anguilla*	0	0.6	0	0	0	0.5
salmon, *Salmo salar*	0	5.6	0	0	0	4.8
cyprinid, carp family, Cyprinidae	0	0	66.7	0	0.0	1.1
cod, *Gadus morhua*	45.0	66.3	0.0	100	0.0	62.4
ling, *Molva molva*	20.0	5.0	0	0	50.0	7.0
gadid, cod family, Gadidae	25.0	13.1	0	0	50.0	14.5
gurnards, Triglidae	0	0.6	33.3	0	0.0	1.1
flatfish, Pleuronectiformes	10.0	8.8	0	0	0.0	8.6
fish, indeterminate % of total NISP	45.9	34.4	75.0	0	60.0	37.8

Table 1. Summary of fish bone

pared with recent specimens; all are from fish of a metre or longer total length but are probably not from a single fish. Some of the vertebrae from context 6 are charred or heat affected. In addition to cod there are 13 bones of the related ling *Molva molva.* In context 4 there are three precaudal vertebrae – probably adjoining – and a partial postcleithrum. From context 6 another three precaudal vertebrae were recovered along with three caudal vertebrae and two cleithra. These last are both from ling well over 1 metre but as they are both from the same side must be from two different fish. They both exhibit cut marks as do two of the precaudal vertebra. A further caudal vertebra was found in context 9. In contrast to the cod remains there are no cranial elements (Table 2). The cleithrum and postcleithrum are elements just behind the gills and often left in the fish when the head is removed. There are also 27 fragmentary and indeterminate gadid elements and it is likely that several of the indeterminate fin rays and other fish fragments are also of the large Gadidae.

Remains of flatfish were recovered from contexts 4 and 6. One bone is the 2nd haemal vertebra of a large fish that is probably turbot *Scophthalmus maximus;* other bones are probably of plaice *Pleuronectes platessa.* Most of these come from fish of about 30-40 cm greatest length, with one from a larger fish of about 50 cm.

Salmon *Salmo salar* is represented by one caudal and eight precaudal vertebrae in context 6.

These are of similar size and could be from a single fish of about 70 – 90 cm length.

Two bones of a gurnard, a cranial fragment and a hyomandibular, were recovered from contexts 6 and 7 respectively.

Eel *Anguilla anguilla* occurs as a single precaudal vertebra of a good-sized fish from context 6. The lateral process of this bone is cut through.

Two vertebrae recovered from context 7, a precaudal and a caudal, are of cyprinids and a good match for bream *Abramis brama*. There are many species within the family and the vertebrae are very difficult to speciate therefore identification is tentative. The majority of these remains come from marine fish, as is typical for Ireland, and even the salmon and eel can be caught in the sea as well as in rivers, but these two cyprinid bones are of great interest as these are freshwater fish. Ireland has a restricted fauna due to the post-glacial separation from mainland Britain. The history of the freshwater fish that can now be found in Ireland is not always clear; some are known to have been introduced but a few may have originated from relict populations (Quigley 2014). Roach, for example, was only introduced into Ireland in 1889 (Went 1950) but bream, tench and carp appear to have become established by the date of the Rathfarnham assemblage. Bones of cyprinids are almost completely absent from the archaeological record and, therefore, this is an important record.

This assemblage has some similarity to that from the medieval material from Trim Castle

Table 2. Fish anatomy by species

Element	eel	salmon	cod	ling	Gadidae	cyprinid	gurnard	flatfish	fish	NISP
frontal			2							2
vomer			1							1
cranial fragment					3		1			4
post temporal			3							3
lacrymal			2							2
ectopterygoid			2							2
quadrate			3		1					4
hyomandibular			3				1			4
ceratohyal			3		1					4
epihyal			2							2
maxilla			2							2
premaxilla			4							4
dentary			7							7
articular			2							2
pharyngeal					1					1
preoperculum			2							2
opercular			1		1					2
suboperculum			1							1
cleithrum			2	2				1		5
postcleithrum				1	1					2
supracleithrum			3							3
precaudal vertebra 1			2							2
precaudal vertebra	1	8	34	6		1		7		57
caudal vertebra		1	34	4		1		8	2	50
vertebral fragment			1						1	2
rays and pterygiophores									70	70
branchiostegals					19					19
fragment									40	40
Total	**1**	**9**	**116**	**13**	**27**	**2**	**2**	**16**	**113**	**299**
percent	***0.3***	***3.0***	***38.8***	***4.3***	***9.0***	***0.7***	***0.7***	***5.4***	***37.8***	
% excl. indeterminate	***0.5***	***4.8***	***62.4***	***7.0***	***14.5***	***1.1***	***1.1***	***8.6***		186

NISP										later		
Phase	**2**	**3**	**4**	**6**	**7**	**9**	**total**		**1**	**10**	**11**	**total**
goose, domestic/greylag, *Anser anser*				8		1	9			2		2
duck, mallard/domestic, *Anas platyrhynchos*				6	1		7					0
duck, teal, *Anas crecca*				1			1					0
duck, other							0			1		1
domestic fowl, *Gallus gallus*	5	1	11	30			47		1	6		7
turkey, *Meleagris gallopavo*				2		1	3		3			3
large galliform				49	11		60			5	2	7
quail, *Coturnix coturnix*			1	3			4					0
corncrake, *Crex crex*				4			4					0
waders, Charadriidae				9	4	2	15					0
gull, Laridae				4			4					0
barn owl, *Tyto alba*			1				1					0
small passerines			1	3	1		5					0
bird, indeterminate	2		4	33	12	2	53			1		1
total NISP	**7**	**1**	**18**	**152**	**29**	**6**	**213**		**4**	**15**	**2**	**21**
NISP excl. indeterminate	**5**	**1**	**14**	**119**	**17**	**4**	**160**		**4**	**14**	**2**	**20**
% of identified NISP												
Phase	**2**	**3**	**4**	**6**	**7**	**9**	**total**		**1**	**10**	**11**	**total**
goose, domestic/greylag, *Anser anser*	0	0	0	6.7	0	25	5.6		0		0	10
duck, mallard/domestic, *Anas platyrhynchos*	0	0	0	5.0	5.9	0	4.4		0		0	0
duck, teal, *Anas crecca*	0	0	0	0.8	0	0	0.6		0		0	0
duck, other	0	0	0	0	0	0	0		0		0	5
domestic fowl, *Gallus gallus*	100	100	78.6	25.2	0	0	29.4		25		0	35
turkey, *Meleagris gallopavo*	0	0	0	1.7	0	25	1.9		75		0	15
large galliform	0	0	0	41.2	64.7	0	37.5		0		100	35
quail, *Coturnix coturnix*	0	0	7.1	2.5	0	0	2.5		0		0	0
corncrake, *Crex crex*	0	0	0	3.4	0	0	2.5		0		0	0
waders, Charadriidae	0	0	0	7.6	23.5	50	9.4		0		0	0
gull, Laridae	0	0	0	3.4	0	0	2.5		0		0	0
barn owl, *Tyto alba*	0	0	7.1	0	0	0	0.6		0		0	0
small passerines	0	0	7.1	2.5	5.9	0	3.1		0		0	0
bird, indeterminate % of total NISP	28.6	0	22.2	21.7	41.4	33.3	24.9		0		0	4.8

Table 3. Summary of bird bone

(Hamilton-Dyer 2011). Cod and other gadids are the most frequent taxa, flatfish are also common and includes at least one bone from the larger species. Other taxa present in both include gurnard and salmon. There are several other fish found in the much larger Trim assemblage not found at Rathfarnham; whiting, seabreams and wrasse, while eel was not found at Trim. Both assemblages contain an obligate, and potentially introduced, freshwater species rarely identified in the archaeological record – pike at Trim and a cyprinid at Rathfarnham. Inventories from Dublin Castle record bream being brought into the castle for eating from 1575-1590 (Flavin pers. com 2016).

There are few reports of post-medieval material from Ireland but fish assemblages from earlier sites show distinct differences. West Coast sites, especially monastic ones, are dominated by the locally available rocky coast fish such as pollack, gurnards, seabreams and wrasse (Hamilton-Dyer 2016). Cod bones are comparatively rare. In contrast the urban sites including Galway, Dublin and Cork, have relatively few of these fish and are dominated by the large gadids and hake (Hamilton-Dyer 2016). The high status Anglo-Norman sites such as Trim have a mixture of species including the more desirable fish such as salmon and turbot.

Mixed birds

Turkey and fowl

Birds

A total of 234 bird bones were recovered, 213 from the main deposits and a further 21 from later dated contexts (noted at end). At least 15 different species are represented, although not all could be determined exactly (Table 3). Galliform remains are the most frequent with 47 identified as domestic fowl (chicken) and a further 49 very immature bones assumed to be of young chickens. None of the diagnostic elements matched pheasant or grouse. Several of the indeterminate bones are also likely to be of fowl. Two bones, a coracoid and a carpometacarpus, are of a much larger bird, the turkey *Meleagris gallopavo* and four are from a tiny galliform, the quail *Coturnix coturnix*.

Geese and ducks are represented by nine and eight bones respectively. One, a humerus of a teal, is certainly of a wild bird but the other bones could be of wild or domestic birds as they are difficult to distinguish from the ancestral wild greylag goose and mallard.

Waders are well represented at 15 bones of at least four different types. This is a diverse group of birds with many species that are difficult to distinguish from the bones. Of the species most likely to be found in Ireland the bones recovered here most closely match woodcock *Scolopax rusticola,* lapwing *Vanellus vanellus,* golden plover *Pluvialis apricaria* and snipe *Gallinago gallinago.*

There are also four bones each of corncrake *Crex crex* and of a gull of black-headed size, one bone of a barn owl *Tyto alba* and five of small passerines (songbirds). These last are of three different sizes, the smallest being about the size of a robin, another is about the size of yellowhammer and the remaining three of about blackbird/thrush size.

Butchery marks are visible on four of the chicken bones, two of goose and a snipe humerus. These probably indicate disjointing, either in preparation or at the table. One of the cut chicken bones and three of the others contain medullary bone indicating that these were hens (Driver 1982). Six bones have gnaw and puncture marks, probably from cat, and four have

Element	goose	duck	teal	domestic fowl	probable young fowl	turkey	quail	corncrake	waders	gull	owl	passerine	indet. bird	total
hyoid													1	1
humerus			1	7	5		1	2	5					21
radius	2			1	5									8
ulna				5	1			1	1	1		1	2	12
scapula				2	9			1						12
coracoid	1	1		6	10	1			1			1		21
furcula				1	3				1					5
pelvis		1			3				1			1	1	7
femur	1			8	6				1				1	17
tibia/tibiotarsus	2			5	1					1			1	10
fibula													1	1
carpometacarpus	1	3		3		1				1			1	10
tarsometatarsus				4	17		1		2		1	2		27
major wing phalanx										1				1
wing phalanx	1													1
foot phalanx (bird)				1									9	10
cervical vertebra													1	1
synsacrum	1			2			1		2					6
vertebra not assigned													4	4
sternebra/sternum		2		2	1		1		1					7
rib													8	8
fragment													23	23
Total	**9**	**7**	**1**	**47**	**61**	**2**	**4**	**4**	**15**	**4**	**1**	**5**	**53**	**213**
percent	***4.2***	***3.3***	***0.5***	***22.1***	***28.6***	***0.9***	***1.9***	***1.9***	***7.0***	***1.9***	***0.5***	***2.3***	***24.9***	
% excl. indeterminate	***5.6***	***4.4***	***0.6***	***29.4***	***38.1***	***1.3***	***2.5***	***2.5***	***9.4***	***2.5***	***0.6***	***3.1***	***33.1***	160

Table 4. Bird anatomy by species

rodent gnaw marks. The anatomical distribution of the domestic fowl is mixed, most elements are represented but there are no skulls and few of the foot or wing phalanges. In part this could be taphonomic with a bias towards the larger and most robust elements but it could also indicate trimming of the birds. It is noticeable that there are just four mature tarsometatarsi, three of which are probably of hens, but 17 porous immature ones (Table 4). For the other species there are too few specimens to discern any pattern of elements.

The quail and corncrake are now very rarely seen in Ireland but were once very common migratory birds, arriving to breed towards the end of April and usually leaving in the autumn (Cramp et al 1980). Traditionally they could be caught in great numbers by netting for example during harvest. The waders are a mixture of resident and migratory birds, the golden plover are mainly winter visitors to Ireland arriving from Iceland in October but are sometimes resident (Cramp et al 1983). If the birds were fresh, as seems likely, then this may indicate either that the deposit was made in the autumn or is not a single disposal event. The immature chickens would also be more likely to be available in autumn.

The turkey, a native of North America, was introduced into Britain in the 16th century and would initially have been a high status offering like the peacock (Poole 2010). Bones have been found in a few Irish post-medieval assemblages including from Dublin and Galway City (Hamilton-Dyer 2007) and at Bective Abbey (Hamilton-Dyer in prep).

No corvids or raptors were found, these can be frequent at some sites in general rubbish deposits but rare in contexts likely to be mostly from food preparation. The single bone of barn owl is possibly the remains of a bird roosting in or near the Castle as it seems an unlikely food item. The small passerines could be natural mortalities or food remains; at Trim Castle several of thrush size were found in deposits that contained food waste and in one case a bone did carry a butchery mark (Hamilton-Dyer 2011).

There are few post-medieval sites to compare with Rathfarnham. The bird bone assemblages from the medieval island monasteries are dominated by wild seabirds with almost no remains of domestic fowl whereas domestic poultry dominate urban and castle assemblages such as those from Trim, Dublin, Galway and Cork (Hamilton Dyer 2007). The variety of non-poultry remains at Trim is quite similar with numbers of waders and small passerines but also with pigeons, absent in the Rathfarnham assemblage. Bective Abbey also had a high numbers of pigeon bones and in this case a known dovecote at the site.

Bird bones from other contexts

The 21 bird bones from contexts 1, 10 and 11 are of at least 4 taxa. Most are of large galliforms, three of which can be identified as turkey and seven as domestic fowl. The other seven large galliform remains are a group of gnawed crania, the damage prevents observation of diagnostic points and, as they are large, they could either be of turkey or of large domestic fowl, perhaps capons. A large indeterminate ulna could also be a large fowl. The other bones are a radius and ulna of goose from different wings and the humerus of a diving duck such as scaup or pochard.

Crab and other bone

In addition to the bird and fish remains there are five fragments of crustacean claws. These represent the dactylus and propodus (major claws) of at least two edible crabs *Cancer pagurus* of a good size for eating. A small quantity of amphibian and mammalian remains also found in the samples are listed in the archive tables. They include a further bone (a tibia) of the young red squirrel reported in the mammal bone section.

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Crab

Eggshell

Niall Hatch and Alva Mac Gowan

The eggshell retrieved from Rathfarnham Castle is surprising in its level of preservation and would indicate a non-acidic environment. Due to its delicate and porous nature eggshell can darken and become somewhat speckled in appearance. This, along with the fact that there is very little post 1975 visual referencing material for eggshell due to poaching and collecting, creates a number of obstacles in the way of visual comparisons.

However, Niall Hatch from Birdwatch Ireland provided some insight in regards to what the eggshell does not resemble. Due to their distinctive characteristics turkey, duck, hen, quail and goose could all be ruled out. Sample 17 from context 2 contained egg shell which was still attached to the membrane, both were stained from the dark deposit they were retrieved from, however they still showed similarities to pheasant eggs in their shape, satin like texture, tight porous surface and greyish-brown colour. DNA analysis may be carried out on the membrane fragments to give a definite identification. Another possibility is partridge, which is also a native Irish game bird. The native Grey Partridge would have been commonly hunted at the time and its shell is not unlike that of a pheasant albeit slightly smaller in size.

Pheasant is not a native species to Ireland; it originally came from Asia and was most likely introduced to southern Europe via Ancient Greece. Although it appears to have been enjoyed by the elite in Britain since the 1000s, it may have been introduced to the Irish banqueting halls by the Anglo-Normans, the first references to pheasant in Ireland is from the 1590s when the English soldier, Fynes Moryson notes in his Itinerary, "In that country, such plenty of pheasants that I have known 60 served up at one feast".

According to a manuscript from the following century, in 1674 Sir John Mc Gill of Gill Hall, Co. Down held a grand pheasant-shoot on his estate that had been stocked with 900 birds, obtained by natural hatch and from eggs hatched under broody hens. This notable event was attended by 64 guns, consisting of noblemen and a "commoner" from each of Ireland's 32 counties. Mc Gill's pheasant shoot is contemporary with the time period of much of the material from the excavation at Rathfarnham and the same type of event, if not on an even grander scale, could well have taken place on the extensive demesne associated with the castle.

There are a number of artefacts from the site that can be associated with hunting and gaming activities and it certainly warrants further invest-igation. Especially since in the late 1600s one of the castle's most important inhabitants, Sir Adam Loftus, the Baron of Rathfarnham and Viscount of Lisburne held the title of Ranger of the Phoenix Park and later all the King's Parks in Ireland. The primary function of these vast tracts of land would have been for gentlemen's hunting pursuits and supplying meat to the tables of the elite in Ireland.

In 1683 Sir Adam Loftus wrote to Thomas Coningsby at Hampton Court Park requesting a setter dog - setters were regarded as 'birding' dogs and were used in hawking and pheasant hunting. Before shooting became common, pheasants were originally hunted using hawks rather than guns.

Another sample of eggshell retrieved from context 6 was suggested by Niall Hatch to be pigeon egg shell. The Rock Dove is a native species of Ireland and is one of the first birds to have been domesticated in the country. Today pigeons are seen more as a rodent rather than a delicacy, however in the past they were commonly kept in captivity for eggs, meat and carrying messages. When chickens and their ability for high yields of nutritional eggs became the more dominant egg producers, pigeons were released into the wild, and they are the birds we see today in parks and urban settings.

Pigeon eggs are less oblong in shape and white in colour. The shell identified as possible pigeon shell has been stained by the dark and pungent deposit it was retrieved from, this makes it difficult to determine a definite identification, and also warrants further investigation along the lines of microscopic analysis.

Mollusc

Antoine Giacometti

337 mollusc shells were recovered from the 2014 Rathfarnham Castle excavations, all of which came from the fill of the 16th century washpit (sealed early 18th century) in the south-west flanker tower [C2-C9].

The molluscs were numbered 'Shell Sample 1-16'. These were identified and counted by the author, and the results are set out in the below table.

The mollusc assemblage is dominated by 248 oysters and 80 cockles, as well as crab, scallops, mussels, periwinkles and limpets. Mussel tends to survive less well than oyster and cockle, so it is likely to be under-reprepresented.

The crab remains are not included here as they were examined by Sheila Hamilton-Dyer (see report above)

crab claw

Context	Item	Identification	Quantity
2	1	Oyster Shells	7
3	2	Oyster Shells	12
4	3	Cockle Shells	23
4	4	Oyster Shells	37
6	5	Cockle Shells	53
6	6	Pale Venus Shell	1
6	7	Pelican's Foot Sea Snail	2
6	8	Limpit Shell	1
6	9	Periwinkle	1
6	10	Queen Scallop	2
6	11	Great Scallop	1
6	12	Oyster Shells	144
7	13	Oyster Shells	46
9	14	Mussel Shell	1
9	15	Oyster Shells	2
9	16	Cockle Shells	4
		Total	**337**

Oyster shells

Banana

Poznań Radiocarbon Laboratory and Antoine Giacometti

Amongst the most surprising recoveries from the 2014 Rathfarnham Castle excavations were two fragments of banana skin (E4468:4 Sample 10). This came from the washpit deposit [C6], which was sealed by a stone floor in the first quarter of the 18th century.

Although bananas were introduced into Europe from the beginning of the 16th century, when Portuguese colonists began to cultivate the first plantations of bananas in the Caribbean and in Central America, bananas were not actually traded to Europe until relatively modern times. This is because the journey between banana producing countries and northern Europe was too long before the invention of refrigerated transportation.

There is no documentary or archaeological evidence for bananas in Ireland prior to the 19th century, to my knowledge. The first documentary evidence for bananas in Britain dates to 1633, but they were not imported commercially until the 19th century. A banana skin thought to date to the mid-15th century was excavated in Southwark, London in 1999, but this early date was not supported by radiocarbon dating (Susan Flavin pers.com 2016).

In order to assess whether the banana skins could have been a result of modern contamination, we sent a sample of one the banana to Poznań Radiocarbon Laboratory for analysis.

The radiocarbon dates are not conclusive. However we can discount the late-18th century date range and conclude that it is c. 80% likely to date to the late 17th century (1640-1684) and c. 20% likely to be modern contamination. The banana skin is therefore likely to be the earliest evidence of banana eating in Ireland.

The Rathfarnham banana

Poznań Radiocarbon Laboratory

Report on C-14 dating Poznań, 24-11-2015

Sample name	**Lab. no.**	**Age 14C**
E4468:S10	Poz-76175	225 ± 30 BP

Results of calibration of 14C dates – order 10047/15

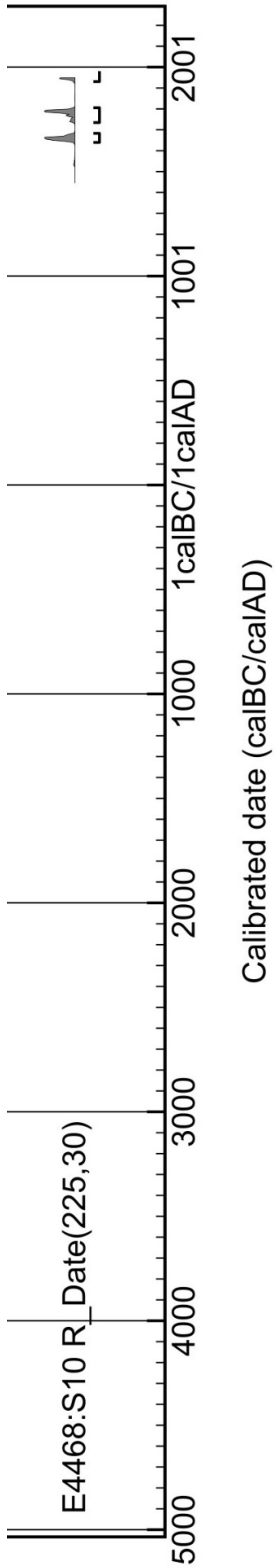
Given are intervals of calendar age, where the true ages of the samples encompass with the probability of ca. 68% and ca. 95%. The calibration was made with the OxCal software.

OxCal v4.2.4 Bronk Ramsey (2013); r:5
IntCal13 atmospheric curve (Reimer et al 2013)

E4468:S10 R Date (225+/-30)
Warning! Date may extend out of range - 225+/-30BP

68.2% probability
1646AD (32.1%) 1670AD
1779AD (27.0%) 1799AD
1943AD (9.1%) ...

95.4% probability
1640AD (40.5%) 1684AD
1735AD (42.2%) 1806AD
1931AD (12.7%) …



'Bananas, guavas and other fruit' by Albert Eckhout (National Museum of Denmark). By a 17th-century Dutch artist who travelled to Brazil, this is one of the earliest depictions of bananas in northwestern European art.

Human tooth

Dr. Jack Grennan B.A.,B.Dent.Sc.,Dip.Clin.Dent

A single human tooth (E4468:7 Sample B26) was recovered from the washpit deposit at Rathfarnham Castle.

Identification

The tooth is an upper first molar tooth from the right-hand-side of the upper jaw.

From its size and anatomy, I believe it to be from a man

The tooth has three cavities: one large cavity on the mesio/palatal surface extending into the palatal root; and two smaller cavities on the distal aspect of the tooth, and again interestingly involving the root of the tooth (Disto/buccal root)

Other interesting findings are:

1. No evidence of occlusal deca, i.e. on the biting surface of tooth (typical of today's pattern).

2. Marked burnished wear facet underneath large cavity on palatal root.

3. Deposits of calculus (tartar) extending down all root surfaces into furcation areas (i.e. gaps between roots).

4. No evidence of trauma which might be interpreted as being consistent with a difficult or mechanical extraction.

Conclusion

The tooth is an upper right molar tooth from an adult male aged over 40 years.

The deposit of sub gingival calculus extending way down the root surface suggests an advanced form of gum disease in the mouth of this man which would have made the tooth very loose and may even have left the tooth spontaneously to fall out.

Since this type of gum disease can take a long time to develop in adulthood, the male in question was at least 40 to 60 years old, but I suspect the lack of occlusal wear puts him nearer 40 years.

The smooth burnished facet on palatal root also suggests the gum had been stripped from this tooth for quite some time before being lost.

The pattern and location of the three cavities (all in the root of the tooth) also informs me that this tooth decay only occurred after the gums had been stripped away from the tooth (due to prevailing gum disease).

The root of any tooth (which are normally protected by the gums) are far more susceptible to decay as they covered by a substance called Cementum which is far softer than enamel (which covers the crown). Once the roots become exposed, root decay can set in and be very aggressive, as shown.

As to the identity of the tooth's owner, I can only really speculate. Servants were exposed to very little sugar in those days and this might tip the tooth's origin in favour of the well-to-do class. Periodontal (gum disease) is a universal and perineal problem. Gum disease has been recorded for over 1500 year and was and it the most common cause of tooth loss.

Sugar consumption was low in general around 1700AD. Average sugar consumption was 4 pounds/year. This roses exponentially through 1800AD to 18 pounds/year) to 1900AD (60 pounds/year) up to today (120 pounds/year). Most people would not have access to large quantities of sugar but certainty this tooth had been exposed to some extent.

Wood types

Ellen O'Carroll

Methods

The process for identifying wood, whether it is charred, dried or waterlogged is carried out by comparing the anatomical structure of wood samples with known comparative material or keys (Schweingruber 1990). A wood reference collection made from specimens collected at the Botanical gardens in Dublin was also used. Thin slices were carefully taken from the transverse, tangential and longitudinal sections (where required) of each piece of wood and sampled using a razor blade. These slices were then mounted on a slide and glycerine was painted onto the wood to keep the sample from drying out as well as to aid identification. Each slide was then examined under a microscope at magnifications of 10 x to 400x. By close examination of the microanatomical features of the samples the species were determined. The diagnostic features used for the identification of wood are micro-structural characteristics such as the vessels and their arrangement, the size and arrangement of rays, vessel pit arrangement and also the type of perforation plates.

Anatomical characteristics from wood remains do not allow for identification of individual species in every case. Several species belong to groups of species, species of genera, of subfamilies and of families that cannot be separated anatomically (Schweingruber 1990). Examples identified at Rathfarnham Castle include oak (*Quercus* spp), willow (*salix* sp), elm (*Ulmus* sp), birch (*Betula* sp) and pomoideae (apple/pear/hawthorn/mountain ash).

Wood types identified

Quercus sp (Oak)

Eight artefacts were carved from oak wood. These are three staves, a gaming piece, a peg and various fragments of furniture and panelling. Sessile oak (*Quercus petraea*) and pedunculate oak (*Quercus robur*) are both native and common in Ireland and the wood of these species cannot be differentiated on the basis of their anatomic characteristics. Pedunculate oak is found growing in areas of heavy clays and loams, particularly where the soil is alkaline. Sessile oak is found on acid soils and often in pure stands. Unlike pedunculate oak, it thrives on well-drained soils but is tolerant of flooding (Beckett 1979, 40-41). Both species of oak grow to be very large trees (30-40m high).

Oak has unique properties of great durability and strength and was frequently used in the manufacture of staves, posts and wooden planks. Oak was one of the most prevalent trees growing in Ireland throughout the medieval period. The anglicised form of the Irish name for oak (derry) is included in many townland names today. Out of 62,000 townlands in Ireland about 1,600 contain the word "derry" in one form or another, either as a prefix or suffix (Mc Cracken 1971, 23). However recent synthesis of wood assemblages from Viking Dublin indicates that oak wood was in short supply during this period in Viking Dublin (Reilly *et al*).

Fraxinus excelsior (ash)

Two furniture components, an L-shaped wooden peg and a sharpened twig were all identified as ash wood. Ash is a native species to Ireland preferring lime rich freely draining soils. It is not a very durable timber in waterlogged conditions but has a strong elastic nature and is easily worked. Ash appears to have colonised the open land after the first farmers removed much of the native woodland therefore it is frequently used as structural timber in the Later Bronze Age periods (Moloney *et al*, 1994). Ash is also abundant in native hedgerows and was quite common in the later historic period. Ash is a native species to Ireland preferring lime-rich, freely draining soils. It is a broad, spreading, deciduous tree growing at a fast rate to 25 metres in height by 20 metres spread. This rapid growth and the ability to re-sprout after being coppiced made ash a valuable renewable tree to the early Irish. It is not a very durable timber in waterlogged conditions but has a strong elastic nature and is easily worked.

Alnus glutinosa (Alder)
Three artefacts from the assemblage were identified as alder. The artefacts included a vessel, a wood point for lace making, a turned wooden core from the construction of a bowl as well a turned furniture foot for bobbin turning.

Alder is a widespread native tree and occupies wet habitats along stream and river banks. It is an easily worked and split timber and therefore quite commonly manufactured into planks. Though it certainly flourishes best where its main roots are just above the water, the alder is also tolerant of stagnant water. The wood of the tree is white when growing, but when it is cut, turns red. It is soft, with short fibres, giving it a homogeneous texture and of moderate density. It is a very durable wood and was specially selected for boat-making and for dug-out canoes. Alder is very suitable for wood-turning and is a common timber in barrel- and wheel-making. Many cores and bowls of alder wood have been identified from Medieval urban deposits (Hurley 1982, Hurley and Scully 1987).

Betula sp (Birch)
Four wooden heels from shoes were identified as birch. Hairy birch (*Betula pubescens Ehrh*) and silver birch (*Betula pendula Roth*) cannot be distinguished microscopically. Silver birch requires light and dry soil while hairy birch grows on wet-marginal areas. Birch is one of the first trees to establish itself on raised bogs. The wood from birch trees is strong but it rots quickly when exposed to outdoor conditions (Grieves 1998). Birch is used as firewood due to its high calorific value per unit weight and volume (Rackham 1980). It burns well even when frozen or freshly hewn.

Taxus baccata (Yew)
The pencil as well as the gold leaf covered knive was identified as yew. Yew would have been selected for the manufacture of these artefacts because it is strong and durable and objects made from yew rarely warp or crack. Yew also has great elasticity and strength and hence its suitability for small functional objects. Vessels, bowls, pins, handles and staves were often manufactured from the yew tree in pre-historic and historic Ireland (Hurley 1982, Hurley and Scully 1987, Morris 2000). Yew is a slow-growing conifer, which can live for as long as 1000 years and can reach a height of 20m. It is known for its strength and resistance to the cold. It is much less common in recent times because of over-harvesting. Its hard, springy wood was the source of English longbows, as well as spears and staves during the medieval period. The evergreen needles are very broad, and the seeds are produced in red, berry-like cones. Yews can be found growing naturally in the understorey of deciduous woods where they are able to withstand very low light-levels. Very old specimens are also commonly found planted in churchyards. Yew, like ash, has a preference for well-drained lime-rich soils.

Ulmus sp (Elm)
One possible wooden tool handle was identified as elm. English elm (*Ulmus procera*) and wych elm (*Ulmus glabra*) cannot be separated by their wood structure. As suggested by Mitchell (1986) elm declined (although would not have completely died out) with the advent of farming and possibly Dutch elm disease around 3700BC. It generally prefers damp but not waterlogged woods particularly on limestone. Wych elm does not reproduce by suckering (new trees growing from roots of the original tree) and is only spread by seed. Despite being one of Ireland's most common trees before the arrival of man, elm is rare in Ireland due to its tendency to occupy the most fertile soils which are the most sought after for agriculture. Many different species of elm are still very common in hedgerows throughout Ireland, but truly native trees are probably confined to rocky hillsides and remote valleys in the west of Ireland. It responds well to coppicing. Elm is a hard, elastic, wood and durable under water, making it useful as structural timber and for domestic implements. The inner bark fibre can be used for ropes and matting. It must be very well seasoned to perform (around 2 years) and could be hard to ignite due

to its high water content. If the wood is still wet, it produces a lot of smoke but it has a high calorific value as it burns for a long time (Rackham 1980).

Pinus sylvestris (Scots Pine)

A pine wooden counter as well as a pine bevelled frame fragment were present in the assemblage. Pine wood is strong and elastic and burns with a good flame, but is prone to spitting, even when well-seasoned. It makes great kindling (Rackham 1980). The timber of *Pinus sylvestris* has played an important part in industry since the 17th century. The strong but easily worked wood has a multitude of uses from poles to furniture and also produces useful by-products such as resin and tar (www.kew.org). It was generally thought that although Scots pine became common throughout Ireland after the last glaciation, it had declined and was absent by the medieval period and was not reintroduced until the late 17th century. However, pollen evidence of former tree growth on Clonsast bog, Co. Offaly as well as on Rockforest Lake in Co. Clare (Roche, 2010) indicates that the Scots pine tree survived from the early post-glacial period up until the modern era (Murray cited by Nelson 1994, 148). *P. sylvestris* occupies a variety of environments-raised bog, limestone pavement, granite scree and upland blanket bog (Roche et al 2009). *Pinus sylvestris* prefers acid, neutral and basic (alkaline) soils and can grow in very acid and very alkaline soils. It can grow in semi-shade (light woodland) or no shade (Rackham 1980). It requires dry moist or wet soil and can tolerate drought. The quality and texture of Scots pine depends on the rate of growth of each tree. Scots pine wood is not naturally durable and is no longer widely planted as a commercial forest species in Ireland. It has an average lifespan of between 250-300 years (Rackham 1980). Drops of sticky resin often cover the tree's buds, and also provide a natural preservative for the wood. If a Scots pine dies while it is still standing, the skeleton can persist for 50 or even 100 years before falling down, because the high resin content in the sap makes the wood very slow to decay (*ibid.*). A tan or green dye is obtained from the needles (Grieves 1984).

Maloideae (apple/pear/hawthorn/mountain ash)

Maloideae or pomaceous fruitwood includes apple, pear, hawthorn and mountain ash or rowan. It is impossible to distinguish these wood species anatomically but as wild pear is not native and crab apple is a rare native species in Ireland it is likely that the species identified from the site is either hawthorn or mountain ash (Nelson & Walsh 1993, 194-200). Hawthorn (*Crataegus monogyna*) is a native species, and is found in many hedgerows throughout Ireland. Mountain ash (*Sorbus aucuparia*) is also a common tree in Ireland growing particularly well in rocky and hilly mountainous places. Both species produce a very hard close grained wood, suitable for small implements such as mallets and splitting wedges. Recent wood identifications of artefacts by the author from the crannog at Drumclay, Co. Fermanagh have shown that many small functional objects such as spindles, gaming pieces, weavers swords and spoons were constructed from pomaceous fruitwood.

Picea abies and Larix decidua (Spruce and Larch)

A re-used wooden panel, a possible counter as well as two timbers associated with a drain (C3) were identified as Spruce/Larch. Spruce and Larch cannot be differentiated microscopically (Schweingruber 1990). Spruce is not native to either Ireland or Britain but is thought to have been first introduced to these islands in the 1500s (Forest Service n.d.).

Spruce is a very useful timber tree. Two of the trade names for this leading world timber are "Whitewood" and "White Deal". It is used for boxes, packing cases, building, joinery, paper pulp and chipboard. European larch was introduced to Britain at a later date to Spruce around 1620 while Japanese larch was not introduced to Ireland until 1865 (Forest Service n.d.).

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Wood types identified from the assemblage at Rathfarnham Castle

ExcavNo	SimpleName	Material	Species	Comment
E4468:2:205	Point	Wood	Maloideae	
E4468:2:217	Fitting	Wood, iron	Elm	Irregular split, fast growth
E4468:2:635	Heel	Wood	Birch	
E4468:3:173	Pencil	Copper alloy, graphite, wood	Yew	
E4468:6:4706	Gaming Piece	Wood	cf Pine??	Very dried out and hard to identify. Defnitely a softwood
E4468:6:4707	Button	Wood	Indeterminate	
E4468:6:4708	Button	Wood	Maloideae	
E4468:6:4783	Doll	Wood	Indeterminate	
E4468:6:4784	Needlecase	Wood	Indeterminate	Possibly Ebony????????
E4468:6:4785	Bung	Wood	Cherry	
E4468:6:4787	Fitting	Wood	Pine	
E4468:6:4788	point	Wood	Alder	
E4468:6:4790	counter	Wood	Yew	
E4468:6:4791	pointed piece	Wood	Birch	
E4468:6:4792	Gaming piece	Wood	Oak	
E4468:6:5563	Fitting	Wood, Iron	Oak	20 annual tree rings, Radial split, fast growth
E4468:6:5564	Fitting	Wood, Iron	oak	10 annual tree rings, Radial split, burnt
E4468:6:5565	Bowl	Wood	Alder	Turned core from wooden bowl
E4468:6:5566	Fitting	Wood	Oak	Fast growth - bracket?
E4468:6:5567	Object	Wood	Oak	
E4468:6:5568	Fitting	Wood, iron	Oak	Post
E4468:6:5569	Fitting	Wood	Ash	25 annual tree rings, some fast growth
E4468:6:5570	Fitting	Wood	Ash	
E4468:6:5571	Fitting	Wood	Alder	Turned object
E4468:6:5572	Fitting	Wood	Oak	
E4468:6:5573	Point	Wood	Maloideae	
E4468:6:5575	Fitting	Wood	Maloideae	Needs to be cleaned
E4468:6:5576	Point	Wood	Ash	5 annual tree rings , fast growth
E4468:6:8045	Point	Wood	cf Maloideae	
E4468:6:8085	Heel	Wood	Birch	
E4468:6:8093	Heel	Wood	Birch	
E4468:6:8110	Heel	Wood	Birch	
E4468:6:8142	Heel	Wood	Birch	
E4468:6:8188	stave	Wood	Oak	50 + annual tree rings, slow growth
E4468:7:612	Cutlery	Wood, gold, silver	Yew	
E4468:7:614	Cutlery	Wood	Maloideae	
E4468:7:616	Gaming Piece	Wood	Larch/Spruce	microscopically you can not differentiate
E4468:7:626	Fitting	Wood	Indeterminate	
E4468:7:629	Point - Spindle?	Wood	Maloideae	
E4468:7:630	Point	Wood	Ash	9 years
E4468:7:632	Tool	Wood	Maloideae	
E4468:7:728	Fitting	Wood, Iron	Larch/Spruce	microscopically you can not differentiate
E4468:7:sample 24	Timber	Wood	Larch/Spruce	microscopically you can not differentiate
E4468:6: sample 9	Timber	Wood	Larch/Spruce	microscopically you can not differentiate