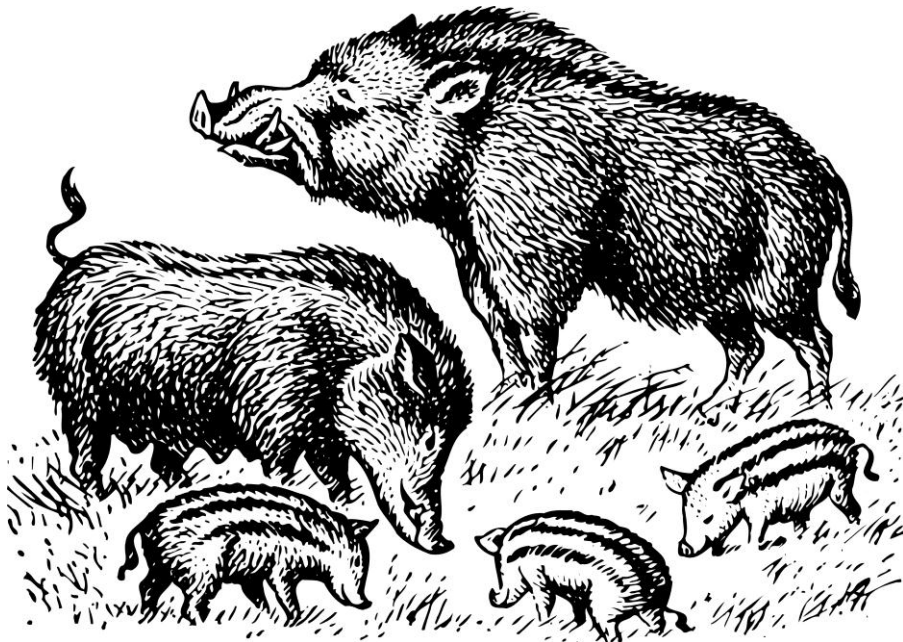


Review of the Natural History of Wild Boar (*Sus scrofa*) on the island of Ireland



Prepared for the

Northern Ireland Environment Agency, National Parks and Wildlife Service (Ireland)

&

National Museum of Ireland - Education & Outreach Department

By

Ruth F. Carden

This report should be cited as:

Carden, R.F. (2012) *Review of the Natural History of Wild Boar (Sus scrofa) on the island of Ireland*. Report prepared by Ruth Carden for the Northern Ireland Environment Agency, Northern Ireland, UK, National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland and the National Museum of Ireland – Education & Outreach Department.

Image credit: barbulat / 123RF Stock Photo

Non-Technical Summary

Wild boar has long been thought as one of Ireland's 'native' animal species, i.e. arrived here independently of human assistance (deliberate/accidental). No bones of wild boar/pig have been identified in the fossil record, to date, from the island of Ireland before humans first arrived about 9,600 years ago. Evidence strongly indicates that these early human settlers introduced wild boar/pig onto the island of Ireland. There are numerous 'pig' bones available from various archaeological sites. But distinguishing between true wild boar and domesticated pig bones is difficult since they are very similar due to their evolutionary relationship (domesticated pigs are descendants of wild boar). Although, the measurements of certain bones and teeth can yield size and shape differences when viewed against larger datasets of measurements available from Britain and Europe. Genetic evidence appears to indicate that the wild boar genetic signature was replaced by a domesticated form about 7,000 years ago in Ireland. But we do not know the exact timing of the establishment or (re)introduction(s) of wild boar or even domesticated pig populations onto this island. Further applied scientific research is required to shed light on these events. Currently, there are no free-living descendants of the early populations of wild boar on the island of Ireland occurring in the wild.

EXECUTIVE SUMMARY

1. The origin and timing of the presence of ‘wild boar’ on the island of Ireland are contentious topics. Arguments have centred on whether wild boar were present in Ireland before humans arrived (i.e. Late Pleistocene period) or were introduced at some stage when or post-human settlement during the Mesolithic archaeological period and/or later. Previous works have suggested that wild boar were native to our island, whilst others suggested that the wild boar were extirpated during the Neolithic archaeological period or even in more recent historical times.
2. The natural history of ‘wild boar’ (*Sus* species) has been reviewed in light of these debates, including all available palaeontological and archaeological sites, including radiocarbon dated specimens.
3. Examination of the evidential basis of the presence from Late Glacial to the historical presence of wild boar on the island of Ireland is as a result of paradigm - a long standing circular argument that if *Sus* skeletal remains are found within Mesolithic sites, then these are interpreted and/or considered as wild boar, whereas if such remains are found within Late Neolithic and more recent sites, then these must be domestic pig. However, such assumptions have not been thoroughly tested within the Irish archaeological record of this species.
4. The stated positions about the native status and extirpated events in previous works, which have not comprehensively reviewed the natural history of this species, have influenced the relative willingness to accept commonly held beliefs that this species was native to Ireland on face value.
5. Evidence collated at this time shows that the identified *Sus* skeletal remains are not present on the island of Ireland prior to human settlement during the Mesolithic archaeological period.
6. Certain genetic evidence suggests that the timing of the extirpation of the ‘wild boar’ on the island occurred during the Mesolithic-Neolithic transition and/or during the Neolithic archaeological period approximately 5,000 years BP. However, to fully ascertain and unravel the complexities of such extirpation and/or (re)introduction events, further applied research is required in addition to an extensive radiocarbon dating programme.

Contents

Non-Technical Summary	iii
Executive Summary	iv
Contents	v
List of Tables and Figures	vi
1.0 Preface	1
2.0 Introduction	2
2.1 Background.....	2
2.2 The natural history of wild boar in Ireland.....	4
2.3 General biology and ecology of wild boar.....	5
2.4 Ecological impacts associated with wild boar.....	6
2.5 Criteria for restoration or reintroduction management programmes.....	6
2.6 The folklore and place-names pertaining to the wild boar/pig in Ireland.....	7
2.7 Discrimination between domestic pig and wild boar skeletal remains.....	9
3.0 Methods	11
4.0 Results	13
4.1 Palaeontological and archaeological <i>Sus</i> species skeletal remains.....	13
4.2 Mesolithic archaeological period.....	13
4.3 Neolithic archaeological period.....	14
4.4 Neolithic/Bronze Age archaeological period.....	14
4.5 Bronze Age archaeological period.....	15
4.6 Iron Age archaeological period.....	15
4.7 Early Medieval, Medieval and Historical archaeological periods.....	15
4.8 Undated archaeological sites and multi-period sites.....	15
4.9 Radiocarbon dated skeletal <i>Sus</i> species remains.....	16
5.0 Discussion	17
5.1 Confusing terminology occurring in the literature.....	17
5.2 Comparison to Britain.....	17
5.3 <i>Sus</i> species: 30,000 years BP to the Mesolithic archaeological period in Ireland.....	19
5.4 Mesolithic and Neolithic archaeological periods.....	23
5.5 Bronze Age, Iron Age, Medieval and Recent Historical archaeological periods.....	24
5.6 Literary and folklore evidence of wild boar in Ireland.....	26
5.7 Genetics and biometrical data.....	27
6.0 Conclusions.....	28
7.0 Acknowledgements.....	30
8.0 References.....	31
Appendix I.....	42

List of Tables

- Table 1.** Key skeletal diagnostic measurement which allows discrimination of teeth and bones between wild boar and domestic pig (after Payne & Bull 1988; Albarella & Payne 2005)..... 11
- Table 2.** The archaeological periods used in reference to events within Ireland in the approximate radiocarbon years before present (BP) and years before Christ (BC) / *Anno domini* (AD) and for the more recent periods, the chronological reference is made to centuries.....13
- Table 3.** Published and unpublished ¹⁴C radiocarbon dated *Sus* species skeletal remains..... 16

List of Figures

- Figure 1.** Approximate timeline indicative of the key events mentioned within the text. Dates are given in approximate radiocarbon years before present (BP) and represents archaeological periods within Ireland. The scale used is not linear pre-10,000 BP. The maximum of the Devensian Glaciation is given; this represents the height of the Last Glacial Maximum (LGM)..... 3
- Figure 2.** Skulls of a domestic pig (Carden, personal collection), a wild boar (NMS, Edinburgh) and an Irish ‘greyhound pig’ (NMI, Natural History, Dublin) (see Section 3.5) illustrating the different shape changes of the dome-shaped skull case, sloping nasal region and lower jaws.....10

1.0 Preface

The purpose of this report is to provide an independent, comprehensive review of the natural history of wild boar (*Sus scrofa*) on the island of Ireland. This review is in direct response to the uncertainty surrounding the natural history of wild boar in Ireland which was brought to the attention of the public by Invasive Species Ireland in their Policy Position Statement and Invasive Species Action Plan for this species (Invasive Species Ireland 2011a,b). Knowledge of the exact relationship of wild boar with this island pre- and post-human settlement appears to be the driving force with regards to public and media attention when recommended mitigations are enforced by necessary authorities when the species in question is assumed a ‘native’ species to our island. Therefore, a critical and comprehensive review of the natural history including the information derived from a variety of sources (archaeology, literary and folklore, palaeontology) of the wild boar presence in Ireland is an essential requirement.

Factual information, when available, forms the basis of policy documents and species action plans when dealing with certain species that are illegally translocated and/or released from captivity into protected and other habitats. This is particularly relevant when a species can potentially have a direct/indirect negative impact(s) on such ecosystems and cause direct conflicts with modern human land use patterns. Equally important, such information provides a basis that will enable national and local communities to understand the potential threats involved and the reasons why certain policies and species action plans are drafted and implemented.

This report was commissioned by the Northern Ireland Environment Agency (Northern Ireland), National Parks and Wildlife Service (Ireland) and the National Museum of Ireland – Education and Outreach Department.

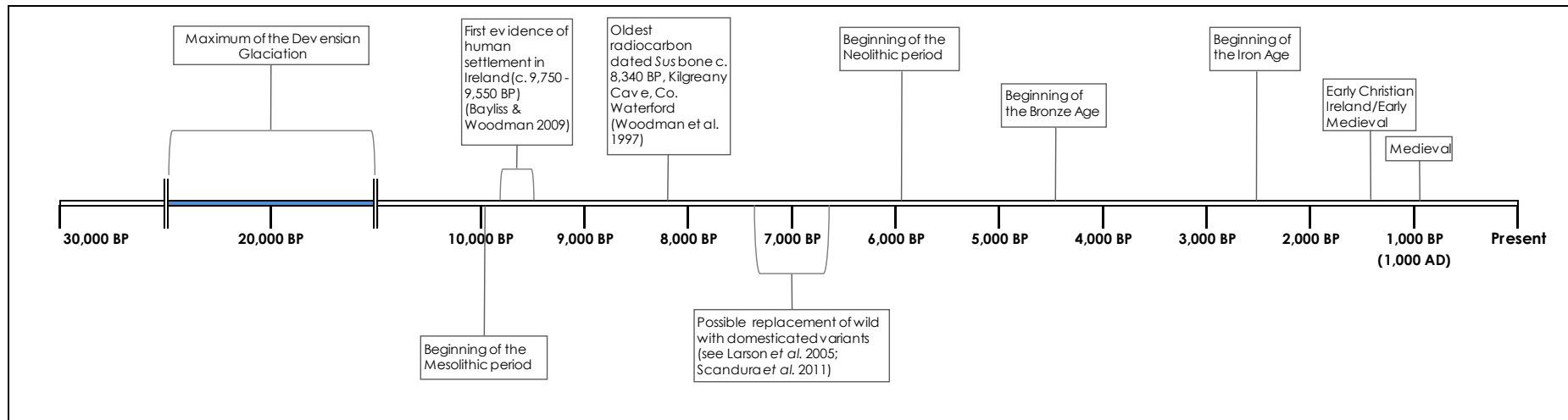
2.0 Introduction

2.1 Background

The question surrounding the colonisation of the island of Ireland (hereafter referred to as Ireland) by the fauna and flora seen today remains one of the key outstanding questions in biogeography (Moore 1987; Yalden 1999; Searle 2008). It could be expected that Ireland would have a relatively similar faunal and floral assemblages to that of Britain given the proximity of these two large islands, yet many species are absent from Ireland that are commonly found in Britain (the common/Eurasian shrew *Sorex araneus*, field vole *Microtus agrestis* and European roe deer *Capreolus capreolus* for example; Yalden 1999). Other terrestrial mammals such as the wild boar (*Sus scrofa*) and red deer (*Cervus elaphus*) have had a longer palaeontological and archaeological history within Britain (Yalden 1999) since before the Last Glacial Maximum (c. 25,000 - 15,000 BP; Yalden 1999). This has led to considerable debate about putative glacial refugia (e.g. Teacher *et al.* 2009), natural colonisation via land/ice bridges (e.g. Markinková *et al.* 2007) and anthropogenic introductions (e.g. McDevitt *et al.* 2011).

Most of our knowledge regarding Irish colonisation processes comes from studies of mammals, in terms of fossils, archaeological evidence and phylogeographic studies in-conjunction, where applicable, with human colonisation and settlement events and patterns. The possible early human traders of the Mesolithic period has been proposed as the causal agent of the link between Ireland's fauna and flora and those occurring in south western Europe, both in terms of species assemblages (Corbet 1961) and genetic affiliations (Searle 2008). However, this general model of how species arrived to Ireland by similar means is too simplistic and unrealistic. There is a demonstrated Neolithic link between Ireland and Britain, the accidental introduction of the pygmy shrew (*Sorex minutus*) (McDevitt *et al.* 2011) and the deliberate introduction of red deer (Carden *et al.* 2012), which indicates the vital role that Ireland's nearest landmass played in the establishment of its contemporary fauna and flora. Indeed the long presumed 'native' (whereby a species arrives at a location/area/landmass without the intervention of human-mediated actions) claim that Ireland's red deer were perceived to have, apart from various misidentifications and erroneous putative red deer remains, was based on the basic presumption that this species was 'probably' present in Ireland during the Early Holocene (Mesolithic period) and subsequently this was propagated within the published literature (e.g. Movius *et al.* 1937; Mitchell 1956; Savage 1966; Stuart 1995). Figure 1 illustrates an approximate timeline of the key events described within this review. Radiocarbon years before present (years BP) were used, converted from Waddell's (2010, pp.iv) BCE/AD time periods (see Table 2).

Figure 1. Approximate timeline indicative of the key events mentioned within the text. Dates are given in approximate radiocarbon years before present (BP) and represents archaeological periods within Ireland (see Table 2). The scale used is not linear pre-10,000 BP. The maximum of the Devensian Glaciation is given; this represents the height of the Last Glacial Maximum (LGM).



2.2 The natural history of wild boar in Ireland

The natural histories of many of our island's animals are complex and far from being transparent with regards to the origin(s) or mode(s) of arrival(s) and during what time period (McDevitt *et al.* 2011; Carden *et al.* 2012). Similar to other animals, the natural history of wild boar (*Sus scrofa*), to date, has not been critically or comprehensively reviewed on the island of Ireland and generally the paucity of information available is much disassociated or even contradictory.

Previous published works present a confusing story as to the presence/absence of wild boar during prehistoric times in Ireland: Southern (1964) states that wild boar were never recorded in Ireland and Moffat (1938) excludes it from the listed historic fauna. Fairley (1984) doubts the presence of wild boar during the Pleistocene and makes no reference to them during the subsequent Holocene period. While Savage (1966) mentions wild boar as a “native Irish mammal”, but on the following page of his publication lists it among the “species not proven native”. Scandura *et al.* (2011) state that wild boar was already extirpated within the British Isles before the 17th Century. Thompson's (1856) ‘The Natural History of Ireland’ monograph states “that this animal was at one period common in Ireland, but has long since become extinct”. Mitchell & Ryan (1997) also suggest that during the 17th Century that the decimation of woodlands led to the extirpation of this species in Ireland. The unpublished work by O’Sullivan-Bearé (c.1670) has mention of “boars, or wild woodland pigs” (p. 79, O’Sullivan 2009). On the other hand, van Wijngaarden-Bakker (1986) suggests that wild boar were replaced by domesticated pigs during the Neolithic archaeological period in Ireland.

During the Medieval period within Ireland, pigs and sheep occurred in fewer numbers relative to cattle during the 8th Century (Kelly 1997, pp.27). However, pigs were to provide an important food source to the military presence within Ireland during the 12th and 13th Centuries: there are records of the importation of approximately 4,297 pigs, via shipping, to Anglo-Norman armies in Ireland in years 1170-71 and 1211-12 (Sweetman 1875-86, 1-3 & 69 respectively).

Apparently the latest incidence of the presence of “wild pig” in Ireland is from the 12th Century (Murray & McCormick 2011a) and “pig” from the late 13th to early 14th Century levels (McCormick 1999; Murray & McCormick 2011a) at Trim Castle, Co. Meath. However, these reports of “wild pig” are based on 0.1% (n=3 partial bones) of the total animal bone fragments identified but Murray and McCormick's report (2011) do not state the methodology used to differentiate between the remains of ‘wild pig’ and ‘pig’ (domesticated). Further, Murray and McCormick (*ibid.*) state that the wild pig bones are of a single partial immature tibia and two

partial metapodial bones that do not yield biometric data due to their fragmentary nature. Therefore, the identification of these partial remains attributed to ‘wild pig’ is inconclusive.

2.3 General biology and ecology of wild boar

The suids (Family Suidae), even-toed ungulates, are the most primitive of living Order Artiodactyla (Groves 2007). The largest of the suids is represented by the European wild boar (*Sus scrofa scrofa*). Wild boar are the direct ancestor to the domestic pig, with which it shares a close genetic affinity and can hybridise with (Larson *et al.* 2007; Scandura *et al.* 2011) and is one of the most important farm animals (Albarella *et al.* 2009). They are omnivorous and have an indiscriminating adaptable diet; foraging for plant and animal species such as acorns, herbs, ferns, tubers, grubs, small rodents, small mammals, reptiles, amphibians and carrion while also feeding on human refuse and human excrement. Pigs root a great deal of their food out of the ground and therefore strong winter cold will limit their geographic range, and their relatively short legs significantly hinder movement through snow while severe winters may cause mass mortality of local populations (Okarma *et al.* 1995).

Wild boar is a gregarious species forming herds (or sounders) of usually between 6-20 individuals comprising of one or more females and their litters, subadults from previous litters are peripheral to this and adult males join the group during the mating season but remain relatively close by females throughout the year. The reproductive activity of wild boar is seasonal and coincides with availability of principal food stuffs and/or climatic factors.

Pigs were probably present throughout the Pleistocene in Europe, although only one species existed at a time; however their fossil record is ambiguous except in the Late Pleistocene (Kurtén 1968). Although currently extirpated in many geographic areas, the Holocene range of the Eurasian wild boar originally included most of Eurasia, with the exception of the northern territories (Albarella *et al.* 2009). Such an expansive geographic distribution (Scandura *et al.* 2011) has been greatly expanded by anthropogenic mediated actions. Wild boar can interact significantly with many different environments and habitats, and shape these accordingly (Albarella *et al.* 2009).

2.4 Ecological impacts associated with wild boar

Wild boar can inhabit a wide variety of temperate and tropical habitats where there is water and tree cover available. Many wild boar populations cause substantial damage to agricultural crops, particularly when energy-rich food is scarce. Virtually every type of cultivated plant appears in the diet of wild boar. In Europe crops damaged by wild boar include wheat, maize, rice, grapes, barley, oats, rye, and potatoes (Massei & Genov 2004). Additionally, Massei & Genov (2004) suggests that the vast majority of studies of the ecology of wild boar are in agreement about the significant impact of wild boar on plant and animal communities, as well as wild boar being implicated in damage to conservation values (plant biodiversity loss) (Reimoser & Putman 2011).

Public opinions and attitudes towards wild boar may be highly contradictory within its extant geographic range, ranging from an ecological pest to a valuable game resource (see chapters in Apollonio *et al.* 2010 and Putman *et al.* 2011). When compared to other ungulate species, wild boar, when present in established populations, cause significantly more levels of damage than other ungulate species such as deer, due in part to high local densities but also due to their digestive physiology that causes them to depend on high energy foods (Reimoser & Putman 2011). Agricultural crops are favoured over natural vegetation and these cultivated crops represent an important component of its diet throughout Europe (see chapters in Apollonio *et al.* 2010). There is no precise data available at a national level for most countries, but it has been estimated that the damage to the agricultural economy of Europe by wild boar is in excess of €80 million per year (Reimoser & Putman 2011).

Given its ecology and reproductive biological characteristics any illegal releases of this species, or its hybrids, can cause large extensive amounts of damage to the land unit (agricultural, forestry etc.) in relatively short time periods and without proper ongoing monitoring and implementation of appropriate control programmes (see Apollonio *et al.* 2010 & Putman *et al.* 2011 and references cited therein).

2.5 Criteria for restoration or reintroduction management programmes

Feasibility studies should precede such reintroduction programmes in terms of, for example, habitat suitability (e.g. Leaper *et al.* 1999) and public awareness and media fallout (e.g. Goulding & Roper 2002). Furthermore, the genetic purity of any potential reintroduction target species must be screened and meet minimal criterion (e.g. IUCN guidelines) with regards to the restoration of a native species within managed reintroduction programmes. In Britain, and other European

countries, which have had a long prehistoric and historic presence of wild boar, the screening of all potential stock including illegally released wild boar and/or escapees from enclosed areas such as the wild boar farms of southern England must be genetically screened prior to any subsequent management strategies if they are perceived as being ‘true’ wild boar. Feral populations of so called ‘wild boar’ have established in southern Britain from escapees from wild boar farms (Goulding 2001; Goulding & Roper 2002; Goulding *et al.* 2003; Wilson 2003) and some authors have contended that the Dorset wild boar may be pure wild boar (Goulding 2001; Wilson 2003); although this postulated theory is not based on actual molecular analysis of this population.

While there is an argument for the restoration of, the formerly native, wild boar to Britain in terms of this species’ natural niche within suitable woodland ecosystems, their rooting behaviour can cause severe ecological damage (Wilson 2005). A recent study by Frantz *et al.* (2012) has highlighted the importance of genetic screening of what was assumed to be a feral wild boar population in the Forest of Dean, Gloucestershire in southwest England. The origins of the current presumed wild boar population within the Forest of Dean were the result of farmed wild boar escapees in the late 1990s and during the 2000s. Management of this herd has been conducted by DEFRA with public consultation and involvement of local authorities. These wild boar are called ‘feral wild boar’ and there is a ‘wild boar best practice guide’ website (<http://www.wild-boar.org.uk/>) which offers guidance on many biological, ecological and management aspects of this species within Britain (also see Wilson 2005). Frantz *et al.* (2012) concluded from their genetic study of the Forest of Dean wild boar population relative to other European populations of wild boar and various domesticated breeds that the Forest of Dean animals have a mixed wild boar/domestic pig genetic make-up and therefore cannot be considered as a restored native species within Britain. These animals should not be referred to as either ‘wild boar’ or ‘feral wild boar’ and their future management should reflect this knowledge of their genetic stock as they now cannot be considered under IUCN guidelines as suitable reintroduction stock of a former native species. It is imperative that the two other free living ‘feral wild boar’ populations in Dorset and Kent/East Sussex be subjected to similar scientific investigations to establish their genetic status.

2.6 The folklore and place-names pertaining to the wild boar/pig in Ireland

There are various written statements within various folklore sources that allude to swine (and other faunal species) on the island of Ireland. These resources include state papers, early written

accounts of the natural history of Ireland, myths and stories (folklore) as well as place-names of geographic areas.

The early writings of the visiting natural historians such as Giraldus Cambrensis '*Topographia Hiberniae*' in the 12th Century make reference to "in no part of the world have I seen such abundance of boars and forest hogs. They are, however, small, misshapen, wary, no less degenerated by their ferocity and venomousness than by the formation of their bodies" (Cambrensis 1183-1185). Whilst, O'Sullivan-Beare (c.1626, p.79) refers to wild woodland pigs/boars in his unpublished manuscript 'The Natural History of Ireland': "Boars, or wild woodland pigs are reported to have been very fat here; they are bellicose and fierce, when provoked they are to be feared by unarmed men".

The Irish word that refers to swine is *muc*. Wilde (1859) contends that the wild hog (Irish: *Torc fiadhain*) were numerous and found in afforested regions on the island of Ireland and frequently these pigs fed upon the acorns and beech-mast in "earliest times". Wilde (*ibid.*) further relates that "pigs were given a tribute to the King of Emania, as stated in the 'Leabhar-na g-Ceart'. There are various porcine legends reported by Hackett (1853) from throughout Ireland, involving the 'Tuatha de Danann' and a ferocious boar named Matal which resided at Mattle rock, Mutton Island, Co. Galway (*Muc Inis*) before Tuatha de Dananns extirpated all of the pigs of Ireland.

A King is mentioned by the name of "*Olioll oll mucaid*", i.e. *Olioll* of the great pigs (this King may be Aengus *Ollmucka*), the origin of his name pertains to Ireland having a remarkable large breed of pig which remained "till at long last the people got tired of them and they were driven out from every place but Imokilly (barony that runs west from Youghal Bay to Cove Harbour)". A glen in Imokilly was named *Ibh Liathain* or Glen O'Leihe (Glen of the liath or boar). All but one of two sows and a hog were driven out from Imokilly. One sow had a sty at a place named *Crobally* (cro, a sty) while the hog lived at a hill called *Cnock-an-Chullaig* (from *collach*, a hog); they would meet at a place called *Kilamucky*. Another tale involves the humorous story of 'Mac Dathós pig' (*Scéla Mucce Meic Dathó*) that tells of which warrior will be given the honour of carving a large pig at a feast (Kelly 1997, p.79 and see further details and references therein).

There are further mentions of reference to wild boar and pigs in Irish place names or that have some derivation from 'pigs', some examples are: *Mucc* Old Irish (Kelly 1997); *Drumhallagh* ('hill of the wild boar'), Co. Donegal. (Batt 1889); Wild pig (*fiadh muc*) (Scharff 1917); *Sliabh-na-muice*, Co. Tipperary (Wilde 1859); *Gleann-na-muice-duibhe*, near Newry (Wilde 1859); *Ceann-*

tuiric, Co. Cork (Wilde 1859), *Muckross and Torc*, Killarney, Co. Kerry (Wilde 1859); *Muckalagh* signifies a place where pigs fed (Wilde 1859). The Irish name *Banbh* apparently means ‘young pig’ (Westropp 1912). *Muccfoil* or *foil muc* indicating a pig-sty, was associated with early medieval literary sources associated with Early Medieval houses (Kelly 1997; O’Sullivan *et al.* 2010).

2.7 Discrimination between domestic pig and wild boar skeletal remains

Domestication took place independently in several different regions throughout its broad geographic range as indicated by genetic data highlighting multiple different origins of pig domestication through various human-pig interactions within the archaeological record (Larson *et al.* 2005; 2007).

There is large variability in terms of overall size and morphological characteristics within wild boar due to the large geographic and environmental ranges that this species occupies and this body size variability is reflected in the bone sizes and metric data. Although most of these investigations have been focused on relatively recent specimens rather than early Holocene populations (Albarella *et al.* 2009), this in part is due to the lack of suitable fossil skeletal material available from either Late Pleistocene or early Holocene sites (Kurtén 1968).

Biometric data recorded from animal bones by zooarchaeologists is used extensively as a criterion to distinguish wild boar from domestic pig skeletal remains in the faunal analysis of archaeological assemblages (Payne & Bull 1988). There is a further complication since the geographic ranges for both wild boar and the domestic pig overlap and interbreeding has occurred (naturally due to escapees or deliberately via human intervention in the form of pig husbandry) (Albarella *et al.* 2007). Until recently there has been a focus on other domesticated animals such as bovids, caprines and equines in terms of geographic origins of domestication and the processes involved. Similar studies on pigs have been overlooked due to widespread view that pigs were domesticated later than sheep and goats (Bökönyi 1976; Clutton-Brock 1999) and since pigs do not provide useful secondary products such as milk and wool or have additional uses (e.g. transport or power), has led to the perception that pigs were of lesser importance and were simply meat providers (Albarella *et al.* 2007). Recent evidence suggests that pig husbandry may be as ancient as 10,000 years (Russell 2012).

Skeletal remains of domestic pig and wild boar may be discriminated using a suite of biometric data that are analysed for changes in the relative size of teeth and postcranial bones,

since innovations in animal husbandry caused changes in the morphology and size of domestic animals and such changes are reflected within the skeletal size measurements. Such methods are the most commonly accepted method for determining the wild or domestic status of excavated animal remains. When examining biometric data, large sample sizes are required to ensure statistical reliability, as well as choosing the most appropriate measurements which are more varied between different genders, age variability and environmental differences (Payne & Bull 1988; Albarella & Payne 2005).

Most animal bones in archaeological assemblages are fragmentary. The natural anatomical structure of pig bones are porous and coupled with the fact that pigs were generally slaughtered at a relatively young age and the postcranial bones from pig are relatively scarce in such assemblages, large samples of comparative biometric data are infrequent (though see Payne & Bull 1988 and Albarella & Payne 2005). Teeth of animals are durable and whole pig teeth are often found even if pig bone is too fragmentary for measurement. The first and second molars are relatively common in most assemblages while the third molar may be relatively uncommon due to the nature of the assemblage. The third molar erupts late in the life, at 24 to 30 months of age, and may be only found in small quantities in many assemblages due to the slaughtering regime. A summary of the most useful and recommended measurements to record from adult pig bones (fully fused epiphyseal sutures and non-porous bone) and teeth that distinguishes domestic pig remains from those of 'wild boar' are presented in Table 1 (after Payne & Bull 1988; Albarella & Payne 2005). All larger measurement values are assigned to the wild boar category rather than domestic pig category, as the process of domestication has caused a decrease from the 'wild' form to the smaller sized 'domestic' pig form. Figure 2 illustrates the different skulls from domestic pig, wild boar and an Irish 'greyhound pig' (see Section 3.3).

Domestic pig**Wild boar****Irish 'greyhound pig'**

Figure 2. Skulls of a domestic pig (Carden, personal collection), a wild boar (NMS, Edinburgh) and an Irish 'greyhound pig' (NMI, Natural History, Dublin) (see Section 3.5) illustrating the different shape changes of the dome-shaped skull case, sloping nasal region and lower jaws.

Table 1. Key skeletal diagnostic measurement which allows discrimination of teeth and bones between wild boar and domestic pig (after Payne & Bull 1988; Albarella & Payne 2005).

<i>Skeletal element</i>	<i>Description of measurement</i>
Mandibular Molar 1	Anterior crown width & Posterior crown width
Mandibular Molar 2	Anterior crown width & Posterior crown width
Mandibular Molar 3	Anterior crown width & Crown length
Tibia	Distal width (fully fused epiphyseal suture; non-porous bone)
Astragalus	Lateral length (non-porous bone)

There are limitations to these measurements in terms of application to *Sus* faunal assemblages. When the size difference between the wild and domestic pig populations is large, distinguishing between the two groups is relatively simple. However, when the size differences are smaller between the two groups due to male/female differences and age-related changes in size and shape of the bones as well as between such changes associated with changes from the wild form to the domesticated form, separation between these groups is more difficult and some measurements may overlap to varying degrees. However, when dealing with archaeological assemblages, there is no *a priori* knowledge known pertaining to the size of the suid remains excavated. Additionally there is the possibility of the presence of not only wild boar but also domesticated pigs, feral pigs and/or interbreeding between any of these. The overlapping measurements cannot be assigned, simply, to either wild or domestic groups. Measurements from teeth rather than bones are most suitable in these incidences, if available, as they do not demonstrate large sexual dimorphism traits and have low age-related variation, as well as generally being less affected by environmental factors (Payne & Bull 1988).

3.0 METHODS

References to the terms pertaining to wild boar and domesticated pig were searched using a variety of sources. Online resources of unpublished reports, archived material on databases, other databases (e.g. www.excavations.ie; see References section 7.0) and a variety of published works were extensively utilised. The palaeontological and archaeological libraries of the National Museum of Ireland (Natural History and Antiquities Divisions), as well as the author's personal collection, were searched for any reference to *Sus* species in Ireland during the last 30,000 years to recent historical times. The presence of wild boar and domestic pig were also summarily reviewed in Britain for comparison. The combined resources and the amount of available material online made visitations to the Royal Dublin Society Library and the Ulster Museum in Belfast redundant. Museum and other professionals were consulted and references to their published works were collated and used.

Due to the amount of post-excavated analyses that are on-going at present from the hundreds of archaeological sites that were excavated during the last 30 or so years and the time-lag between such analyses and publications of reports and records, there will be further sites that may contain *Sus* species remains which will appear in subsequent published reports which the author cannot, at present, account for.

An additional point to note with regards to using archaeological site reports, such as those found in online databases and utilised herein, is that these reports are based on first impressions immediately after excavation. However, in the absence of further post-excavation reports of findings and subsequent analysis, at the time of writing these reports represent the only information available from a variety of archaeological sites and their respective assemblages.

In most cases, the date of archaeological material reported was identified through direct or associated ¹⁴C radiocarbon dating analyses (reported as years BP) and/or by stratigraphic or cultural association, as reported from within the resources used.

The terminology of '*Sus* sp.' was adopted in this study, where appropriate, for clarity, in order to qualify the findings of suid skeletal remains as reported by the authors of the archaeological reports. It is noteworthy that the authors used a diverse range of terminology which was largely inconsistent (see Discussion section 5.1). The reported records derived from the authors' reports and other works terminology and details are reported within Appendix I.

The period, site location, specimen, archaeological context, radiocarbon date (years BP) and the source of reference are reported in all tables, where appropriate to the records. The approximate archaeological periods conventions used in this review is in terms of radiocarbon years before present (BP) and the equivalent in terms of BC and AD. The more recent periods' chronologies are given with reference to Century in the text body. The archaeological periods reported as approximate radiocarbon years before present (years BP; used preferentially within the main text body) and approximate BCE and AD years (after Waddell 2010) are presented in Table 2. These are given to use as a guide and by no means should they be considered absolute.

Table 2. The archaeological periods used in reference to events within Ireland in the approximate radiocarbon years before present (BP) and years before the common era (BCE) / *Anno domini* (AD) (after Waddell 2010). These are given to use as a guide and by no means should they be considered absolute.

Archaeological period	Approximate Radiocarbon years BP	Approximate Years BCE / AD
Mesolithic	9950 - 5950	8000 - 4000 BC
Neolithic	5950 - 4450	4000 - 2500 BC
Bronze Age	4450 - 2550	2500 - 600 BC
Iron Age	2550 - 338	600 BC – AD 400
Early Medieval	338 - 1138	AD 400 – AD 1200
Medieval	1138 - 1638	AD 1200 – AD 1700

4.0 Results

4.1 Palaeontological and archaeological *Sus* species skeletal remains

A review from approximately 30,000 years BP of palaeontological and archaeological sites and other contexts on the island of Ireland revealed no evidence of *Sus* species remains in any contexts prior to the Early Mesolithic period (c.9,500 years BP).

The archaeological records for *Sus* species skeletal remains are presented in order of archaeological period: Mesolithic, Neolithic, Neolithic/Bronze Age, Bronze Age, Iron Age, Early Medieval (or Early Christian), Medieval and Historical times (see Appendix I).

4.2 Mesolithic archaeological period

There are few identified Mesolithic sites, to date, within Ireland. All known Mesolithic sites identified to date have been included in this table to illustrate the presence and the absence of *Sus* species remains (Appendix Ia). The Mesolithic faunal assemblages show the predominance of fish bones and shellfish with some sea mammal remains with relatively few bone fragments of *Sus* species, when present, which were primarily burned fragments derived from immature aged (less than 1 year old up to three years old) individuals.

The remains of *Sus* species are consistently found on Irish Mesolithic sites although, in terms of quantities of skeletal fragments, they are scarce in comparison to the overall species (e.g. cattle, sheep, seals and shellfish) present within these assemblages (Woodman 1986; Yalden 1992; Woodman *et al.* 1997; Woodman *et al.* 1999; Woodman & McCarthy 2003).

Moynagh Lough, Brittas, Co. Meath has archaeological artefacts and remains from several archaeological periods as it was reused throughout prehistoric times by humans and appears to suffer greatly from intrusions of recent deposited bones into older deposition events (see Woodman *et al.* 1997). The multiperiod use of this site includes the Mesolithic, Early/Middle Bronze Age, Later Bronze Age and Early Medieval periods. ‘Pig bones’ have been recovered from the Later Bronze Age (Appendix Id), whilst ‘wild pig bones’ and ‘boars’ tusks’ were recovered from the Mesolithic archaeological period.

4.3 Neolithic archaeological period

Within the Neolithic archaeological period, bones from *Sus* species were recorded from various assemblages throughout the island from a variety of different contexts and sites, in particular from human burial sites. These remains were reported as ‘wild boar’, ‘pig’, ‘domestic pig’ and specifically ‘boar’s tusk’ (Appendix Ib). The earliest Neolithic archaeological site is Annagh Cave, Co. Limerick, where bones from *Sus* species are simply recorded as ‘pig’.

The faunal assemblage of the Neolithic archaeological site of Sydenham, Co. Down included “wild pig bones” (Patterson 1892), however it has been noted by Woodman (1974) that this site was an open find and therefore the stratigraphic position is uncertain. On this basis, this assemblage has been omitted from this Appendix (Ib).

‘Domestic pig’ bones were identified at Newgrange, Co. Meath, whereas ‘wild boar’ bones were identified at Ballycahane Lower, Co. Limerick an Early Neolithic archaeological site.

4.4 Neolithic/Bronze Age archaeological period

A number of archaeological sites were identified that exhibit features of a transition period and therefore were classified as Neolithic-Bronze Age archaeological sites (Appendix Ic). Pig bones were found on all sites listed but there was no mention of ‘wild boar’ or ‘wild pig’ bones from these sources.

The Mound of the Hostages, Hill of Tara, Co. Meath is a multi-period use archaeological site, including Neolithic, Early Bronze Age, Late Bronze Age, Iron Age and post-Medieval usage.

4.5 Bronze Age archaeological period

Bronze Age archaeological period sites that had records of pig bones found in the excavated faunal assemblages are presented in Appendix Id. Bones and teeth remains feature in the assemblages.

It is noteworthy to mention that there were relatively frequently more finds of tusks from ‘boar’ and ‘pig’ associated with human burial sites during the Bronze Age archaeological period relative to other archaeological periods.

Killuragh Cave, Co. Limerick. This site exhibits a range of phases from Late Glacial, Mesolithic, Neolithic and Bronze Age. Human skeletal and other associated remains are present. There have been identifications of fragmentary and butchered pig bones present within this cave, dated to 3285+/-45BP (Bronze Age), although it is plausible that other remains may be from different phases (Woodman 2003). Within a reassessment, which is currently in preparation, no differentiation between wild boar and domestic pig bones have been made, they have been referred to as ‘pig/wild boar’ until subsequent metric analyses are conducted (Carden in prep.).

4.6 Iron Age archaeological period

The Iron Age archaeological sites that had pig bones listed as part of the faunal assemblages are listed in Appendix Ie. All sources listed the *Sus* remains as ‘pig bones’.

4.7 Early Medieval, Medieval and Historical archaeological periods

The Early Medieval, Medieval and Historical archaeological sites that had pig bones listed as part of the faunal assemblages are listed in Appendix If. Predominantly *Sus* species remains are described as ‘pig bones’, with a few describing possible wild boar or wild pig remains. Reference to the ‘greyhound-pig’ is made in relation to two occurrences within Castle sites.

4.8 Undated archaeological sites and multi-period sites

Undated and multiperiod archaeological sites that had pig bones listed as part of the faunal assemblages are listed in Appendix Ig. Bones and teeth are reported as found within these assemblages; some of the teeth were perforated through human-mediated actions.

4.9 Radiocarbon dated skeletal *Sus* species remains

The 14 radiocarbon dates found within the published and unpublished literature are presented in Table 3. These dates range in age from the Mesolithic, through to Medieval and Recent Historical archaeological periods.

Table 3. Published and unpublished ^{14}C radiocarbon dated *Sus* species skeletal remains.

Site	Archaeological period	Radiocarbon date BP	Source	Species/specimen
Kilgreany Cave, Co. Waterford	Mesolithic	8340 +/-110	Woodman <i>et al.</i> 1997	Wild pig
Sutton, Co. Dublin	Mesolithic	7140 +/-100	Woodman <i>et al.</i> 1997	Wild pig
Dalkey Island	Mesolithic	6870 +/-90& 5600+/-80	Woodman <i>et al.</i> 1997	Pig bone (wild/domestic?)
Ringneill Quay, Co. Down	Mesolithic	5380+/-120	Joep 1960	identified as wild boar but subsequently identified as domestic pig
Moynagh Lough, Co. Meath	Early Neolithic	c.5500 (3868 +/-60 cal. BC)	Larson <i>et al.</i> 2007	Pig bone (wild/domestic)
Knocks 1, Co. Meath	Late Bronze Age	2710 +/-40	Elder 2009	Pig bone (but also listed as animal long bone fragment in Appendix 5 of paper)
Roestown 2, Co. Meath	Early Medieval	1380 +/-40	O'Hara 2009; O'Sullivan & Stanley 2007; O'Sullivan & Stanley 2008; Deevey & Murphy 2009; Kerr <i>et al.</i> 2010	Pig bone
Harlockstown, Co. Meath	Early Medieval	1376 +/-31	Chapple 2011	Pig bone
Treanbaun, Co. Galway	Early Medieval	1263 +/-30	Lehane <i>et al.</i> 2010	Pig bone
Cherrywood, Co. Dublin	Early Medieval	1240 +/-40	Chapple 2011	Pig bone
Clare Abbey, Co. Clare	Medieval	790 +/-50	O'Sullivan & Stanley 2008	Pig (<i>Sus</i>) bone
Clare Abbey, Co. Clare	Medieval	720 +/-40	O'Sullivan & Stanley 2008	Pig (<i>Sus</i>) bone
Addergoole 2, Co. Laois	Recent/Historical	160 +/-40	NRA database	Pig bone

5.0 Discussion

Of all ungulates, the wild boar has the widest geographical range and is the most expansive of all terrestrial mammals; it is considered native to parts of Europe, Asia and North Africa and was introduced as a game species in all other continents (except Antarctica) (Scandura *et al.* 2011). Anthropogenic factors have largely shaped *Sus* species geographical patterns since the Early Holocene within Europe (Larson *et al.* 2007) and such patterns may have already been influenced by much older range expansions and constrictions since the Last Glacial Maximum within Europe due to primarily environmental factors.

5.1 Confusing terminology occurring in the literature

During the course of the review, it became apparent, that within all of the examined documents and the various sources searched for the presence of *Sus* species ('wild boar' or 'pig') skeletal remains on the island of Ireland (and even within Britain) and within the literary historical works, the written reference of what was actually identified varied widely. Such terms included: 'wild boar', 'wild hog', 'hog', 'wild pig', 'pig', '*Sus scrofa*', 'domestic pig', 'boar', 'pig/wild boar', '*Sus* species' and 'feral pigs'.

The term *boar* refers to the adult male of the domestic and wild species and there are both 'boar' and 'pig' tusks mentioned in various reports where such remains have been recovered from associated archaeological excavations. It is unclear if these refer to the domesticated or to the wild forms of *Sus*. The term *wild pig* may refer to, depending on the reference, to feral pigs *i.e.* domestic pigs that have escaped human captivity. Obviously, the varied and prolific usages of these terms have confounded the actual archaeological finds and historical written references as they are very interchangeable depending on the type of publication, year of the work and the author and their associated disciplines. As such these records provide a highly ambiguous record, to say the least, and have ultimately led to the rather subjective interpretation of the presence, or indeed the absence, of this species within the island of Ireland in the various published and unpublished works referenced herein from excavated sites.

5.2 Comparison to Britain

It is useful to compare the situation in Ireland to Britain. The natural history of this species within Britain and throughout most of Europe has been examined to various extents and contexts (see Albarella *et al.* 2007; Albarella *et al.* 2009 and references therein). The earliest known occurrence

of the wild boar in Britain dates back to the Cromerian interglacial (Lower Pleistocene) (Yalden 1999). Further fossil remains are found in the Hoxnian and Ipswichian interglacials and also in the Late Glacial period, although it is not commonly found at that time (Yalden 1999). During the Mesolithic period, when Britain was still connected via a land bridge to the Continent, wild boar, red deer and aurochs were the most common game species found (Yalden 1999). Wild boar remains were relatively infrequent at the Early Mesolithic site of Star Carr, Yorkshire (Legge & Rowley-Conwy 1988) but were abundant at the Early Mesolithic sites of, Thatcham (King 1962) and at Faraday Road, both in Berkshire (Ellis *et al.* 2003), while at Goldcliff East in Wales, a Later Mesolithic/Early Neolithic site, wild boar occur in low numbers relative to deer and aurochs (Scales & Ingrem 2007) (the correct identification of wild boar skeletal remains is presumed).

The relative and changing frequencies of wild boar remains found at Mesolithic sites in Britain suggest a relationship between the species' ecological preferences in relation to environmental conditions and human hunting preferences (Albarella 2010). At the onset of the Neolithic period and with the introduction of the domestic pig to Britain Rowley-Conwy (2003), the archaeological record for wild boar in Britain becomes ambiguous (Albarella 2010). Albarella (2010) suggests that this may be due to a combination of the possible rarity of the wild species, the difficulty in distinguishing between wild and domesticated forms or the frequent interbreeding between the two populations. The skeletal remains of domestic pigs are generally distinguished by their smaller size from the wild boar (van Wijngaarden-Bakker 1974; Yalden 1999).

The Neolithic presence of wild boar in Britain is also very meagre, however some of those sites that authors have said are wild boar may also be domesticated pigs (e.g. at the Neolithic site of Windmill Hill where potentially both wild and domesticated forms are present (Grigson 1982; Clutton-Brock 1989) as the biometric data are within these ranges, and as such these assemblages are being reassessed (e.g. Ascott-under-Wychwood; Mulville & Grigson 2007). Whilst evidence based on a detailed biometric analyses of remains excavated from the Late Neolithic site at Durrington Walls, indicates that the presence of wild boar is very rare at this time, although the presence of the wild form is questionable based upon these data (Albarella & Payne 2005). Indeed, other Late Neolithic sites present similar data and findings (Harcourt 1979; Edwards & Horne 1997). These findings suggest that although wild boar were present in Neolithic Britain, they may have been rare or rarely hunted by Neolithic people (Albarella 2010).

With regards to Bronze and Iron Ages, the evidence for the occurrence of wild boar becomes even scarcer (Yalden 1999; Rowley-Conwy *et al.* 2012). The main livestock within these

periods are cattle and sheep (Maltby 1981), with the latter potentially becoming more important than cattle through the Iron Age in part of England (Cunliffe 1978). The Iron Age site of Lake Village, Glastonbury contained a very rich faunal assemblage, but wild boar were present in few numbers relative to other wild species and domesticated species (Dawkins & Jackson 1917). Within Roman times, either no wild boar remains are found or the occasional large specimen is found amongst numbers of smaller pig bones (e.g. at Exeter, Maltby 1979; at Wroxeter, Hammon 2005).

Domestic pig remains, after sheep/goats and cattle, are regularly part of the faunal assemblages from Saxon period (Medieval) sites (e.g. Hamwic (near modern Southampton) Bourdillon & Coy 1980) and less so during later Medieval and historical archaeological contexts. Wild boar remains are rarely found, if at all, during these periods although Yalden (1999) surmised that this species “must have been present”. Wild boar remains were identified at the Anglo-Scandinavian site of Coppergate, York (O’Connor 1989). Extirpation of wild boar, through over-hunting, in Britain has been postulated by several authors: during the 13th Century (1260; Rackham 1986), the late 13th Century (1295; Shaw 1956) and at the end of the 16th Century (1339-1593; Harting 1880). Hunting of wild boar by the Earls of Oxford at Chalkney Wood, Essex until Henry VIII’s reign was popular until the Earl extirpated the remaining animals due to the extent of damage to agriculture crops caused locally (Rackham 1980; also see Yalden 1999). There is documented evidence of introductions of wild boar from France in 1608 and from Germany in 1611 to Britain and these were held enclosed in parks and other enclosures for specific game hunting purposes (Yalden 1999).

5.3 *Sus* species: 30,000 years BP to the Mesolithic archaeological period in Ireland

Due to the confusing terminology used (see aforementioned section 5.1), for the sake of clarity and ease of terminology the Genus taxonomic level of ‘*Sus* species’ or ‘*Sus*’ will be used within this report instead of ‘wild boar’, ‘wild pig’ or ‘pig’ in the broadest general sense to describe the excavated pig bones from various assemblages throughout the island of Ireland, since whether such remains are ‘wild’ or derived from ‘domesticated’ or interbreeds thereof, is unknown at present.

Although absence of evidence does not equate to evidence of absence and to prove the absence of any species is impossible due to numerous factors that include species’ ecologies, mobility, environmental and habitat variables (Greenwood & Robinson 2006; Krebs 2006) as well

as preservation of the remains themselves, it is noteworthy that after a comprehensive review of published and unpublished data (including Carden (unpublished data) on various reassessments of skeletal remains, including (re)identifications of over 30,000 bone fragments, from 11 large cave assemblages within Ireland) was conducted, no *Sus* species bones or fragments thereof have been (re)identified, to date, prior to the Mesolithic archaeological period in Ireland. Indeed other works have noted the sporadic occurrence of this species on various archaeological sites within Ireland (McCormick 1999; Yalden 1999). If *Sus* species (i.e. wild boar/pig) were present in Ireland prior to the Mesolithic period, perhaps this medium-large sized mammal occurred in somewhat localised and small densities on the island of Ireland and their bones were not preserved in suitable conditions that allowed for survival of the skeletal remains.

Teeth, on the other hand, composed of an external enamel layer are found in a whole or partial state in many assemblages and due to their inherent nature can withstand high temperatures such as those found associated with bones that were subjected to burning/cooking and in some incidences teeth may be found more regularly than bones. On a whole, *Sus* bones are porous in terms of morphology and not all parts of the skeleton (if present) are typically found preserved within many archaeological faunal assemblages. However, age-related factors as well as taphonomic processes (the study of decomposition, burial and preservation processes) will confound this general rule, as well as the possibility that partial skeletons or body parts are only present at the site rather than the whole animal due to butchery practices off-site and/or different kill site to cooking/preparation site. It is apparent that if this was the case and the presence of *Sus* bones (primarily burnt immature bones in Mesolithic contexts) is representative of near to full carcasses that this species may not have formed an integral or perhaps even frequent part of the typical prey within the diet of Mesolithic humans within Ireland. Perhaps this may be due to the relative scarcity of groups/populations of this species on the island and/or the introduction of a small founder population.

Overall, there is a low diversity of faunal species within the Mesolithic archaeological record for the island of Ireland and as such this situation is reflected within the remains of human settlement or occupation sites in terms of the prey items utilised (Yalden 1999; Woodman *et al.* 1999; Woodman & McCarty 2007). *Sus* species remains are scarce and localised in terms of geographic distribution throughout the island of Ireland as inferred by their presence on certain Mesolithic sites, which may be due to a variety of anthropomorphic social and cultural reasons as well as species' ecology and biology in relation to environmental conditions at that time. The

nutritional value derived from one individual *Sus* carcass represents a much greater food value in terms of calorific sustenance than how many thousands of shellfish within the human diet? Therefore, on a cautionary note, when examining the minimum number indices (MNI) of skeletal remains found on sites, which is commonly used by (zoo)archaeologists, and it is recognised within that discipline that the food value (calories) of the species must be considered when interpreting the overall presence of species in terms of the numbers of (partial) skeletal elements found when interpreting the human diet and the exploitation of animal species. Thus, although few skeletal remains may be present on certain archaeological sites, it does not always follow that such species are scarce in the surrounding landscape. These early settlers would have eaten foods that were available locally and hunted/gathered those that returned high food energy for the least expenditure of physical energy. Thus the overall size of a 'wild boar' carcass represented a larger energy source than many smaller sized prey items (e.g. shellfish) and additionally less energy was expended hunting one larger animal than many smaller ones. It is only when larger game becomes scarce do humans resort to developing and using sophisticated techniques to increase chances of trapping smaller animals (e.g. use of nets and hunting traps). The occurrences of *Sus* remains at the Mesolithic Mount Sandel site are derived from numerous dated pits from a period of about 200 years and therefore *Sus* are a consistent presence in the north of Ireland during that time, even though there are few skeletal remains present (Bayliss & Woodman 2009).

Furthermore, much emphasis has been placed on the apparent preponderance, or lack thereof, of *Sus* species skeletal remains within Mesolithic archaeological sites on the island of Ireland relative to those in Britain (e.g. van Wijngaarden-Bakker 1989; McCormick 2004). The comparison of this particular archaeological period between these two islands is unjustified in so far as the number of available prey species that Mesolithic humans could hunt is more diverse within Britain than for the island of Ireland at that time; namely, red deer, aurochs, roe deer, moose and wild boar at, for example, the Early Mesolithic Star Carr site (Legg & Rowley-Conwy 1988). In Ireland, after examining the evidence to date, the largest terrestrial ungulate species within the Mesolithic period is *Sus* species.

There are no deer species present during the Mesolithic period in Ireland (see Carden *et al.* 2012) and while there may have been some occurrence of domestic cattle and sheep at this time, this occurred only at the Late Mesolithic archaeological site of Ferriter's Cove, Co. Kerry (Woodman *et al.* 1999), although these occurrences at this site may be due to an intrusion of an otherwise unidentified activity of Neolithic age (Woodman & McCarthy 2003; Woodman pers.

communication 2012). Furthermore, not all Mesolithic archaeological sites that contain faunal material have *Sus* remains (see Table 2) and therefore the occurrence of *Sus* on these sites could be considered as relatively scarce (Yalden 1999); notwithstanding previous reasons stated for relatively lack of such remains. Taking the island of Ireland as its own unique landmass and associated faunal species rather than comparing to Britain, the predominant diet of Mesolithic humans, as evident from the skeletal remains found, was based upon marine and freshwater elements which included fish, shellfish, marine mammals (usually seals) and some wildfowl that was supplemented in certain regions on the island of Ireland (e.g. seasonal occupations and activities) by the inclusion of highly nutritious carcasses of *Sus* species. The *presence* of the *Sus* skeletal remains is of interest and the focus within this review at these Mesolithic and other archaeological periods, rather than the actual quantity of these remains at these sites.

On Mesolithic archaeological sites, wild *Sus* bones have been recorded on Mount Sandel, Co. Antrim but few, if any stone scrapers were found at this site, suggesting that there were few tools to process *Sus* (or animal) skins. Since red deer were absent from the Mesolithic period of Ireland (see Carden *et al.* 2012), tools such as burins that would have been used to modify the antlers, the question arises as to why there are very few scrapers present at say Mount Sandel to process animal skins such as those from *Sus*? Several fish species and birds skeletal remains were found at Mount Sandel along with the only mammalian bone (*Sus* sp.). Could it be possible that young piglets were imported (live or joints of meat cuts) rather than hunting of resident *Sus* species on the island? While this is a possibility, another equally plausible scenario is that other stone tools (such as stone knives) were presumably used instead of the traditional scrapers to process the animal hides. The presence of other terrestrial mammals has been recorded on various Mesolithic archaeological sites on the island of Ireland, for example, at Moynagh Lough, Co. Meath: hare (*Lepus* sp.), otter (*Lutra lutra*) and bear (*Ursus arctos*); Ferriter's Cove, Co. Kerry: hare, domestic cattle (*Bos* sp.), dog (*Canis* sp.); Dalkey Island, Co. Dublin: brown bear, seal (*Phoca* sp.), dog, domestic cattle, domestic sheep. Obviously these animal skins would have to be processed in some form or another, if they were to serve a purpose(s).

It is not until the Neolithic archaeological period that we see the fauna of Ireland increase in terms of the number of species identified within faunal assemblages, such as within the large assemblage at Newgrange, Co. Meath (van Wijngaarden-Bakker 1986; Woodman & McCarthy 2003).

Considering the evidence to date of the apparent absence of *Sus* species within the palaeontological records for the island of Ireland since 30,000 years BP to the early Holocene period and the appearance of the first *Sus* skeletal remains on Mesolithic archaeological human settlement/occupation sites from c.9,000 years BP, infers that early human colonisers to this island deliberately introduced this species (Adams 1883; see also Woodman & McCarthy 2003).

5.4 Mesolithic and Neolithic archaeological periods

Historically the distribution of wild boar in the northern hemisphere has been heavily influenced by anthropogenic factors (Rosvold *et al.* 2010). Prehistoric remains of wild boar are difficult to distinguish from early domestic pigs based on skeletal morphology. Wild boar and domestic pigs interbreed and produce hybrids and early pigs would have looked quite similar to wild boar.

If other domestic species (cattle and sheep/goats) were brought to Ireland during the Neolithic and perhaps even during the Late Mesolithic archaeological periods, then so presumably were *Sus* species. Certainly there were interconnections between the island of Ireland and its nearest landmass, Britain, as evidenced within the archaeological and faunal records (see McDevitt *et al.* 2011; Carden *et al.* 2012).

Van Wijngaarden-Bakker (1986) suggests wild boar were extirpated in Ireland during the Neolithic, possibly due to habitat loss and human-mediated affects such as hunting. However, the archaeological record does not provide such a clear-cut result as the introduction of domesticated pigs occurs during the Neolithic period throughout much of Europe, and probably Ireland. The evidence for the presence (or indeed absence) of wild boar in Ireland is rather confusing and by no means transparent or straightforward. This is further compounded by the lack of Neolithic assemblages, other than Newgrange, that are in a secure stratigraphic context.

During the course of conducting this review it became apparent that various reports published and other works, more often than not, do not specifically refer to domestic pigs or wild boar (or even wild/feral pigs), rather the term ‘pig’ is often used to describe *Sus scrofa* skeletal remains from archaeological assemblages. This is not surprising given the difficulties associated in the discrimination between wild boar, wild/feral pigs and domestic pigs (as well as their crossbreds) skeletal remains, which are often highly fragmentary as humans used them for meat. Certainly the use of various morphometric and other techniques (see Rowley-Conwy *et al.* 2012) can yield some interesting patterns and trends within faunal assemblages, however such methods to distinguish wild from domesticated *Sus* are limited due to the interbreeding history of pig

populations and therefore results are only meaningful if analysis is conducted on relatively large assemblages (Payne & Bull 1988). Moreover, what is equally confusing is the assumed presence of wild boar based on the discovery of ‘pig bones’ on certain sites, such as those of the Mesolithic and Neolithic periods, as such finds would apparently seem logical due to the current thinking and theories of that time (decades if not centuries ago); there is a possibility that these remains are domestic pigs or interbreeds of wild and domesticated forms.

5.5 Bronze Age, Iron Age, Medieval and Recent Historical archaeological periods

From the review of the available archaeological sites which contained *Sus* remains within Ireland, the occurrence of bone and teeth remains are more prolific at various contexts and site types from the Bronze Age throughout the island (see Tables 5-7). Teeth (large tusks) of *Sus* were found associated with some Bronze Age and Medieval human burials and potentially had some ritualistic association with the next world after death.

Generally, within these time periods, *Sus* remains are reported as ‘pig bones’ within the majority of the works reviewed. Whether the usage of this term rather than ‘domestic pig’ or ‘wild boar’, represents the authors’ awareness with regards to the assumed presence of domestic pig breeds rather than wild boar or not is inconclusive. Or equally possible, the authors’ cannot differentiate between the wild and domesticate variants and therefore assignation of a generic term of ‘pig bones’ to *Sus* remains is accepted. In some instances, ‘wild boar’ is assigned based on the specimen’s subjective larger size relative to other remains present. However, these identifications remain inconclusive at present and should not be taken literally until further applied analyses have been conducted. Such analyses may potentially shed further light on whether ‘wild boar’ were present on the island of Ireland at that time either representing continuous presence since Mesolithic times or a reintroduction(s) by humans pre- and during the Bronze Age, or such *Sus* remains are domesticated ‘wild boar’ or represent hybrids between domesticated and wild varieties.

Throughout the Early Medieval period, the livestock economy was based primarily on cattle and secondarily on pigs, followed by sheep and goats playing a very minor role (O’Sullivan *et al.* 2010) and pigs were commonly kept in towns during the Later Medieval period (Cantwell 2001). Domesticated pigs were commonly found during these times and whether or not ‘wild boar’ were found within the wilds of Ireland is uncertain, although current evidence to suggest this is weak or at the very least ambiguous.

The Irish ‘greyhound pig’ breed, or the ‘turf-pig’, is specifically referenced within the sources reviewed and comments on certain archaeological skeletal remains from Neolithic through to recent historical archaeological contexts including numerous mentioned at various Medieval sites. The exact history of this breed has not been forthcoming during this review. Scharff (1917), in his review of this breed, describes it as a ‘tall, long-legged heavy-eared and coarse-haired pig that had long heads and bodies, prominent ears and was a greyish colour’, which apparently was confined to Co. Galway (Clare Island, Achill Island, Ballina and Rossmuck) and possibly also occurred in Co. Wicklow up until the mid-1800s. Wilde (1854) describes this breed as ‘tall, leggy, arched on the back and remarkably long in the head with huge pendant ears falling over the sides of its face’. It apparently was ‘exceedingly fleet’ and ‘celebrated for its cunning’. Pendulous wattles hung down at its throat/corners of jaw (these features are usually found on feral pigs of free ranging wild boar).

While the domestic pig was already spread far and wide over Ireland an apparently wild pig (*fiadhmuic*) abounded in the woods and forests. Other textual references pertain to wild pigs in early writings and they coexisted in Ireland with their domesticated relative since very remote times until about the 17th century. Cambrensis during his 12th Century visit to Ireland, describes small, misshapen and wary pigs (Cambrensis 1183-1185), these may have been in reference to the so called ‘greyhound pig’ or a feral (domestic) pig of some sort.

Scharff (1917) thought that the ‘greyhound pig’ may either have been a large modified type of the old ‘turf-pig’ or possibly a cross between the latter and ‘wild boar’, although there is no direct evidence of this at present. The ‘turf-pig’ is very different to the ‘wild boar’ and is also abundant in Quaternary deposits; the ‘turf pig’ appears to have no ancestors although it was considered allied with Asian wild swine by De Mortillet (1879). There have been references within archaeological reports from various sites within Ireland of slender build pig bones which some authors equate to the more active breeds and that of the ‘greyhound pig’, that were supposedly found in Ireland in earlier times and into the middle ages (Jope 1952; Proudfoot *et al.* 1953; Jope 1954; van Wijngaarden-Bakker 1986).

5.6 Literary and folklore evidence of wild boar in Ireland

Place-name studies can provide important information about the ancient biogeography of animal species and locality names indicate strong human connections (Gelling 1987; Aybes & Yalden 1995; Yalden 1999, 2002; Cox *et al.* 2002). However, such associations between place-names and

the former existence of extinct animals may also be metaphorical and lack evidence of definite associations due to legendary and symbolic connotations (Rackham 1986). Within place-name evidence in Britain, it is difficult to distinguish between wild boar and domestic swine (Aybes & Yalden 2008) and this is probably similar, if not more difficult in Ireland due to the use of the various Irish language dialects (Celtic and Gaelic) and mythical associations with Gaelic place-names as has been found in Britain (Watson & Allan 1984).

For example, the name *Lostford* in Britain, indicated that the lynx (*Lynx lynx*) did not become extirpated several millennia ago, as previously believed, but rather that this species survived into the Anglo-Saxon period (Gelling 2006). This was corroborated by radiocarbon dating of lynx remains recovered from two caves in Yorkshire which proved that the lynx was extant in Britain until at least the 6th/7th Century (Hetherington 2010). However, in the case of using place name evidence (Old English **pohha* or **pocca* ‘fallow deer’) indicating that fallow deer were introduced to Britain during pre-Norman times, the evidence has been shown to be highly questionable as there is no supporting zooarchaeological data (skeletal remains) (see Sykes & Carden 2011). Further research into the origins of Irish place-names that appear to derive from ‘wild boar’ (e.g. Kanturk (boar’s head), Co. Cork or Drumhallagh (hill of the wild boar), Co. Donegal) is required.

Furthermore, mythological stories involving the Fianna war band are replete with tales of chasing magic boars and boar hunts during the Iron Age and Early Historic times, and this literary and artistic ‘evidence’ has been interpreted that wild boar hunting was a major part of the cultural and socio-economic aspects of these societies (Rowlett 1994). Based on place-names of localities within Ireland and mythological tales, such lines of ‘evidence’ cannot be relied upon to indicate the past presence of wild boar on the island of Ireland due to the lack of supporting zooarchaeological data from verified wild boar skeletal remains from throughout earlier archaeological time periods to more recent historical times.

Therefore, certain caution must be exercised and place-names thoroughly studied with regards to the parent(s) language used. The use of place-names’ meanings and derivations to substantiate an argument for presence, or equally absence, of a species at a certain time and place does not always provide conclusive evidence of that species actually being present or that the locality is named as such due to the previous or current presence of a species. Such information should always be examined in conjunction with the zooarchaeological and paleontological evidence.

5.7 Genetics and biometrical data

No discrimination based upon statistical analysis of bone and dental measurements has been systematically performed, to date, on *Sus* species bone remains found within archaeological contexts on the island of Ireland - therefore the question of when the 'wild boar' extirpated on the island of Ireland is unknown and whether the original introduction was of pure 'wild boar' or domestic pig, or an interbreed of the two variants remains unknown at present. Certainly, based upon all data, archaeological records and resources examined within this comprehensive review, the date or archaeological time period of when the domestic pig or wild boar arrived and disappeared (if present at all in pure wild form) is unknown. As recent studies on other Irish mammals have highlighted, to gain further robust knowledge on the natural history of species in terms of presence/absence and/or introductions within certain geographic areas, a multidisciplinary approach is required. Such studies utilise various techniques such as molecular based methods, biometric and other data and comprehensive reviews of palaeontological and archaeological records (e.g. the pygmy shrew (McDevitt *et al.* 2011) and the red deer (Carden *et al.* 2012)).

Two relatively recent reviews on the domestication and natural history of wild boar have been published by Larson *et al.* (2007) and Scandura *et al.* (2011). Larson *et al.* (2007) found evidence of the arrival of Near Eastern domestic pigs in Europe during the Neolithic; although they used one molecular marker and available biometric data (excluding Ireland). In addition, they found evidence that suggested that by at least 6,000 years BP (the Late Mesolithic archaeological period), European wild boar had been domesticated and that they had rapidly spread throughout Europe, replacing pigs of Near Eastern origins to become the dominant lineage within European domestic *Sus* species. However, there may also be underlying geographic patterns associated with the recolonisation from glacial refugia that may be influencing patterns that Larson *et al.* found in their study (see Scandura *et al.* 2008; Scandura *et al.* 2011).

Included within the study by Larson *et al.* (2007) were three Irish archaeological *Sus* samples that yielded valid ancient mitochondrial DNA sequences: Kilgreany Cave (Mesolithic), Moynagh crannóg (Early Neolithic) and Newgrange (Neolithic). The study assumed that the Irish pre-Neolithic archaeological samples were 'wild boar' and previously van Wijngaarden-Bakker (1974) had assigned the Newgrange bones to the domestic pig category. By examining Larson *et al.* (2007) results in conjunction with those of Scandura *et al.* (2011) a few interesting theories and conclusions can be postulated. The available ancient genetic results do not discriminate between wild and domestic breeds of *Sus* species. Multiple genetic markers are required to even attempt

this type of classification. From these two studies, it does appear that during the pre-Neolithic archaeological period, both European lineages were present throughout Europe (see Larson *et al.* 2007 and Scandura *et al.* 2011 for further details). The A-side European lineage becomes more predominant in the Neolithic archaeological period than the C1-side lineage, and the A-side is largely found on islands which are of significance and interest - illustrating that humans have directly influenced the phylogeographic signal of this important livestock animal. Therefore these results do suggest a European domestication that was independent of the Near Eastern domestication of pigs. The examination of the three Irish genetic sequences does suggest that the Mesolithic sample (Kilgreany Cave) was a bone from a non-domesticated wild boar, whereas the two Neolithic bone samples (Moynagh crannóg and Newgrange) were probably derived from domesticated wild boar/pig. Thus, there is a case to suggest that the 'wild boar' were replaced by 'domesticated' forms during the Neolithic archaeological period within Ireland. However, it must be noted that this interpretation is inferred from these studies which are based on small sample sizes of *Sus* species bones from Ireland, primarily the maternal genetic lineage (mitochondrial DNA) and the lack of multiple genetic markers used within these published works. Obviously further detailed multidisciplinary research is required to thoroughly investigate this theory and the Mesolithic-Neolithic transition within Ireland in terms of possible introduction(s) of domesticated *Sus* species.

6.0 Conclusions

The origin and timing of the presence of 'wild boar' onto the island of Ireland are contentious topics. Arguments have centred on whether wild boar were present in Ireland before humans arrived (i.e. Late Pleistocene period) or were introduced at some stage when or post-human settlement during the Mesolithic archaeological period and/or later. Previous works have suggested that wild boar were native to our island, whilst others suggested that the wild boar were extirpated during the Neolithic archaeological period or even in more recent historical times.

The stated positions with regards to the native status and extirpated events in previous works, which have not comprehensively reviewed the natural history of this species on the island of Ireland, have influenced the relative willingness by modern society to accept commonly held belief that this species was native to Ireland on face value. This may be in part due to the actual presence of tangible zooarchaeological evidence (i.e. numerous skeletal remains) in various archaeological sites and contexts.

Evidence collated at this time indicates that the identified *Sus* ('wild boar') skeletal remains are not present on the island of Ireland prior to human settlement during the Mesolithic archaeological period. However, from the Mesolithic period onwards, the history of the presence of wild boar in Ireland is poorly understood and is obfuscated by linguistic and zooarchaeological evidence, which are ambiguous when it comes to determining the timing of the extirpation of wild boar and the first introduction of domesticated pig on this island due to the method of reporting such remains and lack of biometrical and other analysis.

Although certain zooarchaeological and genetic data suggests that the timing of the extirpation of the 'wild boar' on the island occurred during the Mesolithic-Neolithic transition and/or during the Neolithic archaeological period approximately 5,000 years BP, the evidence does not rule out subsequent (re)introductions of 'wild boar' during or after these time periods, as many livestock species such as cattle, sheep, goats as well as red deer were introduced during the Neolithic period and thereafter.

This review has taken the available evidence as far as it can go. To advance the study and obtain a more detailed understanding of the natural history of the wild boar/domestic pig, further extensive molecular analysis and examination of the maternal and paternal genetic lines is required in conjunction with other scientific techniques including subjecting remains from throughout the archaeological period to an extensive radiocarbon dating programme in addition to the reassessment of the zooarchaeological remains in order to document changes at both temporal and spatial scales within the island of Ireland.

7.0 Acknowledgements

This work was funded by the Northern Ireland Environment Agency (NIEA), National Parks and Wildlife Service, Ireland (NPWS) and the Education and Outreach Department of the National Museum of Ireland. I am particularly grateful for useful discussions with a number of people during the course of this review, in particular: Peter Woodman, Marion Dowd, Ned Kelly, John Maas, Steven McDowell, John Early, John Kelly, Colette O'Flynn, Daniel Buckley and Allan McDevitt.

8.0 References

- Addams AL (1883). Report on the history of Irish fossil mammals (abridgment of the Report). *Proceedings of the Royal Irish Academy. Science*, 3: 89-100.
- Albarella U (2010). Wild boar. In: O'Connor T, Sykes N (eds), *Extinctions and Invasions: A social history of British fauna*, pp. 59-67. Oxbow Books, Oxford, UK.
- Albarella U, Dobney K, Ervynck A, Rowley-Conwy P (2007). *Pigs and humans: 10,000 years of interaction*. Oxford University Press, Oxford, UK.
- Albarella U, Dobney K, Rowley-Conwy P (2009). Size and shape of the Eurasian wild boar (*Sus scrofa*), with a view to the reconstruction of its Holocene history. *Environmental Archaeology* 14:103-136.
- Albarella U, Payne S (2005). Neolithic pigs from Durrington Walls, Wiltshire, England: a biometrical database. *Journal of Archaeological Science* 32: 589-599.
- Alves PC, Pinheiro I, Gohinho R, Vicente J, Gortazar C, Scandura M (2010). Genetic diversity of wild boar populations and domestic pig breeds (*Sus scrofa*) in south-western Europe. *Biological Journal of the Linnean Society* 101: 797-822.
- Apollonio M, Andersen R, Putman R (Eds.) (2010). *European ungulates and their management in the 21st Century*. Cambridge University Press.
- Aybes C, Yalden DW (1995). Place-name evidence for the former distribution and status of wolves and beavers in Britain. *Mammal Review* 25: 201-227.
- Barrett-Hamilton GEH (1895). Irish mammals. *The Irish Naturalist* 4: 65-72.
- Barry T (1981). Archaeological excavations at Dunbeg promontory fort, County Kerry: 1977. *Proceedings of the Royal Irish Academy* 81C: 295-330.
- Batt NG (1889). The priory and castle at Rathmullen, Co. Donegal. *The Journal of the Royal Historical and Archaeological Association of Ireland, Fourth Series*. 9: 42-43.
- Bayliss A, Woodman P (2009). A new Bayesian chronology for Mesolithic occupation at Mount Sandel, Northern Ireland. *Proceedings of the Prehistoric Society* 75: 101-123.
- Bökönyi S (1974). *History of domestic mammals in Central and Eastern Europe*. Akadémiai Kiadó, Budapest.
- Bourdillon J, Coy J (1980). The animal bones. In: Holdsworth P (ed.), *Excavations at Melbourne Street, Southampton 1971-76*, pp. 79-121. *CBA Research Report* 33.
- Bourke C (1986). 'Newtownlow'. In: C. Cotter (ed.), *Excavations 1985*. Irish Academic Publications, Dublin, 40.
- Bourke C (1997). 'Newtownlow'. In: C. Cortter (ed.), *Excavations 1986*. Wordwell Ltd., Dublin, 37.
- Bradley J (1991). Excavations at Moynagh Lough, County Meath. *The Journal of the Royal Society of Antiquaries of Ireland* 121: 5-26.
- Brannon NF (1981/1982). A rescue excavation at Lisdoo Fort, Lisnaskea, County Fermanagh. *Ulster Journal of Archaeology* 44/45: 53-59.
- Buick GR (1894). The crannog of Moylarg (second paper). *The Journal of the Royal Society of Antiquaries of Ireland Fifth Series* 4: 315-331.
- Burenhult G (1984). *The Archaeology of Carrowmore*. Stockholm, Sweden.
- Butler V (2005). Animal bones. In: O'Sullivan M, *Duma na nGiall Tara. The Mound of the Hostages*. Wordwell books, Bray, Co. Wicklow.
- Cambrensis G (1183-1185). *The history and topography of Ireland*. Translated by J. O'Meara (1982), Penguin Books, London.
- Cantwell I (2001). Anthropozoological relationships in Late Medieval Dublin. *Dublin Historical Record* 54: 73-80.

- Carden RF, Lewis H (2010). Preliminary assessment of the archive of faunal remains from excavated Irish cave sites. Unpublished report, The Heritage Council, Kilkenny, Ireland (Heritage Research Grant Scheme no. R00359).
- Carden RF, McDevitt AD, Zachos FE, Woodman PC, O'Toole P, Rose H, Monaghan NT, Campana MG, Bradley DG, Edwards CJ (2012). Phylogeographic, ancient DNA, fossil and morphometric analyses reveal ancient and modern human introductions of a large mammal: the complex case of red deer (*Cervus elaphus*) in Ireland. *Quaternary Science Reviews* 42: 74-84.
- Carroll F (1992). Some finds on the Sillees River around Ross lough, Co. Fermanagh. *Clogher Record* 14: 109-131.
- Carroll J (1998). Rathfarnham, The Old Orchard Inn. *Medieval Archaeology* 42: 161.
- Chapple, RM (2011). Catalogue of radiocarbon determinations & dendrochronology dates (March 2011 version). Oculus Obscura Press, Belfast.
- Clark CD, Hughes ALC, Greenwood SL, Jordan C, Sejrup HP (2010). Pattern and timing of retreat of the last British-Irish Ice Sheet. *Quaternary Science Reviews* doi:10.1016/j.quascirev.2010.07.019.
- Clark, P.U., Dyke, A.S., Shakun, J.D., Carlson, A.E., Clark, J., Wohlfarth, B., Mitrovica, J.X., Hostetler, S.W., McCabe, A.M., 2009. The Last Glacial Maximum. *Science* 325, 710-714.
- Cleary RM (1995). Later Bronze Age settlement and prehistoric burials, Lough Gur, Co. Limerick. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 95C: 1-92.
- Clutton-Brock J (1999). *A natural history of domesticated mammals*. Cambridge University Press, UK.
- Clutton-Brock J. (1989). Five thousand years of livestock in Britain. *Biological Journal of the Linnean Society* 38: 31-37.
- Coffey G (1898). On a cairn excavated by Thomas Plunkett, M.R.I.A., on Belmore Mountain, Co. Fermanagh. *Proceedings of the Royal Irish Academy* (1889-1901), Vol. 4 (1896 - 1898): 659-666.
- Coffey G (1906). Craigyarwarren crannog. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 26C: 109-118.
- Collins AEP (1954). The excavation of a double horned cairn at Audleystown, Co. Down. *Ulster Journal of Archaeology* 17: 53-56.
- Cooney G, Bayliss A, Healy F, Whittle A, Danaher E, Cagney L, Mallory J, Symth J, Kador T, O'Sullivan M (2011). Ireland. In: Whittle A, Healy F, Bayliss A. *Gathering time: Dating the Early Neolithic enclosures of southern Britain and Ireland*. Oxford. Pp 562-669.
- Corbet GB (1961). Origin of the British insular races of small mammals and of the 'Lusitanian' fauna. *Nature* 191: 1037-1040.
- Cotter C (1996). Dún Eoghanachta, Eoghanacht, Inis Mór. In: I. Bennett (Ed.) *Excavations 1995*. Wordwell Ltd., Bray.
- Cox JJ, Maehr DS, Larkin JL (2002). The biogeography of faunal place names in the United States. *Conservation Biology* 16: 1143-1150.
- Cunliffe B (1978). *Iron Age communities in Britain*. Revised edition. Routledge and Kegan Paul, London.
- Davies O (1939). Excavation at the horned cairn at Aghanaglack, Co. Fermanagh. *Journal of the Royal Society of Antiquaries of Ireland* 69: 21-38.
- Davies O, Paterson TGF (1936/7). Excavations at Clontygora Large Cairn, Co. Antrim. *Proceedings of the Belfast Natural History Philosophical Society* 20-42.
- Dawkins WB, Jackson JW (1917). The remains of the Mammalia found in the Lake Village of Glastonbury, pp. 641-672 in A. Bulleid and A St.G. Gray (eds) *The Glastonbury Lake Village*. Glastonbury Antiquarian Society, Taunton.
- De Mortillet G (1879). The origin of the domestic animals. *The American Naturalist* 13: 747-753

- Deevey MB, Murphy D (eds.) (2009). Places along the way: first findings on the M3. Dublin.
- Dowd MA (2002). Kilgreany, Co. Waterford: biography of a cave. *The Journal of Irish Archaeology* XI: 77-97.
- Dowd MA (2009). Middle and Late Bronze Age ritual activity at Glencurran Cave, Co. Clare. Pp 89-100. In: *From Bann flakes to Bushmills: papers in honour of Professor Peter Woodman*. (Eds) N Finlay, S McCartan, N Milner, Wickham-Jones C. Prehistoric Society Research Paper I. Oxbow Books, UK.
- Eachtra (2010). Archaeological Excavation Report 04E0750 - Castledermot Town, Co. Kildare. Medieval town walls and cemetery. Issue 7, August 2010
- Eachtra (2010). Archaeological excavation report E3770 - Owenbristry, co. Galway. Cashel and Burial Ground. *Eachtra Journal* Issue 8, October 20.
- Eachtra (2010). Archaeological excavation report E3826 - Caherweelder 7, Co. Galway. Iron Working site. *Eachtra Journal* Issue 8, October 20.
- Edwards A, Horne M (1997). Animal bone. In: Whittle A (ed.), Sacred mound, holy rings. Silbury Hill and the West Kennet palisaded enclosures: a later Neolithic complex in Northern Wilshire. *Oxford Monograph* 74: 117-129.
- Elder S (2009) Report on the archaeological excavation of Castletown Tara 2, Co. Meath. Unpublished Stratigraphic Report. ACS Ltd.
- Ellis C, Allen MJ, Gardiner J, Harding P, Ingreem C, Powell A, Scaife R (2003). An early Mesolithic seasonal hunting site in the Kennet Valley, Southern England. *Proceedings of the Prehistoric Society* 69: 107-136.
- Eogan G (1968). Excavations at Knowth, Vol. 1. *Royal Irish Academy Monographs in Archaeology* I.
- Evans EE (1953). Lyles Hill: a late Neolithic site in Co. Antrim. HMSO, Belfast, UK.
- Evans EE, Davies O (1933/4). Excavations of a chambered horn cairn at Ballyalton, Co. Down. *Proceedings of the Belfast Natural History Philosophical Society* 79-104.
- Fairley JS (1984). *An Irish beast book: a natural history of Ireland's furred wildlife*. Blackstaff Press, Belfast.
- Frantz A, Massei G, Burke T (2012). Genetic evidence for past hybridisation between domestic pigs and English wild boars. *Conservation Genetics* DOI 10.1007/s10592-012-039-1.
- Frazer W (1879). Description of a great sepulchral mound at Aylesbury road, near Donnybrook, in the County of Dublin, containing human and animal remains, as well as some objects of antiquarian interest, referable to the tenth or eleventh centuries. *Proceedings of the Royal Irish Academy. Polite Literature and Antiquities* 2 (1879-1888): 29-55.
- Gelling M (1987). Anglo-Saxon eagles. *Leeds Stud England* 18: 173-181.
- Gelling M (2006). The place-names of Shropshire V. English Place-Name Society, Nottingham.
- Goulding MJ (2001). Possible genetic sources of free-living wild boar in southern England. *Mammal Review* 31:245-258.
- Goulding MJ, Roper TJ (2002). Press responses to the presence of free-living wild boar (*Sus scrofa*) in southern England. *Mammal Review* 32: 272-282.
- Goulding MJ, Roper TJ, Smith GC, Baker SJ (2003). Presence of free-living wild boar *Sus scrofa* in southern England. *Wildlife Biology* 9 (Suppl. 1): 15-20.
- Gowen M (1988). Three Irish gaslines: new archaeological evidence in Munster. Dublin.
- Gowen M (1992). Excavations of two souterrain complexes at Marshes Upper, Dundalk, Co. Meath. *Proceedings of the Royal Irish Academy Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 92: 55-121.
- Greenwood JJD, Robinson RA (2006). Principles of sampling. In: Sutherland WJ (ed.) *Ecological Census Techniques: A Handbook*, 11-86. Cambridge University Press, Cambridge, UK.

- Grigson C (1982). Porridge and pannage: pig husbandry in Neolithic England, pp. 297-314 in M. Bell, G. Grigson and S. Payne (eds) *Ageing and Sexing animal bones from archaeological sites*. BAR British Series 109. Oxford.
- Grogan E (1984). Excavation of an Iron Age burial mound at Furness. *Journal of the Kildare Archaeological Society* 16: 298-316.
- Groves C (2007). Current views on taxonomy and zoogeography of the genus *Sus*. In: Alberalla U, Dobney K, Ervynck A, Rowley-Conwy P (eds), *Pigs and Humans: 10,000 years of interaction*, pp. 15-29. Oxford University Press, Oxford, UK.
- Hackett W (1853). Folk-Lore.No. 1.Porcine Legends.*Transactions of the Kilkenny Archaeological Society* 2:303-310.
- Hammond A (2005). *Romano-British – Early Medieval socio-economic and cultural change: analysis of the mammal and bird bone assemblages from Roman city of Viroconium Cornoviorum, Shropshire*. Unpublished PhD thesis, University of Sheffield, UK.
- Harcourt R (1979). The animal bones. In: Wainwright GJ (ed.), Mount Pleasant, Dorset: Excavations 1970-1971. *London Society of Antiquaries, Reports of the Research Committee* 37: 214-223.
- Harnett WF (1957). Excavation of a Passage Grave at Fourknocks, Co. Meath. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 58C: 179-277.
- Harting JE (1880). *British animals extinct with historic times*. Trubner, London.
- Hencken H O'N, Movius HL (1934). The cemetery cairn at Knockast. *Journal of the Royal Society of Antiquaries of Ireland* 65: 191-222.
- Hencken H, Price L, Start LE (1950/51). Lagore Crannog: An Irish royal residence of the 7th to 10th Centuries A.D. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 53: 1-247.
- Herity M (1974). *Irish Passage Graves*. Dublin, Ireland.
- Hetherington DA (2010). The Lynx, pp. 75-82. In: T O'Connor & NJ Sykes (eds) *Extinctions and invasions: A social history of British fauna*. Windgather, Oxford.
- Invasive Species Ireland (2011a). *Policy position statement on wild boar (Sus scrofa) and hybrids in Ireland and Northern Ireland*. Invasive Species Ireland, published online 18/11/2011: http://invasives.biodiversityireland.ie/wp-content/uploads/Wild-Boar-Position-Statement_151111.pdf
- Invasive Species Ireland (2011b). Invasive Species Action Plan: *Wild boar (Sus scrofa)*. *Invasive Species Ireland*, published online November 2011: <http://invasives.biodiversityireland.ie/wp-content/uploads/Wild-Boar-ISAP-15112011.pdf>
- Irish Archaeological Consultancy (2010).N18 Gort to Crusheen Road Scheme.Curtaun 1 and 2. E3721.
- Jope M (1952). Animal bones from Carrickfergus Castle bridge-pit. In: Waterman DM, Excavations at the entrance to Carrickfergus Castle, 1950. *Ulster Journal of Archaeology* 15: 103-118.
- Jope M (1954). Animal remains from Clough Castle. In: Waterman DM, Excavations at Clough Castle, Co. Down. *Ulster Journal of Archaeology* 17: 150-156.
- Jope M (1954). Animal remains from the chambers in the Audleystown cairn. In: Collins AEP, The excavation of a double horned cairn at Audleystown, Co. Down. *Ulster Journal of Archaeology* 17: 53-56.
- Jope M (1955). The animal remains. In: Collins AEP, Excavations in Lough Faughan crannog, Co. Down, 1951-52. *Ulster Journal of Archaeology* 15: 77-82.
- Jope M (1960). The Mollusca and animal bones from the excavations at Ringneill Quay. In: Stephens N, Collins AEP, The Quaternary deposits at Ringneill Quay and Ardmillan, Co.

- Down. *Proceedings of the Royal Irish Academy Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 61C: 65-77.
- Jope M (1961-1962). Animal remains from Larrybane promontory fort, Co. Antrim. In: Proudfoot VB, Wilson BCS, Further excavations at Larrybane promontory fort, Co. Antrim. *Ulster Journal of Archaeology* 24-25: 91-115.
- Kelly F (1997). *Early Irish farming*. Dublin Institute for Advanced Studies, Dublin, Ireland.
- Kerr T, Harney L, Kinsella J, O'Sullivan A, McCormick F (2010). Early Medieval dwellings and settlements in Ireland. AD400-1100. Vol. 2: Gazetteer of site descriptions. Dublin.
- Kilbride-Jones HE (1939). The excavation of a composite tumulus at Drimnagh, Co. Dublin. *Journal of the Royal Society of Antiquaries of Ireland* 69: 190-220.
- King JE (1962). Report on animal bones. Excavations at the Maglemosian sites at Thatcham, Berkshire, England, pp. 335-361. Wymer J (ed.). *Proceedings of the Prehistoric Society* 28: 329-361.
- Knowles WJ, Newton ET (1891). Second report on the prehistoric remains from the sandhills of the coast of Ireland. *Proceedings of the Royal Irish Academy* (1889-1901), 1 (1889-1891): 612-625.
- Krebs C (2006). Mammals. In: Sutherland WJ (ed.) *Ecological Census Techniques: A Handbook*, 351-369. Cambridge University Press, Cambridge, UK.
- Kurtén B (1968). *Pleistocene mammals of Europe*. Aldine Transaction, A Division of Transaction Publishers, Rutgers, USA.
- Larson G, Albarella U, Dobney K, Rowley-Conwy P, Schibler J, Tresset A, Vigne J-D, Edwards C, Schlumbaum A, Dinu A, Balasescu A, Dolman G, Tagliacozzo A, Manaseryan N, Miracle P, van Wijngaarden-Bakker L, Masseti M, Bradley D, Cooper A. (2007). Ancient DNA, pig domestication, and the spread of the Neolithic into Europe. *Proceedings of the National Academy of Sciences of the United States of America* 140: 15276-81.
- Larson G, Dobney K, Albarella U, Fang M, Matisoo-Smith E, Robins J, Lowden S, Finlayson H, Brand T, Willerslev E, Rowley-Conwy P, Andersson L, Cooper A (2005). Worldwide phylogeography of wild boar reveals multiple centres of pig domestication. *Science* 307: 1618-21.
- Leaper R, Massei G, Gorman ML, Aspinall R (1999). The feasibility of reintroducing wild boar (*Sus scrofa*) to Scotland. *Mammal Review* 29: 239-259.
- Leask HG, Price L (1936). The Labbacallee megalith, Co. Cork. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 43C: 77-101.
- Legge AJ, Rowley-Conwy PA (1988). Star Carr revisited. A re-analysis of the large mammals. Birkbeck Coll., London, UK.
- Lehane J, Muñiz Perez M, O'Sullivan J, Wilkins B (2010). Three cemetery-settlement excavations in County Galway at Carrowkeel, Treanbaun and Owenbristy. In: Corlett C & Potterton M (eds.) *Death and burial in Early Medieval Ireland in the light of recent archaeological excavations*. Dublin. Pp139-156.
- Liversage D (1958). An island site at Lough Gur. *The Journal of the Royal Society of Antiquaries of Ireland* 88: 67-81.
- Lucas AT (1963). National Museum of Ireland Archaeological Acquisitions in the Year of 1961. *Journal of the Royal Society of Antiquaries of Ireland* 93: 115-133.
- Macalister RAS, Armstrong ECR, Praeger RL (1912). Report of the exploration of the Bronze Age cairns at Carrowkeel Mountain, Co. Sligo. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 29C: 311-347.
- Macalister RAS, Praeger RL (1931). The excavation of an ancient structure on the townland of Togherstown, Co. Westmeath. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 39C: 54-83.
- Mallory J (1995). Haughney's Fort: Macha's other twin? *Archaeology Ireland* 9: 28-30.

- Mallory JM (1995). Haughey's Fort and the Navan complex in the Late Bronze Age. In: Waddell J, Twohig ES (eds), *Ireland in the Bronze Age*, pp. 73-86. *Proceedings of the Dublin Conference, April 1995*.
- Maltby M (1979). Faunal studies on urban sites. The animal bones from Exeter 1971-1975. Exeter Archaeological Reports, Vol. 2. Department of Prehistory and Archaeology. University of Sheffield.
- Maltby M (1981). Iron Age, Romano-British and Anglo-Saxon animal husbandry: a review of the faunal evidence, pp. 155-204, In: M. Jones and G. Dimbleby (eds). *The Environment of man: the Iron Age to Anglo-Saxon Period*. BAR British Series 87. Oxford.
- Martínková N, McDonald RA, Searle JB (2007). Stoats (*Mustela erminea*) provide evidence of natural overland colonisation of Ireland. *Proceedings of the Royal Society of London, Series B274*, 1387-1393.
- Massei G, Genov PV (2004). The environmental impact of wild boar. *Galemys* 16, 135-145.
- May A McL, Batty J (1948). The sandhill cultures of the River Bann Estuary, Co. Londonderry. *The Journal of the Royal Society of Antiquaries of Ireland* 78: 130-156.
- McCarthy M (1999) Faunal remains. In: *Excavations at Ferriter's Cove, 1983-1995: last foragers, first farmers in the Dingle Peninsula*. Eds. PC Woodman, E Anderson, N Finlay. Wordwell Books, Bray, Co. Wicklow, Ireland.
- McCarthy M (2011). Animal Bones. In: Cleary RM, Kelleher H. *Archaeological excavations at Tullahedy County Tipperary. Neolithic settlement in North Munster*. The Collins Press, Cork, Ireland.
- McCormick F (1985-6). Faunal remains from prehistoric Irish burials. *The Journal of Irish Archaeology* 3 (1985/1986): 37-48.
- McCormick F (1998). The Animal Bones. In: *Late Viking Age and Medieval Waterford Excavations 1986-1992*. MF Hurley and OMB Scully. Waterford County Council.
- McCormick F (1999). Early evidence for wild animals in Ireland. In: *The Holocene history of the European vertebrate fauna modern aspects of Research*. Benecke N (Ed.). Verlag Marie Leidorf GmbH. Pp.355-371.
- McCormick F (2002). The animal bones from Tara, pp. 103-116. Discovery Programme Reports 6. Royal Irish Academy/Discovery Programme. Royal Irish Society, Dublin.
- McCormick F (2004). Hunting pig in the Late Mesolithic. In: Roche H, Grogan E, Bradley J, Coles J, Raftery B (eds), *From megaliths to metal: essays in honour of George Eogan*, pp. 1-5. Oxbow Books, Oxford, UK.
- McCormick F, Murray EV (2007). Knowth and the zooarchaeology of Early Christian Ireland. Royal Irish Academy, Dublin, Ireland.
- McCormick F, Murray EV (2011). The animal bones. In: Hayden A, Trim Castle, Co. Meath: Excavations 1995-98, pp. 419-431. Dublin Stationary Office, Ireland.
- McDevitt AD, Vega R, Rambau RV, Yannic G, Herman JS, Hayden TJ, Searle JB (2011). Colonization of Ireland: revisiting 'the pygmy shrew syndrome' using mitochondrial, Y chromosomal and microsatellite markers. *Heredity* 107, 548-557.
- Mitchel GF (1947). An early kitchen-midden in County Louth. *Journal of the County Louth Archaeological Society* 11: 167-174.
- Mitchell F, Ryan M (1997). *Reading the Irish landscape*. Town House, Dublin, Ireland.
- Mitchell GF (1949). Further early kitchen middens in County Louth. *Journal of the County Louth Archaeological Society* 12: 14-20.
- Mitchell GF (1956). An early kitchen-midden at Sutton, Co. Dublin (Studies in Irish Quaternary Deposits: No. 12). *The Journal of the Royal Society of Antiquaries of Ireland* 86: 1-26.
- Moffat CB (1938). The mammals of Ireland. *Proceedings of the Royal Irish Academy Section B: Biological, Geological and Chemical Science* 44: 61-128.
- Moore PD (1987). Snails and the Irish question. *Nature* 328, 381-382.

- Movius HL Jr. (1953). Archaeological Research in Northern Ireland: an historical account of the investigations at Larne. *Ulster Journal of Archaeology* 16: 7-23.
- Movius Jr HL, Allen GM, Fisher N, Richardson Jr FLW (1937). A stone age site at Glenarm, Co. Antrim. *The Journal of the Royal Society of Antiquaries of Ireland, Seventh Series* 7: 181-220.
- Mulville J, Grigson C (2007). The animal bones. In: Benson D, Whittle A (eds), *Building memories: the Neolithic Cotswold long barrow at Ascott-under-Wychwood, Oxfordshire*. Oxbow Books, Oxford, UK.
- Murray E, McCormick F (2011a). The animal bones, pp.419-431. In: *Trim Castle, Co. Meath: excavations 1995-8*. Hayden AR. Archaeological Monograph Series: 6. The Stationary Office, Dublin.
- Murray E, McCormick F (2011b). Doonloughan: a seasonal settlement site on the Connemara coast. *Proceedings of the Royal Irish Academy* 112C: 1-52.
- Ó Floinn R (2011). Annagh, Co. Limerick. In: *Breaking ground, finding graves – reports on the excavations of burials by the National Museum of Ireland, 1927-2006*. (Eds) M Cahill and M Sikora. National Museum of Ireland. Wordwell Books.
- Ó Riordáin AB (1967). A prehistoric burial site at Gortnacargy, Co. Cavan. *The Journal of the Royal Society of Antiquaries of Ireland* 97: 61-73.
- Ó Riordáin SP (1940). Excavations at Cush, Co. Limerick. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 45C: 83-181.
- Ó Riordáin SP (1947). Excavation of a Barrow at Rathjordan, Co. Limerick. *Journal of the Cork Historical Archaeology Society* 52: 1-4.
- Ó Riordáin SP (1949). Lough Gur excavations: Carraig Aille and the “Spectacles”. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 52C: 39-111.
- Ó Riordáin SP (1951). Lough Gur excavations: The Great Stone Circle (B) in Grange Townland.. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 54C: 37-74.
- Ó Riordáin SP (1954). Lough Gur excavations: Neolithic and Bronze Age houses on Knockadoon. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 54C: 297-459.
- Ó Riordáin SP, Ó h-Iceadha G (1955). Lough Gur excavations: the megalithic tomb. *Journal of the Royal Society of Antiquaries Ireland* 85: 34-50.
- O’Connor TP (1989). *Bones from the Anglo-Scandinavian levels at 16-22 Coppergate. Archaeology of York* 15/3. CBA, London.
- O’Hara R (2009). *Report on the archaeological excavation of Roestown 2, Co. Meath*. Unpublished Stratigraphic Report. ACS Ltd.
- O’Kelly MJ, Shee E (1974). Bronze Age burials at Coolnahane and Ballinvoher, Co. Cork. *Journal of the Cork Historical Archaeology Society* 79: 71-82.
- O’Neill Hencken H (1935). A cairn at Poulawack, Co. Clare. *Journal of the Royal Society of Antiquaries of Ireland* 65: 191-222.
- O’Rourke FJ (1945). A kitchen-midden at Dog’s Bay, Roundstone, Co. Galway. *The Journal of the Royal Society of Antiquaries of Ireland* 75: 115-118.
- O’Shaughnessy J (2003). The faunal remains. In: Cleary RM, *Enclosed Late Bronze Age habitation site and boundary wall at Lough Gur, Co. Limerick. Proceedings of the Royal Irish Academy Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 103C: 97-189.
- O’Sullivan A (2001). *Foragers, farmers and fishers in a coastal landscape: an intertidal archaeological survey of the Shannon estuary*. Discovery Programme Monographs, Royal Irish Academy, Dublin, Ireland.

- O'Sullivan A, McCormick F, Harney L, Kinsella J, Kerr T (2010). *Early Medieval dwellings and settlements in Ireland, AD400-1100. Vol.1: text*. Early Medieval Archaeology Project (EMAP) Report 4.2. Published December 2010:
http://www.ucd.ie/archaeology/documentstore/allreports/emap_report_4.2voll1_print.pdf
- O'Sullivan A, Sands R, Kelly EP (2007). Coolure Demesne crannog, Lough Derravaragh; a crannog and its landscapes. Wordwell Ltd., Bray, Ireland.
- O'Sullivan DC (2009). *The natural history of Ireland: included in Book one of the Zoilomastix of Don Philip O'Sullivan-Beare, translated and edited by DC O'Sullivan*. Cork University Press, Cork, Ireland.
- O'Sullivan J, Stanley M (2007). Appendix 1 - radiocarbon dates from excavated archaeological sites describes in these proceedings. In: O'Sullivan J & Stanley M (eds.) *New routes to the past: proceedings of a public seminar on archaeological discoveries on national road schemes, August 2006*. Dublin. Pp. 153-161.
- O'Sullivan J, Stanley M (2008). Appendix 1 - radiocarbon dates from excavated archaeological sites describes in these proceedings. In: O'Sullivan J & Stanley M (eds.) *Roads, rediscovery and research. Proceedings of a public seminar on archaeological discoveries on national road schemes, August 2007*. Dublin. Pp.163-171.
- O'Sullivan M (2005) *Duma na nGiall Tara. The Mound of the Hostages*. Wordwell books, Bray, Co. Wicklow.
- Okarma H, Jędrzejewski B, Jędrzejewski W, Krasieński Z.A, Miłkowski L (1995). The roles of predation, snow cover, acorn crop, and man-related factors on ungulate mortality in Białowieża Primeval Forest, Poland. *Acta Theriologica* 42: 203-224.
- Payne S, Bull G (1988). Components of variation in measurements of pig bones and teeth, and the use of measurements to distinguish wild from domestic pig remains. *ArchaeoZoologia* 2: 27-65.
- Persson E, Persson O (1984). The osteological analysis of the cremated unburnt bones from the megalithic cemetery at Carrowmore. In: Burenhult G, *The Archaeology of Carrowmore*, pp. 198-201.
- Praeger RL (1892). Estuarine clays of the north-east of Ireland. *Proceedings of the Royal Irish Academy* 2: 212-289.
- Proudfoot VB, Jope M, Morrison M, McConaghy CH, Preston EJ (1953). Excavation of a rath at Boho, Co. Fermanagh. *Ulster Journal of Archaeology, Third Series*, 16: 41-57.
- Putman R, Apollonio M, Andersen R. (Eds.) (2011). *Ungulate management in Europe. Problems and Practices*. Cambridge University Press.
- Rackham O (1980). *Ancient woodland: its history, vegetation and uses in England*. Edward Arnold, London.
- Rackham O (1986). *The history of the countryside*. JM Dent, London, UK.
- Raftery B (1969). Freestone Hill, Co. Kilkenny: an Iron Age hillfort and Bronze Age cairn. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 68C: 1-108.
- Raftery B (1981). Iron Age burials in Ireland. In: O'Corrain D (ed.). *Irish Antiquity*, pp. 173-204. Cork, Ireland.
- Reimoser F, Putman R (2011). Impacts on vegetation: costs and benefits. Pp. 144-191. In: *Ungulate management in Europe. Problems and Practices*. (Eds) Putman R, Apollonio M, Andersen R. Cambridge University Press.
- Riley FT (1936). Excavations in the townland of Pollacorragune, Tuam, Co. Galway. *Journal of the Galway Archaeology Historical Society* 17: 44-64.
- Roche G (1964). Report on the animal remains. In: Danaher P, A prehistoric burial at Ballyeeskeen, Co. Sligo. *Journal of the Royal Society of Antiquaries of Ireland* 94: 145-158.

- Roche G, Stelfox AW (1936). The animal remains from Ballinderry crannog no. 1. In: Hencken H O'N, Ballinderry crannog no. 1. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 43C: 230-235.
- Rosvold J, Halley DJ, Hufthammer AK, Minagawa M, Andersen R (2010). The rise and fall of wild boar in a northern environment: evidence from stable isotopes and subfossil finds. *The Holocene* 20: 1113-1121.
- Rowlett RM (1994). Did Iron Age celts really hunt wild boar (*Sus scrofa*)? *Proceedings of the Harvard Celtic Colloquium* 14: 195-210.
- Rowley-Conwy P (2003). Early domestic animals in Europe: imported or locally domesticated? In: Ammerman A, Biagi P (eds), pp.99-117, *The Widening Harvest. The Neolithic Transition in Europe: Looking Forward, Looking Back*. Boston: Archaeological Institute of America.
- Rowley-Conwy P, Albarella U, Dobney K (2012). Distinguishing wild boar from domestic pigs in prehistory: a review of approaches and recent results. *Journal of World Prehistory* 25: 1-44.
- Russell N (2012). *Social zooarchaeology: humans and animals in prehistory*. Cambridge University Press, UK.
- Ryan M (1984). Archaeological excavations at Lough Boora, Boughal Townland, Co. Offaly, 1977. In: Cooke J (ed.), *Proceedings of the 7th International Peat Congress, Dublin (Volume 1)*, pp. 401-413. Office of Public Works, Dublin, Ireland.
- Ryan MF (1981). Poulawack, Co. Clare: the affinities of the central burial structure. In: D. O'Corrain (ed.), *Irish Antiquity, Cork*, 134-146.
- Savage RJG (1966). Irish Pleistocene mammals. *The Irish Naturalists' Journal* 15: 117-130.
- Scales R, Ingrem C (2007). Mammal and fish bones. Pp.160-168. In: *Prehistoric coastal communities: The Mesolithic in western Britain*. Ed. M. Bell. CBA Research Report 149. Council for British Archaeology.
- Scandura M, Iacolina L, Apollonio M (2011). Genetic diversity in the European wild boar *Sus scrofa*: phylogeography, population structure and wild x domestic hybridisation. *Mammal Review* 41: 125-137.
- Scandura M, Iacolina L, Crestanello B, Pecchioli E, Di Benedetto MF, Russo V, Davoli R, Apollonio M, Bertorell G (2008). Ancient vs. recent processes as factors shaping the genetic variation of the European wild boar: are the effects of the last glaciation still detectable? *Molecular Ecology* 17: 1745-1762.
- Scharff RF (1915). On the Irish names of mammals. *The Irish Naturalist* 24: 45-53.
- Scharff RF (1917) On the Irish Pig. *The Irish Naturalist* 173-185.
- Scharff RF (1928). The animal remains. In: Macalister RAS, Praeger RL, Report on the excavation of Uisneach. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 38C: 122-124.
- Searle JB (2008). The colonization of Ireland by mammals. In: Davenport, J.L., Sleeman, D.P., Woodman, P.C. (Eds.), *Mind the gap: postglacial colonization of Ireland. Irish Naturalists' Journal Special Supplement*, pp. 109-115.
- Shaw RC (1956). *The Royal Forest of Lancaster*. Guardian Press, London.
- Southern HN (1964). *The handbook of British mammals*. Oxford, UK.
- Stelfox AW (1939). Report on the animal bones. In: Kilbride-Jones HE, The excavation of a composite tumulus at Drimnagh, Co. Dublin. *Journal of the Royal Society of Antiquaries of Ireland* 69: 190-220.
- Stelfox AW (1940). Report on the animal bones. In: Movius HL, McMilian NF, Maby JC, Stelfox AW, Report on a Stone Age excavation at Rough Island, Strangford Lough, Co. Down. *Journal of the Royal Society of Antiquaries Ireland* 70: 142.
- Stelfox AW (1942). Report on the animal remains from Ballinderry 2 crannog. In: Hencken H O'N, Ballinderry crannog no. 2. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 47C: 1-76.

- Stuart AJ (1995). Insularity and Quaternary vertebrate faunas in Britain and Ireland. In: Preece RC (ed.), Geological Society Special Publication 96, London, pp. 111-125.
- Sweetman HS (Ed.) 1875-76. *Calendar of documents relation to Ireland 1171-1307* (5 vols). London.
- Sykes NJ, Carden RF (2011). Were fallow deer spotted (OE **pohha/*pocca*) in Anglo-Saxon England? Reviewing the evidence for *Dama dama dama* in Early Medieval Europe. Winner of the 2011 Martin Jope Award. *Medieval Archaeology* 55: 139-162.
- Teacher AGF, Garner TWJ, Nichols RA (2009). European phylogeography of the common frog (*Rana temporaria*): routes of postglacial colonization into the British Isles, and evidence for an Irish glacial refugium. *Heredity* 102, 490-496.
- Thompson W (1956). *Natural history of Ireland*. London.
- van Wijngaarden-Bakker LH (1974). The animal remains from the Beaker settlement at Newgrange, Co. Meath: First report. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 74: 313-383.
- van Wijngaarden-Bakker LH (1986). The animal remains from the Beaker settlement at Newgrange, Co. Meath: final report. *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* 86C: 17-111.
- van Wijngaarden-Bakker LH (1989). Faunal remains and the Irish Mesolithic. In: Bonsall C (ed.), *The Mesolithic in Europe*, pp. 125-133. John Donald, Edinburgh, UK.
- Waddell J (1974). The Bronze Age burials of County Galway. *Journal of the Galway Archaeological and Historical Society* 34: 5-20.
- Waddell J (2010). *Prehistoric archaeology of Ireland (revised edition)*. Wordwell Books, Dublin.
- Wailles B (1970). Excavations at Dun Ailinne, Co. Kildare 1968-9 Interim Report. *Journal of the Royal Society of Antiquaries of Ireland* 100: 79-90.
- Wallace PF (1992). The Archaeological identity of the Hiberno-Norse town. *Journal of the Royal Society of Antiquaries of Ireland* 122.
- Walsh C (1997). *Archaeological excavations at Patrick, Nicholas and Winetavern Streets, Dublin*. Brandon Book Publishers, Kerry, Ireland.
- Walsh C (2007). *Archaeological excavations at Patrick, Nicholas and Winetavern Streets, Dublin*. Brandon Book Publishers, Co. Kerry.
- Walsh C (2009). An early Medieval roadway at Chancery Lane: from Duibhlinn to Áth Cliath? *Medieval Dublin IX: Proceedings of the Friends of Medieval Dublin Symposium 2007*, pp. 9-37.
- Walsh G (1995). Iron Age settlement in Co. Mayo. *Archaeology Ireland* 9:7-8.
- Warren G (2009). Belderrig: a 'New' Later Mesolithic and Neolithic landscape in northwest Ireland. 143-15. In: *From Bann Flakes to Bushmills. Papers in honour of Professor Peter Woodman*. Eds. Finlay N., McCartan S, Milner N & Wickham-Jones C. Prehistoric Society Research Paper 1. Oxbow Books, Oxford, UK.
- Warren G (2009). Belderrig: A 'new' later Mesolithic and Neolithic landscape in Northwest Ireland. In: Finlay N, McCartan S, Milner N, Jones CW (eds), pp. 143-152, *From Bann flakes to Bushmills: Papers in honour of Professor Peter Woodman*. Oxford, UK.
- Wilde W (1854). The food of the Irish. *Dublin University Magazine* 43: 127-146.
- Wilde WR (1849). *The beauties of the Boyne and its Tributary the Blackwater*. Dublin, Ireland.
- Wilde WR (1858). On human remains found at Barrettstown, County Westmeath. *Proceedings of the Royal Irish Academy (1836-1869)* 7: 88-91.
- Wilde WR (1859). On the unmanufactured animal remains belonging to the Academy. *Proceedings of the Royal Irish Academy (1836-1869)* 7 (1857-1861): 181-212.
- Wilson CJ (2003). Distribution and status of feral wild boar *Sus scrofa* in Dorset, southern England. *Mammal Review* 33: 302-307.

- Wilson CJ (2005). *Feral wild boar in England status, impact and management*. Department for Environment, Food and Rural Affairs, London.
- Woodman P, McCarthy M, Monaghan N (1997). The Irish Quaternary fauna project. *Quaternary Science Reviews* 16: 129-159.
- Woodman PC (1974). The chronological position of the latest phases of the Larnian. *Proceedings of the Royal Irish Academy* 74C: 237-258.
- Woodman PC (1985). Excavations at Mount Sandel, 1973-77. *Northern Ireland Archaeological Research Monographs* No. 2. Belfast.
- Woodman PC (1986). Problems with the human colonisation of Ireland. *Ulster Journal of Archaeology* 49: 7-17.
- Woodman PC (1997). Killuragh. In: Bennett I (ed.), pp. 53-62, Excavations 1996. Bray. Ireland.
- Woodman PC, Anderson E, Finlay N (1999). *Excavations at Ferriter's Cove, Co. Kerry: Last foragers and first farmers on the Dingle Peninsula*. Wordwell books, Bray, Ireland.
- Woodman PC, Anderson E, Finlay N (1999). Excavations at Ferriter's Cove, 1983-95: Last foragers, first farmers in the Dingle Peninsula. Wordwell Ltd., Bray, Wicklow, Ireland.
- Woodman PC, McCarthy M (2003). Contemplating some awful (ly interesting) vistas: importing cattle and red deer into Prehistoric Ireland. In: Armit I, Murphy E, Nelis E, Simpson D (eds), *Neolithic settlement in Ireland and Western Britain*, pp. 31-39. Oxbow Books, Oxford, UK.
- Yalden DW (1992). When did the mammal fauna of the British Isles arrive? *Mammal Review* 12: 1-57.
- Yalden DW (1999). *The History of British Mammals*. Poyser, London.
- Yalden DW (2002). Place-name and archaeological evidence on the recent history of birds in Britain. *Acta Zoologica Cracoviensia* 45: 415-429.

Online resources

- www.heritagecouncil.ie/unpublished_excavations
- www.eachtra.ie
- www.excavations.ie
- www.JSTOR.org
- www.nra.ie

Appendix I

Appendix Ia. Mesolithic archaeological sites, identified to date, illustrating the presence and absence of *Sus* species skeletal remains. ‘?’ denotes uncertainty.

Period	Site	Specimen	Context	Radiocarbon date (years BP)	Source
Early Mesolithic	Mount Sandel, Co. Antrim	Various burned bones ?wild/domestic; foetal	Occupation site	c.9200 - 8500	Woodman 1985
Early Mesolithic	Kilgreany Cave, Co. Waterford	Metapodial	Occupation site	8340+/-110	Woodman <i>et al.</i> 1997
Early Mesolithic	Lough Boora, Co. Offaly	“Wild pig”	Occupation site		Ryan 1984
Late Mesolithic	Rockmarshall, Co. Louth	<i>No Sus species bones found</i>	Occupation site		Mitchell 1947, 1949
Late Mesolithic	Strangford Lough, Co. Antrim	<i>No Sus species bones found</i>	Occupation site		Mitchell 1947, 1949
Late Mesolithic	Cushendun, Co. Antrim	<i>No Sus species bones found</i>	Occupation site		Movius 1953
Late Mesolithic	Dalkey Island, Co. Dublin	Scapula & radius ?wild/domestic	Midden - Occupation site	6870+/-90; 5600+/-80	Woodman <i>et al.</i> 1997
Late Mesolithic	Belderrig, Co. Mayo	<i>No Sus species bones found</i>	Occupation site		Warren 2009
Late Mesolithic	Sutton, Co. Dublin	Ulna ?wild/domestic	Midden - Occupation site	7140+/-100**	Woodman <i>et al.</i> 1997
Late Mesolithic	Ferriter’s Cove, Co. Kerry	Various butchered bones identified as wild boar due to their stratified Late Mesolithic context	Occupation site (seasonal)		McCarthy 1999
Late Mesolithic	Moynagh Lough, Co. Meath	Wild pig bones; boars’ tusks	Occupation site		McCormick 2004; www.excavations.ie 1998:504

** The author indicates this date may be unreliable as bone treated with preservative.

Appendix Ia. Cont.

Period	Site	Specimen	Context	Radiocarbon date (years BP)	Source
Mesolithic	Curran Point, Co. Antrim	<i>No Sus species bones found</i>			Mitchell 1947, 1949
Mesolithic	Newferry, Co. Antrim	<i>No Sus species bones found</i>			Mitchell 1947, 1949
Mesolithic	Ringneill Quay, Co. Down	Identified as wild boar but subsequently identified as domestic pig		5380+/-120	Jope 1960
Mesolithic	Larne Harbour, Co. Antrim	Possible pig tooth	Raised beach		www.excavations.ie 2000:0017
Mesolithic	Killuragh Cave, Co. Limerick	Pig/wild boar	Cave		Woodman 1997; Carden unpub. data
Mesolithic/Neolithic	Baylet, Co. Donegal	Wild boar bones	Midden		www.excavations.ie 2002:0407

Appendix Ib. Neolithic archaeological sites, identified to date, illustrating the presence of *Sus* species skeletal remains. ‘?’ denotes uncertainty.

Period	Site	Specimen	Context	Radiocarbon date (years BP)	Source
Early Neolithic	Annagh, Co Limerick	Pig bones	Associated with human burial		Ó Floinn 2011
Early Neolithic	Ballycahane Lower, Co. Limerick	Wild boar bones		6025 +/-45	Gowen 1988; www.excavations.ie 1986:37
Neolithic	Pollthanacarra Cave, Legg, Co. Fermanagh	Pig bones	Possible human burial site		Cooney <i>et al.</i> 2011
Neolithic	Newgrange, Co. Meath	Domestic pig bones	Passage grave	c.4200 - 4400	van Wijngaarden-Bakker 1974
Neolithic	Whitepark Bay, Co. Antrim	Pig bones	Sandhill site		Knowles & Newton 1891
Neolithic	Audleystown, Co. Down	Pig bones	Double court tomb		Collins 1954; Jope 1954
Neolithic	Ballyalton, Co. Antrim	Pig bones	Court grave		Evans & Davies 1933/4
Neolithic	Belmore Mountain, Co. Fermanagh	Pig bones	Passage grave		Coffey 1898
Neolithic	Keshcorran/Carrowkeel, Co. Sligo	Boar's tusk (Tomb E)	Passage grave		Macalister <i>et al.</i> 1912
Neolithic	Lough Gur, Co. Limerick	Pig bones	Wedge tomb		Ó Ríordáin & Ó h-Iceadha 1955
Neolithic	Lough Gur, Ballingoola, Co. Limerick	Pig bones	Beaker barrow		Ó Ríordáin 1949
Neolithic	Lough Gur, Knockadoon, Co. Limerick	Pig bones	House/settlement	4410+/-240; 4690+/-240	Ó Ríordáin 1954
Neolithic	Lough Gur, Grange, Co. Limerick	Pig bones	Stone circle		Ó Ríordáin 1951
Neolithic	Rough Island, Co. Down	Pig bones	Habitation		Stelfox 1940
Neolithic	Toberagnee, Co. Antrim	Burnt pig bones	Round barrow		Evans 1953
Neolithic	Annaghmare, Co. Armagh	Pig bones (mostly teeth, young individual)	Court tomb		Davies & Paterson 1936-37

Appendix Ib.Cont.

Period	Site	Specimen	Context	Radiocarbon date (years BP)	Source
Neolithic	Labbacallee, Co. Cork	Pig bones	Wedge tomb		Leask & Price 1936
Neolithic	Drimnagh, Co. Dublin	Pig bones (burnt)	Megalithic tomb		Kilbride-Jones 1939; Stelfox 1939
Neolithic	Aghanaglack, Co. Fermanagh	Teeth of pig	Dual court tomb		Davies 1939
Neolithic	Rathjordan I, Co. Limerick	Cremated pig remains	Round barrow		Ó Ríordáin 1947
Neolithic	Dowth, Co. Meath	Pig bones	Passage grave		Wilde 1849
Neolithic	Fourknocks, Co. Meath	Pig bones	Cruciform passage grave		Hartnett 1957
Neolithic (&/or Bronze Age)	Audleystown, Co. Antrim	Pig bones	Dual court-tomb		McCormick 1985-6
Neolithic	Ballyalton, Co. Antrim	Pig bones	Court tomb		McCormick 1985-6
Neolithic	Drimnagh, Co. Dublin	Pig bones	Tomb		McCormick 1985-6
Neolithic	Poulawach, Co. Clare	Boar's tusk	Human burial in tomb		Ryan 1981
Neolithic	Knowth, Co. Meath	Pig bones	Passage grave complex - Site I		Eogan 1984
Neolithic	Ashleypark, Co. Tipperary	Pig bone	Tomb		McCormick 1985-6
Neolithic	Carrowmore/Knocknerea, Co. Sligo	Pig bones	Passage grave		Herity 1974; Burenhult 1984; Persson & Persson 1984
Neolithic	Tullahedy, Co. Tipperary	Boar tusk; pig bones	Settlement		www.excavations.ie 1999:839; McCarthy 2011
Neolithic	Poulawack, Co. Clare	Large boar's tusk	Round cairn		O'Neill Hencken 1935

Appendix Ic. Neolithic/Bronze Age archaeological sites, identified to date, illustrating the presence of *Sus* species skeletal remains.

Period	Site	Specimen	Context	Source
Neolithic/Bronze Age	Dún Ailinne, Co. Kildare	Pig bones		Wailles 1970
Neolithic/Bronze Age	The Mound of the Hostages, Hill of Tara, Co. Meath	Domestic pig	Passage tomb	Butler 2005
Neolithic/Bronze Age	Ballyveelish, Co. Tipperary	Pig bones		McCormick 2002
Neolithic/Bronze Age	Dún Aonghasa, Co. Galway	1 pig bone		McCormick 2002
Neolithic/Bronze Age	Mooghaun, Co. Clare	Pig bones		McCormick 2002
Neolithic/Bronze Age	Tara, Co. Meath	Pig bones		McCormick 2002
Neolithic/Bronze Age	Parknabinnia, Co. Clare	Pig bones	Settlement	www.excavations.ie 1995:020

Appendix Id. Bronze Age archaeological sites, identified to date, illustrating the presence of *Sus* species skeletal remains. ‘?’ denotes uncertainty.

Period	Site	Specimen	Context	Source
Early Bronze Age	Kilshane, Dublin	Possibly pig	Enclosure	www.excavations.ie 2004:0612
Bronze Age	Killuragh Cave, Co. Limerick	Pig bones	Cave	www.excavations.ie 1996:242
Bronze Age (possibly Iron Age)	Carrigdirty Rock 3, Newtown, Co. Limerick	Pig bone		O’Sullivan 2001
?Bronze Age	Carrigdirty Rock 10, Newtown, Co. Limerick	1 domestic pig bone		O’Sullivan 2001
?Bronze Age	Knocks 1, Co. Meath	Possibility of pig (boar) bones	Ring ditch	www.excavations.ie 2005:AD11
Bronze Age	Navan Fort/Emain Macha, Co. Armagh	Pig bones		McCormick 2002
Bronze Age	Ballyeskeen, Co. Sligo	Pig bones	Cairn, round barrow	Roche 1964
Bronze Age	Gortnacargy, Co. Cavan	Pig bones	Cairn	Ó Ríordáin 1967
Bronze Age	Knockast, Co. Westmeath	Pig bones, boar’s tusk	Cairn, round barrow	Hencken & Movius 1934
Bronze Age	River Bann, Co. Derry	Pig bones	Settlement	May & Batty 1948
Bronze Age	Lough Gur, Geroid Island, Co. Limerick (3680+/-140 BP)	Pig bones	Settlement	Liversage 1958
Bronze Age	Ballinderry II, Co. Offaly	Pig bones	Settlement	Stelfox 1942
Bronze Age	Moone, Co. Kildare	2 boar tusks	Cemetery	www.excavations.ie 2000:0506
Bronze Age	Ballinvoher, Co. Cork	Boar’s tusk	Flat cemetery	O’Kelly & Shee 1974
Bronze Age	Moylehid (Belmore), Co. Fermanagh	Large boar tusks, unburnt pig bones	Reused cruciform passage grave	Coffey 1898
Bronze Age	Gortnahoun, Co. Galway	Boar’s tusks	Flat cemetery	Waddell 1974
Bronze Age	Ballyoan/Carn/Lisneal/Ardlough, Co. Derry	1 pig bone	Cist burials	www.excavations.ie 2006:403

Appendix Id. Contd. ‘NMI’ denotes National Museum of Ireland.

Period	Site	Specimen	Context	Source
Bronze Age	Coolmore, Co. Kilkenny	Boar’s tusk	Flat cemetery	Lucas 1963
Bronze Age	Finney (Cong), Co. Mayo	?pig tusks	Cist	NMI files
Bronze Age	Keenoge, Co. Meath	Teeth of pig or dog	Flat cemetery	NMI files
Bronze Age	Loughry and Rockhead, Co. Tyrone	Possible pig tooth fragment	Barrow and house	www.excavations.ie 2003:1847
Bronze Age	Barrettstown, Co. Westmeath	Boar’s tusk	Round barrow	Wilde 1858
Bronze Age	Chancellorsland, Co. Tipperary	Pig bones	Settlement	www.excavations.ie 1994:211
Middle & Late Bronze Age	Glencurran Cave, Co. Clare	Domestic pig bones, large male pig tusk probably domestic pig	Cave	Dowd 2009
Late Bronze Age	Haughey’s Fort, Co. Armagh	Pig bones, boar tooth pendant	Hillfort, enclosure	McCormick 2002; Mallory 1995; www.excavations.ie 1999:023
Late Bronze Age	Coolure Demesne crannog, Lough Derravaragh	Domestic pig bones		O’Sullivan <i>et al.</i> 2007
Late Bronze Age	Lough Gur, Knockadoon, Co. Limerick	Domestic pig bones		Cleary 1995; O’Shaungnessy 2003
Late Bronze Age	Moynagh Lough, Brittas, Co. Meath	Pig bones		Bradley 1991; www.excavations.ie 1995:228
Late Bronze Age	Knocknalappa, Co. Clare	Pig bones	Lakeside platform	www.excavations.ie 1994:018
Bronze Age	Pollacragune I, Co. Galway	Pig bones	Round barrow	Riley 1936
Bronze Age	Belmore Mountain, Co. Fermanagh	Pig bones, 5 boars’ tusks	Cairn	Coffey 1898

Appendix Ie. Iron Age archaeological sites, identified to date, illustrating the presence of *Sus* species skeletal remains. ‘?’ denotes uncertainty.

Period	Site	Specimen	Context	Source
Iron Age	Navan Fort, Co. Armagh	Pig bones	Enclosure	www.excavations.ie 1999:021
Iron Age	Lislackagh, Co. Mayo	Pig bones	Ringfort	Walsh 1995
Iron Age	Dún Ailinne, Co. Kildare	Pig bones	Hill fort	Wailes 1970; Crabtree 1990
Iron Age	Tara (Cuttings 1 and 2), Co. Meath	Pig bones		McCormick 2002
Iron Age	Freestone Hill, Co. Kilkenny	Pig bones	Hill fort	Raftery 1969
Iron Age	Caherweelder 7, Co. Galway	Pig bones	Iron working site	Eachtra 2010
Iron Age	Larrybane, Co. Antrim	Pig bones	Promontory fort	Jope 1961-1962
Iron Age	Cush, Co. Limerick	Pig bones	Ring forts	Ó Ríordáin 1940
Iron Age	Uisneach, Co. Westmeath	Pig bones	Ring fort	Scharff 1928
Iron Age	Togherstown, Co. Westmeath	Pig bones	Ring fort	Macalister & Praeger 1931
Iron Age	Lough Gur, Grange and Ballingoola, Co. Limerick	Pig bones	Huts	Ó Ríordáin 1949
Iron Age	Marlhill, Co. Tipperary	Pig bones	Ring barrow	www.excavations.ie 2007:1702
Iron Age	Pollacorragune I, Co. Galway	Pig bones	Circular mound	Riley 1936
Iron Age	Furness, Co. Kildare	Pig bones	Flat topped mound	Grogan 1984
Iron Age	Bettystown, Co. Meath	Pig bones	Pits	Raftery 1981
Iron Age	Navan, Co. Armagh	Pig bones	Enclosure complex	www.excavations.ie 2000:0029
?Iron Age	Caherconnell, Co. Clare	Pig bones	Drystone chamber	www.excavations.ie 2008:109
Iron Age/Christian	Ballinrobe-Claremorris-Ballindine, Co. Mayp	Pig bones	Various	www.excavations.ie 1999:App2
Iron Age/Christian	Kiltullagh Hill, Kiltullagh, Co. Roscommon	Pig bones	Inhumations	www.excavations.ie 1998:561

Appendix If. Early Medieval, Medieval and Historical archaeological sites, identified to date, illustrating the presence of *Sus* species skeletal remains. ‘?’ denotes uncertainty.

Period	Site	Specimen	Context	Source
Early Christian	Ballinderry I, Co. Westmeath	Pig bones	Crannóg	Roche & Stelfox 1936
Early Christian	Boho, Co. Fermanagh	Pig bones	Rath	Proudfoot <i>et al.</i> 1953
Early Christian	Dysart Church, Co. Roscommon	Boar jaw bones	Church and graveyard	www.excavations.ie 1993:193
Early Christian	Ballinderry II, Co. Westmeath	Pig bones	Crannóg	Stelfox 1942 in O’Neill Hencken 1942
Early Christian	Knowth, Co. Meath	Pig and a possible wild pig bone		McCormick & Murray 2007
Early Christian	High Island, Co. Galway	Pig bones	Monastery	www.excavations.ie 1997:210
Early Christian	Craigwarren, Co. Antrim	Pig bones	Crannóg	Coffey 1906
Early Christian	Lagore, Co. Meath	Pig bones	Crannóg	Hencken <i>et al.</i> 1950/51
Early Christian	Lough Faughan, Co. Down	Pig bones	Crannóg	Jope 1955
Early Christian	Moynagh Lough	Pig bones	Crannóg	Bradley 1991
Early Christian	Randalstown, Co. Meath	Pig bones	Souterrain	www.excavations.ie 1985:44
Early Christian	Sillees River, Ross Lough, Co. Fermanagh	Pig bones, possible one wild boar bone (uncertain and undated)	Large crannóg	Carroll 1992
Early Christian	Dún Eoghanachta, Inis Mór, Co. Galway	Pig bones	Stone fort	Cotter 1996
Early Christian	Newtownlow, Co. Westmeath	Pig bones	Crannóg	Bourke 1986, 1987
?Early Christian	Sranure, Co. Offaly	Pig bones	Church site & graveyard	www.excavations.ie 2001:1104
Early Christian	Moylarg	Pig bones	Crannóg	Buick 1894
Early Christian	Dog’s Bay, Roundstone, Co. Galway	pig bones	Coastal	O’Rourke 1945
Christian/Medieval	Dún Eoghanachta, Eoghanacht, Inis Mór, Co. Galway	Pig bones	Stone fort	www.excavations.ie 1995:117
Christian/Medieval	Mainistir Chiaráin, Oghil, Inis Mór, Co. Galway	Pig bones	Monastery	www.excavations.ie 1997:221
Early Medieval	Clonmacnoise, Co. Offaly	Pig bones	Bridge	www.excavations.ie 1997:447
Early Medieval	Betaghstown, Co. Meath	Pig bones	Habitation	www.excavations.ie 2005:1158

Appendix If. Contd.

Period	Site	Specimen	Context	Source
Early Medieval	Curtaun 1 & 2, Co. Galway	1 pig mandible & 1 pig boar tusk (wild boar based on size)	Kiln	Irish Archaeological Consultancy Ltd 2010
Early Medieval	Donacarney Great, Co. Meath	Pig bones	Settlement	www.excavations.ie 2007:1302
Early Medieval	Parknabinnia, Co. Clare	Pig bones	Settlement	www.excavations.ie 1995:020
Early Medieval	Owenbristy, Co. Galway	Pig bones	Cemetery settlement	Eachtra 2010
Early Medieval	Coolure Demesne, Co. Westmeath	Pig bones	Crannóg	www.excavations.ie 2004:1725
Early Medieval	Doonloughan, Connemara, Co. Galway	Pig bones	Sandhills - settlement	Murray & McCormick 2011
Early Medieval (9th Century)	Chancery Lane, Dublin	Pig bone	Trackway	Walsh 2009
11th Century	Newtownlow, Co. Westmeath	Pig bones	Crannóg	www.excavations.ie 1985:58
Early Medieval	Souterrain B, Site 3 at Marshes Upper, Co. Louth	Pig bones	Souterrain	Gowen 1992
Early Medieval (5th/6th Century)	Butterfield Avenue, The Old Orchard Inn, Rathfarnham Dublin 14	Pig bone	Palisade Trench; occupation and burials	Carroll 1998; www.excavations.ie 1997:184
Early Medieval	Lisdoo Fort, Lisnaskea, Co. Fermanagh	Pig bones	Fort	Brannon 1981/1982
Medieval (10-11th Century)	Dublin – Viking settlement	Pig bones	Urban site	Wallace 1992; Walsh 1997
Medieval (end of 10th Century)	Dunbeg, Co. Kerry	Pig bones	Promontory fort	Barry 1981
Medieval	Grattan Street, Cork, Co. Cork	Pig bones	Urban	www.excavations.ie 1998:069
Medieval	Cahermacnaghten, Co. Clare	Pig bones	Settlement	www.excavations.ie 2007:150
Medieval	Main Street, Cashel, Co. Tipperary	Pig bones	Urban	www.excavations.ie 2005:1415

Appendix If. Contd.

Period	Site	Specimen	Context	Source
Medieval	Cahermacnaghten, Co. Clare	Pig bones	Urban	www.excavations.ie 2008:112
Medieval	Staad Abbey, Agharrow, Co. Roscommon	Pig bones	Church, souterrain, middens	www.excavations.ie 2001:1126
Medieval	26 Patrick Street, Kilkenny, Co. Kilkenny	Pig bones	Urban	www.excavations.ie 1999:451
Medieval	Carrickfergus Castle bridge	Pig bones ('greyhound pig')	Pit	Jope 1952
Medieval	Ship Street Great, Dublin	Pig bones	Urban	www.excavations.ie 1997:161
Medieval	Rathmore West, Co. Kildare	Pig bones	Urban	www.excavations.ie 1998:338
14-15th Century	Trim Castle, Co. Meath	Wild pig bones	Castle	McCormick & Murray 2011
Medieval	Ardree, Co. Kildare	Pig bones	Borough	www.excavations.ie 2000:0457
Medieval	Aylesbury Road, Donnybrook, Dublin 4	Pig bones and teeth (3 tusks)	Mound	Frazer 1879
Medieval	6 Main Street, Raheny, Dublin	Pig bones	Urban	www.excavations.ie 2004:0634
13th Century Medieval	Clough Castle, Co. Down	Domestic pig ('greyhound pig')	Castle	Jope 1954
13th Century	Dublin	Pig bones	Urban site	Walsh 1997
12-14th Century	Dublin	Pig bones	Urban site	Walsh 1997
14-16th Century	Dublin	Pig bones	Urban site	Walsh 1997
Mid 16th – early 18th Century	Dublin	Pig bones	Urban site	Walsh 1997
16th Century	Kilcoe Castle, Kilcoe, Co. Cork	Pig bones	Tower-house	www.excavations.ie 1998:079
Medieval (11th - 14th Century)	Lady Lane, Waterford, Co. Waterford	Pig bones	Urban	McCormick 1998
Medieval (13th Century)	Shop Street, Drogheda, Co. Louth	Pig bones	Urban	McCormick 1998

Appendix If. Contd.

Period	Site	Specimen	Context	Source
Medieval	Grubb's Lane, Waterford, Co. Waterford	Pig bones	Urban	www.excavations.ie 2004:1692
Medieval	Church Road, Lusk, Co. Dublin	Boar's tusk	Burial site	www.excavations.ie 2005:504
Medieval	11 Patrick Street, Kilkenny, Co. Kilkenny	Pig bones	Urban	www.excavations.ie 2007:972
Medieval	Castle Hill, Dungannon, Co. Tyrone	Pig bones	Castle	www.excavations.ie 2003:1846
Medieval	Castledermot Town, Co. Kildare	Pig bones	Medieval town walls & cemetery	Eachtra 2010
Medieval	Old Bawn Road, Tallaght, Dublin	Pig bones	Urban site	www.excavations.ie 1990:044
c.16th Century	Newtown Castle, Newtown, Co. Clare	Pig bones	Castle	www.excavations.ie 1993:013
12th - mid 13th Century	Presentation Convent, George's Hill, Oxmantown, Dublin	Pig bones	Urban site	www.excavations.ie 1993:098
13th - 14th Century Medieval	Blackfriary, Trim, Co. Meath	Pig bones	Burials and well	www.excavations.ie 2008:987
Historical	Rothe House, Parliament Street, Kilkenny, Co. Kilkenny	Pig bones	Urban	www.excavations.ie 2007:970
18th/19th Century	Park Street, Dundalk, Co. Louth	Pig bones	Urban site	www.excavations.ie 1996:287
Early 13th Century	Market Street, Ardee, Co. Louth	Pig bones	Urban site	www.excavations.ie 2003:1218

Appendix Ig. Undated archaeological sites, illustrating the presence of *Sus* species skeletal remains. ‘?’ denotes uncertainty.

Period	Site	Specimen	Context	Source
Prehistoric site	Dun Aonghasa, Kilmurvey, Inismór, Co. Galway	Pig bones	Cliff fort	www.excavations.ie 1993:112
Mesolithic, Neolithic, Other	Ballynaclogh, Co. Galway	Pig/boar tusks	Various	www.excavations.ie 2008:517
Probably Mesolithic & Early Neolithic	Clowanstown 1, Co. Meath	Pig bones	Burnt mounds	www.excavations.ie 2006:1533
Neolithic & Early Christian	Site M, Knowth, Co. Meath	Pig bones	Earthworks complex	www.excavations.ie 2002:1484
Early Neolithic to Late Bronze Age	Cloncreen Bog, Co. Offaly	Small pig bone	Peatland	www.excavations.ie 2002:1550
?Late Bronze Age	Raynestown 1, Co. Meath	Boar bones	Double ring-ditch	www.excavations.ie 2006:1630
Iron Age?	Ballykean bog, Co. Offaly	Pig bones	Peatland	www.excavations.ie 2003:1509
Prehistoric to Early Christian	Brokerstown, Lisburn, Co. Down	5 pig molars		www.excavations.ie 2008:349
Medieval and prehistoric	Mullamast, Co. Kildare	Large boar or pig tusk (perforated)	Settlement	www.excavations.ie 2007:838
Early Historic	Glebe, Dublin	Pig bones	Ringfort & field system	www.excavations.ie 2002:0594
?Post- Medieval	Knocknaganny, Co. Tipperary	Pig bones	Urban	www.excavations.ie 2008:1071
Post Medieval	Main Street, Naas, Co. Kildare	Pig bones	Urban	www.excavations.ie 1998:330
multi-period	Parknahown 5, Co. Laois	Pig bones	Double ditch enclosure	www.excavations.ie 2006:AD13
	Clonmeath, Co. Meath	Possible pig bone	Fulacht fiadh	www.excavations.ie 2002:1440

Appendix Ig. Contd.

Period	Site	Specimen	Context	Source
	Kilnatierny, Co. Down	Wild or domestic pig teeth	Shell midden	www.excavations.ie 2004:0437
	Athenry, Co. Galway	Perforated boar's tusk	Pit complex and mound	www.excavations.ie 2006:740
	Site 1, Inner Relief Road, Banagher, Co. Offaly	Perforated boar's tusk	Burnt mound and pits	www.excavations.ie 2006:1685
	Berrillstown 1, Co. Meath	Pig bones	? barrow	www.excavations.ie 2004:1184
	Main Street, Ballinrobe, Co. Mayo	Pig bones	Urban	www.excavations.ie 2005:1102
	Kinicha Road, Gort, Co. Galway	Pig bones	Burial ground	www.excavations.ie 2005:609
	Mackney, Co. Galway	Pig or sheep tooth	Enclosure	www.excavations.ie 2005:630
	Sonnagh, Co. Mayo	Possibly pigs teeth	Fulacht fiadh	www.excavations.ie 2006:1480
	Baronstown 1, Co. Meath	Pig bones	Ringfort and enclosures	www.excavations.ie 2007:1263
	Knockalton Upper, Co. Tipperary	Probable pig	Possible sunken structure	www.excavations.ie 2007:1698
	Cavankilgreen, area 1, Co. Tyrone	Pig teeth and bone	Burnt mounds	www.excavations.ie 2008:1186
	Gortafrika 1, Co. Clare	Possible pig tusk	Burnt spread	www.excavations.ie 2008:126
	Springfield, Co. Offaly	Possibly pig	Earthwork	www.excavations.ie 2008:1017
	Lourdsville, Kildare, Co. Kildare	Pig bones	Burials	www.excavations.ie 2008:665
	Ratoath, Co. Meath	2 boar tusks	Various	www.excavations.ie 2003:1455
	Cloughjordan Road, Moneygall, Co. Offaly	1 boar's tooth	?Fulacht fiadh	www.excavations.ie 2004:1421
	Clogher Demesne, Co. Tyrone.	Skull of pig	Ring & Hill forts	www.excavations.ie 1973:0033
	Kilpatrick, Corbetstown townland, Co. Westmeath.	Pig bones	Ecclesiastical enclosure	www.excavations.ie 1973:0036
	Killucan, Kilpatrick, Co. Westmeath	Pig bones (husbandry)	Religious enclosure	www.excavations.ie 1975:36

Appendix Ig. Contd.

Period	Site	Specimen	Context	Source
	Edenvale Cave complex, Co. Clare	Pig/wild boar bones	Caves	Carden & Lewis 2010; Carden unpub. data
	Keelorum Lower, Co. Donegal	Pig bones	Circular stone-built enclosure	www.excavations.ie 1976:17
	Kesh caves, Co. Sligo	Pig bones	Caves	Scharff 1917
	Ballynamindra cave, Co. Waterford	Pig bones	Cave	Scharff 1917
	Cross Church of Moreen, Balally, Dublin	1 pig bone	Church site within enclosure	www.excavations.ie 1990:029
	Derryhowlaght Lough, Derryhowlaght East, Co. Fermanagh	1 pig bone	Crannóg	www.excavations.ie 1993:105
	Tully, Co. Leitrim	Pig's teeth and jawbone	Fulacht fiadh	www.excavations.ie 1994:153
	Various, Co. Mayo	1 pig bone	Various	www.excavations.ie 1994:184
	Boleyboy, Co. Mayo	Pig bones	Burial mound	www.excavations.ie 1994:185
	Ferganstown and Ballymackon, Co. Meath	Pig bones	Souterrain	www.excavations.ie 1999:687
	Alexandra Dock, Belfast, Co. Antrim	Lower jaw of a large wild boar, teeth in situ and single tusk	Estuarine clays	Praeger 1892
	Site 20, Duleek Road, Platin, Co. Meath	Pig/sheep bone	Pits	www.excavations.ie 2001:1024
	Site 43, Glebe, Dublin	Pig bones	Ringfort	www.excavations.ie 2001:425
	Gortatlea, Co. Kerry	1 pig bone	Souterrain	www.excavations.ie 2001:572
	Site 16/17, Collinstown, Co. Kildare	Pig bones	Habitation site, ditch, roasting pit	www.excavations.ie 2001:625
	Mell 2, Co. Louth	Pig bones	Ditched enclosure	www.excavations.ie 2001:869