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A geographical perspective on the decline and extermination of the Irish wolf *canis lupus*— an initial assessment

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ABSTRACT

Wolves were a component of the Irish landscape until 1786 when the last one was killed. It had taken a concerted effort by Cromwell and his Government in Ireland to bring this about particularly through deforestation and landscape change, legislation, bounties and the efforts of a few professional wolf hunters. This paper estimates the wolf population in Ireland at three time periods in the 1600s and examines how each of the forces already mentioned led to their eventual extermination. The 87 dated and documented wolf incidents which include wolf attacks on both animals and humans, wolf observations and the hunting and killing of wolves over the period 1560–1789 show both spatial and temporal variations.

Key index words: wolves, population, extermination, Ireland.

Introduction

It has been well established that Ireland has one of the poorest mammalian faunas of any region in Europe in the postglacial period (Stuart and van Wijngaarden-Bakker, 1985). But for the introduction of a considerable number of species by humans this fauna would be considerably poorer (Sleeman, 1997). However, humans have also been responsible for the extermination of a number of species including the wolf. This was the last carnivore to be erased from the Irish landscape despite the fact that it survived into the late-eighteenth century. The wolf was a significant part of the postglacial fauna of Ireland. This is evidenced by its occurrence in many of the ancient Irish myths and legends (O'Sullivan, 1996) in a number of place names in both Irish and English (Flanagan, 1979), in archaeological sites (Raftery, 1994; Waddell, 1998) along with a considerable number of historical references. The decline and extermination of the Irish wolf was a rapid and irreversible process, and as soon as it started there was little chance that the wolf would have been able to survive the forces pitched against it.

This article sets out to estimate the population of wolves in Ireland for three time periods in the 1600s. It also sets out to examine how wolves survived in Ireland and identify key characteristics of their ecology. This will include their habitat, diet and breeding requirements. Finally there is an assessment of the forces at work in their rapid decline and extermination including habitat change, legislation, bounties and the role of a few professional wolf hunters.

Data sources

All of the data available on wolves in Ireland come from documentary evidence, given that their elimination from the Irish landscape occurred in the late-eighteenth century. In the case of the documentary data from the pre-1500 period the original record has often not survived or is

available in manuscript source either in Latin or Irish, so translations are needed. This is one of the reasons why the post-1500 period was chosen for examination, in that much of the original material is still available in a relatively easily accessible form. As a result, primary data sources are more easily traced. Secondly, there is an excellent survey of the extent of Irish woodland in 1600, and this will form the basis of the initial habitat assessment (McCracken, 1971).

The data sources for the post-1500 period can be broken down into three major types. The first of these is natural histories or works with a strong natural history component. These can be either early works, for example, Roderic O'Flaherty (1629-1718) whose book *West or h-Iar Connaught*, written in 1684 but unpublished in his lifetime, can in parts be described as a natural history (O'Flaherty, 1846) or modern natural histories, often quoting either well known early written histories and/or descriptions of Ireland and early historical references (Foster, 1997a; Cabot, 1999). The second major type is legislation, Government orders and directives. These sometimes include details of bounties available or paid for wolf kills, for example, Sir John Ponsonby in a report to the Committee of Grievances in 1662 is recorded in the journal of the House of Commons suggesting that a bill should be brought in to encourage the killing of wolves and foxes in Ireland (Fairley, 1984). The final type is letters and diaries, for example J. Howel, Alderman of Cork city, wrote in a letter dated 1698 of having both wolves and foxes in the district (Allen, 1909).

The assessment of the reliability of the data sources is based on a number of considerations. Ideally the record relating to the description of wolf incidents should be contemporary both temporally and spatially with the incident it records. The recorder of the wolf incident should be in or near the location and at or near the date when it occurred, thereby reducing the possible impact of second-hand stories being repeated and duplicated and creating new wolf incidents. Where possible, the reliability of these early authors should be considered as in the case of Roderic O'Flaherty above, the quality and reliability of whose work has long been established (Moriarty, 1997). If the record is not contemporary then the next best is to have the available reference directly quoting an earlier contemporary or near contemporary source. This is obviously less reliable than above, but is still sufficiently valid enough to include, particularly if the earlier reference may be traced.

The data that are most problematic and for which a quality or reliability assessment is difficult to apply are from sources not contemporary with the information they record, and for which no earlier references are given in support of the material presented. Surprisingly, this problem occurs most in the 1700s when the concern of many authors was to identify the date of extinction of the last wolf either in their own county or in the country as a whole. This is possibly as a result of some perverse competition to see whom could produce the last record of wolves in Ireland (Fairley, 1984). This may have led to exaggeration and possibly even the fabrication of information including a number of late-eighteenth century and even early-nineteenth century claims for the death of the last wolf (Allen, 1909). This may also be associated with the romanticisation of the wolf, now that they were no longer a feature of the Irish landscape and their very real threat had been removed given their history of attacks on livestock, though very rarely humans, in Ireland.

Literature

There is very little written in scientific terms on wolves in Ireland, primarily as a result of their extinction in Ireland in the late-eighteenth century. There are a number of short

articles in journals such as *The Irish Naturalist*, but these usually consist of brief notices of newly identified historical references to wolves in Ireland (Scharff, 1922; 1924). There are only two major works of note. The first is an assembly of documentary data and historical references to wolves in Britain and Ireland (Harting, 1880). This includes the first chronology of wolf incidents in Ireland and the Cromwellian response in terms of legislation and bounties. It also briefly mentions wolf bone finds from a number of archaeological sites in Ireland. The second is a chapter on wolves in Ireland in *An Irish Beast Book: A Natural History of Ireland's Furred Wildlife* (Fairley, 1984). Harting's work forms a considerable portion of the data used by Fairley's chapter. However, Fairley updates the information considerably. Although he briefly mentions some of the archaeological evidence for wolves in Ireland, he concentrates on the documentary evidence and describes it in roughly chronological order. However, a number of themes are discussed in the work including the diet of wolves. Wolves are omnivores, but given that they operate in packs the preferred prey are large herbivores, primarily deer in an Irish context. The author also considers wolf attacks on humans, which are dismissed as being unlikely, except when the wolf is rabid. The role of deforestation is examined in reducing the available habitat for wolves, although the latter is not treated in any great detail. Fairley also shows that a number of place names in Ireland contains references to wolves both in English and particularly in Irish.

Archaeological evidence

The earliest evidence for wolves in Ireland comes from a series of excavated cave sites where deposits of bone have accumulated. The earliest radiocarbon date for a wolf in Ireland is 34,000BP from Castlepook Cave, north of Doneraile, county Cork (Stuart and van Wijngaarden-Bakker, 1985). Wolf bones from similar contexts in a number of other cave sites particularly in the counties of Cork, Waterford and Clare indicate the presence of wolf throughout the Midlandian ice age which probably reached its peak around 18,000-20,000BP (Scharff *et al.*, 1918; Scharff, 1922).

In the postglacial period the evidence for wolves in Ireland comes from a variety of excavated sites including caves, Mesolithic camp sites, loughs and middens, with a variety of post-glacial dates (Stuart and van Wijngaarden-Bakker, 1985; Waddell, 1998). The ringforts, a common feature of the Irish landscape, were built partly as a defence against wolves and to protect livestock, over the period 1000 BC to AD 1000, and these types of enclosures are still in use in parts of Europe where wolves remain a threat to livestock (Fairley, 1984).

Wolf zoology

Individual wolves when fully grown can be up to 1.7m in length of which 1-1.25m would be the torso. Adults can weigh up to 57Kg. On average wolves live for ten years but can live up to sixteen years (Federal US Database on Wildlife, 1999). However, the key fact about these animals is that they operate in packs. Pack sizes vary depending upon a number of factors but normally consist of between five and twenty individuals. For example, in the Mercantour area of the French Alps three packs of five, nine and thirteen wolves were identified in 1999 (Wavell, 1999). The pack is controlled by a dominant pair and only they are allowed to breed. Wolves reach breeding age at three years, have a short gestation period of two months and usually produce between four and six cubs. Wolves have excellent reproductive rates and can double population annually dependent upon prey and habitat. The

minimum sustainable breeding population is estimated at fifty individuals (Federal US Database on Wildlife, 1999).

Wolves prefer a variety of habitat types within their range, need a supply of water, and a secluded area for breeding purposes and ready availability of food. Wolves are considered opportunistic feeders but will primarily concentrate on big game. In Ireland, this would have been deer, but they will eat virtually anything including rodents, birds, reptiles, fish, crabs, insects, worms and berries. Clearly, domesticated animals such as sheep, cattle and even horses are relatively easy prey for a hungry wolf pack (Fairley, 1984). In 1663 Christopher Croaffts in county Down writing in a letter to Sir John Perceval states that "we are much troubled with wolves for we lost at Wailshistowne three sheep; another night at Ballyadam four sheep" (Croaffts, 1909: 5). Wavell notes that in the five years until 1998 wolves had killed 2978 sheep in the French Alps (Wavell, 1999).

So, the wolf or wolf pack is a formidable unit capable of killing large animals, but flexible in its diet, capable of travelling over large distances within its range, prefers a variety of habitats and as a result is considered to be more prey dependent than habitat dependent. This is a formidable species with a high reproductive rate and these factors must be borne in mind when examining the three estimates below.

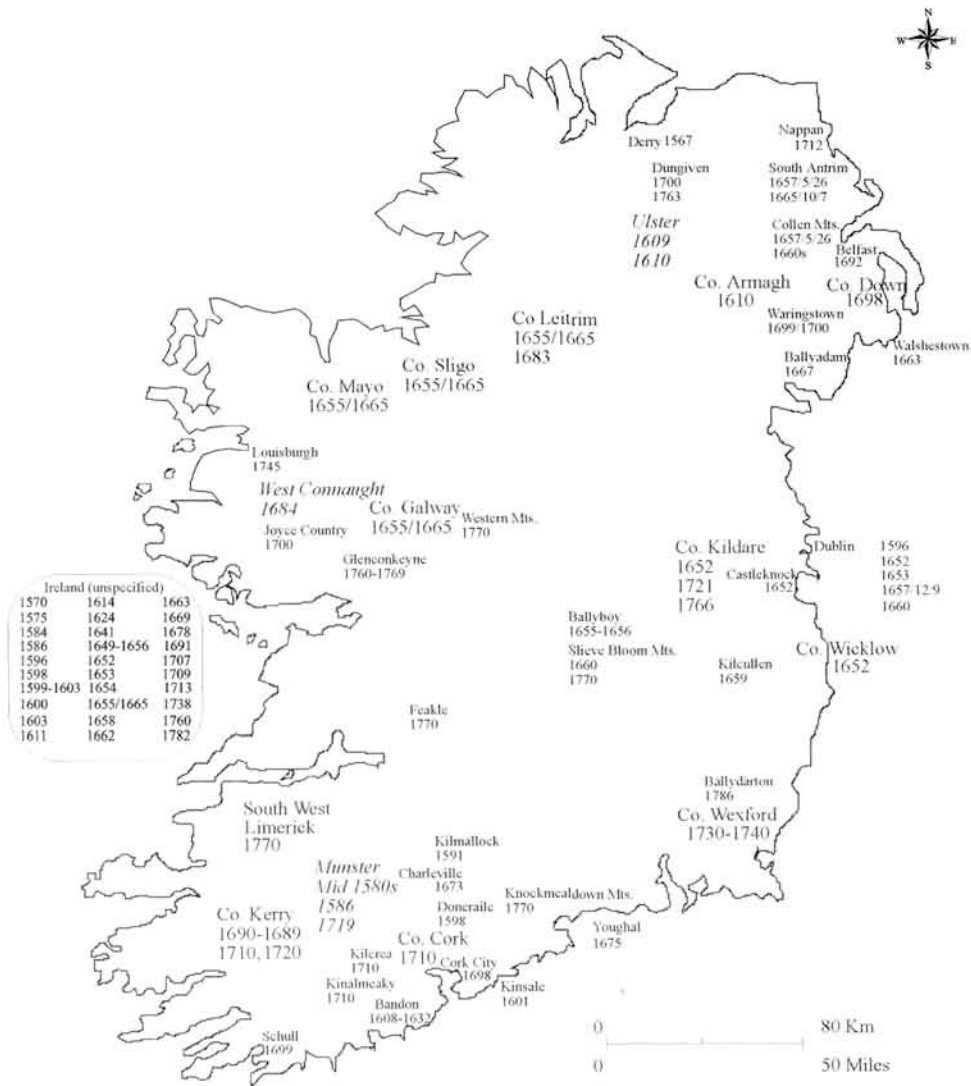
Population estimate AD 1600

In an attempt to estimate the population of wolves in Ireland two approaches were adopted based on the available evidence. Both approaches provide insights into the potential and actual numbers of wolves throughout Ireland. The evidence is dealt with as conservatively as possible throughout, in order that justifiable wolf population estimates can be arrived at, especially at the minimum population level.

The population estimate for 1600 is based on habitat information. This is an assessment of the nature of the Irish landscape around 1600 and human population levels. This will roughly indicate the extent of habitat available for wolves to occupy and coupled with ecological information for existing wolf populations, particularly in the USA, will indicate a range of wolf numbers that could be supported given these considerations.

The total area of the island of Ireland is 84,440Km². McCracken (1971) who examined in great detail the woods of Ireland around 1600, estimated that the total woodland cover at around 12.5 percent, primarily in the river valleys where soils were difficult to cultivate with the technology of the time. Tracts of woodland also occurred in the more isolated mountain regions of the north-west, west and south-west and in parts of the south-east and north-east (Figure 1). Woodland was relatively scarce immediately around Dublin with the exception of the Wicklow Mountains, but was also scarce in the north central part of Ireland as far west as Galway city and Killala. There were no vast areas of virtually untouched woodland but such as existed were of a considerable size. This by no means represents the total area available for wolves, as at least a further 20 percent of the country remained uncultivated including mountains, bog and exposed limestone areas.

Secondly, just like foxes today, wolves were seen near and in some cases in the outskirts of Irish cities at this time, indicating their lack of fear of humans and that they could survive in areas where humans were common. In 1652 measures were taken for the destruction of wolves in the Barony of Castleknock, county Dublin (Dunlop, 1913).



Sources: See references, but especially Harting (1880), Fairley (1984).

Figure 1: Dates and locations of documented references to wolves in Ireland, 1560-1789.

The population of Ireland at this time is estimated to be of the order of 1 million to 1.5 million people which gives a very low population density of 17 people per Km² (Dixon, 2000). The population by no means was evenly distributed (Pender, 1939). This suggests that large tracts of Ireland were still in an uncultivated or relatively natural state with low human populations. Coupled with the wolves' adaptability, this generates an estimate of the minimum available habitat of 32.5 percent of the land area of Ireland or 27,440Km².

To convert this crude estimate into a possible population level some further assumptions have to be made. Based on the 1999 data from the Federal US Database on Wildlife, pack

sizes normally average between five and ten individuals and have an average range size of 350Km² and a maximum range size of 560Km². This will enable the generation of two estimates of wolf populations.

Firstly, a conservative estimate based on the maximum range, obtained by dividing this figure into the available Irish habitat, indicates a population of 50 packs of between five and ten individuals or a total population of between 250 and 500 wolves. Even taking the lower figure this is easily a sustainable breeding population. Secondly, a less conservative estimate, based on the average range size, indicates a population of 78 packs of between five and ten individuals or a total population of between 390 and 780 wolves, well over the threshold for a sustainable breeding population.

Population estimate AD 1655 or 1665

The second approach is called the bounty approach. This is based on bounties paid out for wolf kills after 1652. In 1652 the Commissioners of the Revenue of Cromwell's Government in Ireland set enormous bounties on wolves, £6 for a female, £5 for a male, £2 for a hunting juvenile and 10 shillings for a cub. These were substantial sums of money for the time (Scharff, 1922). It had long been a custom in England and Scotland to pay bounties for wolf kills (Harting, 1880). As early as 1167 the Bishopric of Hereford, which at the time was vested in the King, paid out 10 shillings for three wolves captured that year. In 1621 the price paid in Sutherlandshire in Scotland for the killing of one wolf was £6 13s 4d (Harting, 1880).

In 1655 or 1665 (the date depends on the author) a grand total of £243 5s 4d was paid for wolf kills in Galway, Mayo, Sligo and part of Leitrim formerly within the precinct of Galway (Dunlop, 1913; Prendergast, 1922; McCracken, 1971). Unfortunately, no further breakdown of this figure is given (Dunlop, 1913). It must also be noted that this money may have included some costs associated with hunting wolves, although there is no clear evidence to indicate the extent of this.

If all the wolf kills were female, this would indicate a total of 40 wolves, if all male a total of 49 wolves, if all hunting juveniles a total of 124 wolves and if all cubs a total of 681 wolves. Obviously, the wolf kills would consist of a mixture of all four types, particularly as it is likely that individual packs would be targetted for extermination. So therefore, to arrive at a total figure for which this amount of bounty represents the age, sex and mobility of individuals within a pack must be taken into account. It is therefore suggested that this bounty conservatively would probably represent between 75 and 150 wolf kills in that year and for that part of the country. This area covers 13,730Km², allowing for 25 percent of Leitrim to be included in this figure. Extrapolating from this for the country as a whole, the population of wolves in Ireland would be between 300 and 600 wolves at the lower level or between 450 and 900 wolves at the upper level. Again these totals are well above the sustainable breeding threshold. This ties in with the habitat estimate above. In fact, this calculation of wolf populations would seem to indicate that the habitat estimate above might be too conservative.

Population estimate July 1649 to November 1656

Again the bounty approach is used. Between the period July 1649 and November 1656 the total amount of bounty paid out for wolf kills in Ireland as a whole was £3,847 5s, a huge amount of money by the standards of the time (Dunlop, 1913). Again, caution must be noted

in that some of this money may have been used to purchase some hunting and trapping equipment although there is little direct evidence for this. However, when the above figure is broken down this gives a national average bounty payment over 7.5 years of £513 per annum. If all the wolf kills were female this would indicate a total of 85 wolves, if all male a total of 103 wolves, if all hunting juveniles a total of 256 wolves and if all cubs a total of 1436 wolves per annum. It is suggested that this bounty would conservatively represent an annual wolf kill over this time period of between 225 and 400 individuals. This would indicate that for the population to be sustained over this time period, even allowing for an initially higher number of wolf kills at the start of this period with a subsequent decline throughout the period, that the overall wolf population was higher than this by some margin. It is suggested that conservatively a factor of two might be applied to these figures to give a total population. This allows for the fact that this phase of the extermination was not totally successful and there were residual wolf populations around the country. If this is done, then the overall population would range between 600 at the lower estimate and 800 at the higher estimate.

Again, this ties in with the habitat estimate and may suggest that Galway, Mayo, Sligo and part of Leitrim had proportionately more wolves than the rest of the country, given that large tracts of this area would be relatively untouched by humans.

Based on the three estimates from above, it is safe to conclude that, even as late as 1665 Ireland had a considerable wolf population capable of sustaining considerable annual losses. Based on the evidence presented it is conservatively estimated that between 1600 and 1655/1665 the wolf population in Ireland never dropped below 400 individuals and could easily have been as high as 800 to 1000 individuals, if the estimates above are even slightly too conservative. A number of writers from this time period suggest that as a result of ongoing military campaigns in Ireland, particularly the Cromwellian wars 1641-1652 and the devastation of much of the country, wolf numbers were on the increase (Prendergast, 1922; McCracken, 1971; MacLysaght 1979). Wolves were taking advantage of the desolation that was occurring to such an extent that they were becoming common even in the outskirts of Dublin (MacLysaght, 1979).

Last wolf

In order to emphasise further the extent of wolves in Ireland a brief examination of the recorded and dated observations of wolves over the period 1560 to 1789 will be undertaken. The observations take a number of particular forms which can be classified into four main types—

- (1) statements of the existence of wolves in Ireland at a particular time and for a particular location or the country as a whole;
- (2) statements concerning the hunting of wolves, dated wolf kills and bounties paid out on wolf kills, details of particular preventative measures taken against wolves;
- (3) dated reports of attacks by wolves on livestock and
- (4) dated reports of attacks by wolves on humans.

Over the period 1560-1789 there were 87 dated wolf incidents. Three periods of increased decadal observation of wolves between 1550 and 1819 can be identified (Figure 2). The first was from 1590 to 1619 and probably coincided with the arrival of English settlers to Ireland and their first contact with wolves, given that wolves had been exterminated in England probably prior to 1500 (Fairley, 1984). It has been suggested above that wolves were

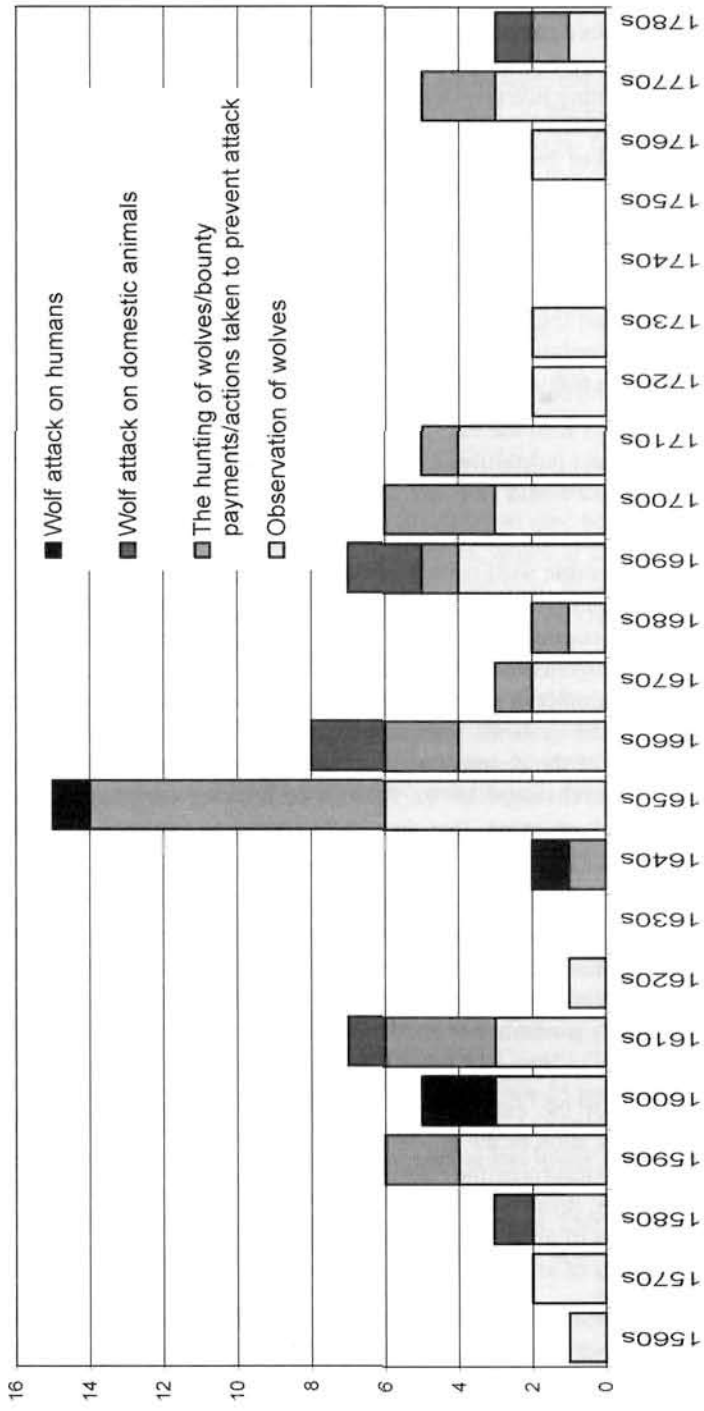


Figure 2: Classification of dated documentary records of wolves in Ireland 1560-1780.

on the increase during the first half of the seventeenth century (Prendergast, 1922; McCracken, 1971; MacLysaght, 1979). The second and main period of recorded wolf incidents is from 1650-1669. This period is clearly associated with the introduction of substantial bounties in 1652 by Cromwell's Government in Ireland for wolf kills (Scharff, 1922). This would have focused attention on wolves and with reduced political and military strife after 1651, more attention would have been given to this problem. The final period is from 1690 to 1729 and represents the beginning of notices of the last wolves been killed in certain areas, primarily counties. Even if these were incorrect, it shows how rapidly wolf populations must have declined particularly after the 1652 legislation (Harting, 1880).

There is a general agreement amongst many authors writing on the topic of wolves in Ireland that after 1700 they had become very scarce and may have been confined to a much smaller number of areas throughout the country (Harting, 1880; Fairley, 1984). The last reliable observation of a wolf in Ireland, surprisingly comes from county Carlow when a wolf was hunted down and killed near Mount Leinster for killing sheep in 1786 (Moffat, 1938). Although there are a number of claims for later wolf kills than this, none of them so far are based on documentary evidence from the time of occurrence and must be considered dubious at best (Fairley, 1984).

In terms of spatial distribution of the 87 dated wolf incidents 30 refer just to Ireland as a whole and the remaining 57 incidents at least refer to the province of occurrence and from this right down to the individual townland (Figure 1). Most of the specifically located wolf incidents occur in three clusters—(1) south-west Munster—primarily Cork and Kerry; (2) east Leinster—primarily Dublin, Kildare and Wicklow and (3) north-east Ulster—primarily Down, Antrim, Armagh and Derry. These were all areas of strong colonial influence with the arrival of settlers from England and Scotland and where wolves would be considered a major menace. The exception to this were parts of Kerry which remained uncolonised. There is a scattering of references to other places outside these areas from Wexford in the south-east to Louisburg in the west and Leitrim in the north-west. Not surprisingly there are no references to wolves in counties such as Westmeath, Louth, Meath going west as far as Sligo and Mayo, this roughly corresponds with an area that according to McCracken (1971) was very poorly wooded and too boggy even by 1600 (Figure 1). There are no records from counties such as Donegal, Tyrone, Fermanagh and Cavan where woodland was still common in 1600 and would have provided suitable areas for wolf occupation (McCracken, 1971). These would have been areas where Irish control remained and probably less consideration was given to the wolf problem.

Causes of the wolf decline and extermination

Two primary causes have been identified as being responsible for the decline and extermination of the wolf on the island of Ireland. The first of these is habitat change. Between 1600 and 1700 the forested area of Ireland declined from approximately 12.5 percent to 2 percent (McCracken, 1971). This would have been the primary and probably preferred habitat of the wolves in Ireland. This deforestation came about as a result of number of factors including the Plantations of Ulster and Munster which brought large number of settlers from Britain to Ireland and who wanted to replicate an English landscape as much as possible in Ireland (Barnard, 1975). This included demesnes and estates, parkland and well fenced fields. As they were often granted the best lands in Ireland, the settlers often forced the Gaelic Irish off their land and as a result they had to move to the more marginal lands

(MacLysaght, 1979). One of the rewards for English settlers was the granting of tracts of oak forest, which were extremely valuable, especially if shipped to Britain. Large woodland areas were rapidly felled, the timber being used for shipbuilding, stave-making, charcoal production and iron working (McCracken, 1971). This resulted in the bringing into permanent cultivation of large tracts of the country. Politically, deforestation was used as a means of depriving both Irish rebels known as woodkerne and wolves a place of refuge and from where attacks on the colonists could be initiated. For the mid-1600s the perspective of the newly arrived settlers the density of the forest was to be deplored because it could conceal wolf and woodkerne (Foster, 1997b). This rapid change in the Irish landscape would have deprived the wolf of large areas for feeding and particularly for breeding purposes and would have put the wolf population under ever increasing pressure.

In terms of population, the picture is not so clear. The evidence suggests that as a result of the slaughter of the Irish during the Cromwellian wars, the overall population had declined in the 1640s and 1650s. It is noted that the wolves had multiplied in the lands which had been destroyed and depopulated (Prendergast, 1922). Even by 1687 Petty's estimate of the population of Ireland based on the number of hearths was 1.3 million, little different than the 1600 estimate (Pender, 1939). It is likely, however, that by 1700 the population of Ireland was on the rise as by the first modern census in 1821 the population of the country stood at 6.821 million (Census of Ireland, 1821).

The second factor in the wolf decline relates to three inter-related aspects, namely legislation and bounties and the activities of a few professional wolf-hunters. This also represents a difference in attitudes between the native Irish and the English settlers. Although the Irish hunted wolves, it is evident from the documentary data that they did not see the need to exterminate the wolves. They perceived them as a natural part of the landscape, although wolves were still a threat, and were usually associated with evil (Feehan, 1997). It is also claimed that the Irish kept them as pets or familiars (Broghill, 1874; Foster, 1997b). The newly arrived English settlers in Ireland were probably horrified at finding that there was a significant wolf population in Ireland in the 1600s, in fact, one of the nicknames used for Ireland at this time was *wolf-land*. Along with the rebel Irish the settlers viewed the wolves as vermin and a significant threat to the English society they were trying to recreate in Ireland, and should be exterminated as quickly as possible.

The first piece of legislation dealing with wolves in Ireland dates back to 1584 when a scheme was devised by Robert Legge under the orders of Sir John Perrot who was the Lord Deputy of Ireland. This scheme was to encourage the destruction of ravening and devouring wolves. However it appears that although a scheme was devised, it was not acted upon until much later (O'Flaherty, 1846). No further details of the scheme have been found so far. There are two further records of an institutional response in 1610 and 1611 (Table 1). In 1614 the first indication of the amount of bounty on offer is recorded when Henric Tuttesham was rewarded with £3 (a substantial amount of money at the time) for the head of every wolf. There is no information available to indicate how many wolves he killed (O'Flaherty, 1846). The bulk of the legislation and bounties which seems to have affected wolf populations most in Ireland was issued in the ten years from 1652 to 1662 by Cromwell's Government. There was an initial ban on the export of Irish wolf-dogs so that the problem of wolves in Ireland could be tackled. Secondly substantial bounties were introduced in 1653 as discussed above. To aid in the wolf extermination orders were made that some wolf hunting equipment would be provided for from the public purse. Finally in 1662 a further Bill to encourage the killing

of wolves and foxes in Ireland was introduced (Table 1). In Leitrim a hearth tax was used to pay the rewards for wolf kills which consisted of 2d per hearth in that parish for every wolf killed. One response by certain landowners in the early 1700s was to issue leases to tenant farmers which stipulated that they were required to kill a certain number of wolves as part of their leasing agreement (McCracken, 1971). Unfortunately, with the exception of the two summary bounty payments relating to the 1653 legislation, there is no direct evidence relating to the specific effects of the various legislation and bounties on offer. The general effect, as has been already noted, was a significant decline in wolf numbers by the late 1600s, so that they were considered scarce in the early part of the 1700s.

Table 1: Legislation and Bounties dealing with wolves in Ireland.

1584	First scheme devised by Robert Legge by order of Sir John Perrott to encourage the destruction of ravening and devouring wolves (Harting, 1880).
1610	Rewards (unspecified) given for the destruction of wolves (McCracken, 1971).
1611	Heads of a Bill in the Irish Parliament : An Act for Killing Wolves and other Vermin (Scharff, 1922).
1614	Reward of £3 for every wolf kill to Henric Tuttesham (McCracken, 1971).
1652/4/27	Council order of Cromwell's Government made to prevent the export of Irish wolf dogs on account of the growing wolf problem (Harting, 1880).
1653/6/29	(published 1656/7/1) Introduction of a system of bounties to encourage wolf hunting: female £6, male £5, juvenile who hunted £2 and suckling cub 10 shillings (O'Flaherty, 1846).
1659/8/29	Order made that some wolf hunting equipment be provided from the public purse (Archibald and Bell, 1854).
1662	Sir John Ponsonby to report of a Bill brought to encourage the killing of wolves and foxes in Ireland in the House of Commons, London (Fairley, 1984).
1680s	Co. Leitrim: a hearth tax used to pay the rewards for wolf kills to the amount of 2d for every hearth in the parish where the wolf was killed (McCracken, 1971).

The level of rewards and bounties available attracted a few professional wolf hunters to Ireland, mostly from England. This is surprising given that the extermination of wolves in England was complete at least 100 years prior to the arrival of the first recorded professional wolf hunter into Ireland. It is possible that some of these men had experience of wolf hunting in Scotland or in Europe, but there is no evidence for this in the documentary records. Politically, it may have been that the prospect of numbers of armed Irish roaming around the country hunting wolves was not acceptable, given the ongoing conflict between the Irish and the new English settlers and attempts to control the country and prevent further rebellions. It would have been much safer for the English authorities to encourage men from their own country to deal with the wolf problem. It is likely that as a result of the 1611 legislation the first recorded professional wolf hunter arrived in Ireland in 1614. He was Henric Tuttesham from Newmarket and seems to have been given a national brief to hunt wolves (Table 2).

Table 2: Professional wolf hunters in Ireland.

1614/11/26	Henric Tutttesham, Newmarket, England, reward of £3 for the head of every wolf. Authorised to keep four men and twelve couple of hounds in every county for seven years. This would give a total of 128 men and 768 hounds (McCracken, 1971).
1641	Notice that wolf hunters were appointed in various districts including Connaught (O’Flaherty, 1846).
1652/12/1	Richard Toole and his servant equipped with two fowling pieces given permission to hunt wolves in Kildare, Wicklow and Dublin for the following two months (Prendergast, 1922).
1653/3/11	Captain Edward Piers reward for each wolf killed plus a favourable lease on land in Dunboyne for five years. Required to kill fourteen wolves and 60 foxes over the five year period and must hunt three times monthly. Required to pay £100 deposit plus rent as security against the performance of his duties (Prendergast, 1922).
1663	William Collowe, England sends petition to the Duke of Ormond, Lord Lieutenant of Ireland, for special legal powers to hunt wolves in Ireland (Fairley, 1984).
1690’s	Rory Carragh, hired to kill the last two wolves in part of Ulster, equipped with a boy and two wolf dogs (Allen, 1909).

Tutttesham was authorised to keep four men and 24 hounds in every county for seven years, a total of 128 men and 768 hounds and for which he received £3 for each wolf head. This indicates that there was a sizeable wolf population in Ireland which represented a considerable threat and was not confined to certain locations. If this was carried out and there is no indication from the documentary records how he fared, it certainly would have had a sizeable impact on the wolf population. Any impact he had made on the wolf population seems to have been short-term because by the time of the Cromwellian wars in Ireland the wolf population was again on the increase (Prendergast, 1922). The next identified professional wolf hunter was Richard Toole, who was probably Irish, and began his activities as a result of the bounties offered in the 1652 legislation. The person for whom most detail is available is Captain Edward Piers who was leased land on very favourable terms in Dunboyne, county Meath and was required over a five year period to kill fourteen wolves and 60 foxes. As security against the performance of his duties, Piers had to deposit annually the sum of £100 in addition to his rent, the deposit being redeemed upon proof of the execution of his duties (Prendergast 1922). In the 1690s Rory Carragh was hired to kill the last two wolves in one part of Ulster and was equipped with a boy and two wolf dogs (Table 2). This may indicate that by the late 1600s only localised wolf problems remained. This agrees with the onset of last wolf observations from the 1690s onwards and particularly the decline in wolf observations from 1720 onwards.

Conclusions

Despite the extermination of the wolf in the late 1700s, most likely 1786, Ireland throughout most of the first half of the 1600s had a substantial wolf population of not less

than 400 and maybe as high as 1000 wolves at any one time. As a result of their perceived threat to the new order of incoming English settlers a campaign was undertaken to eliminate them from the Irish landscape. This was achieved by habitat change particularly deforestation and the creation of new permanent agricultural land, by legislation and the offering of bounties particularly in 1652 and probably aided by the activities of a few professional wolf hunters. Clearly, all these factors combined would have made the survival of a species even as formidable and adaptable as the wolf increasingly more difficult. With the virtual elimination of woodland in Ireland, the gradual extension of English control over the more remote parts of Ireland and with it the development of permanent agricultural land, the days of the wolf were numbered. By the early 1700s they were probably confined to a small number of areas and probably would have tried to avoid human contact as much as possible. Nevertheless, despite the ongoing bounty payments for wolf kills they were not completely exterminated from the Irish landscape until most likely 1786. This represented the loss of one of Ireland's most formidable post-glacial species and certainly the only major carnivore to survive into the historic period.

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