

---

Ireland

Red List No. 3



## Terrestrial Mammals







## Ireland Red List No. 3:

### Terrestrial Mammals

**Ferdia Marnell<sup>1</sup>, Naomi Kingston<sup>1</sup> & Declan Looney<sup>2</sup>**

<sup>1</sup>National Parks & Wildlife Service

<sup>2</sup>Northern Ireland Environment Agency

#### Citation:

Marnell, F., Kingston, N. & Looney, D. (2009) *Ireland Red List No. 3: Terrestrial Mammals*, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Cover photos: From top – Pine Marten (Eddie Dunne © NPWS); Brandt's bat (Frank Greenaway © NPWS); Irish Hare (Eddie Dunne © NPWS).

Ireland Red List Series Editors: N. Kingston & F. Marnell

© National Parks and Wildlife Service 2009

ISSN 2009-2016

## Contents

Executive Summary .....	3
Acknowledgements .....	3
Introduction .....	4
Aim .....	5
Red list categories & criteria .....	5
Workshops .....	6
Taxonomic and geographic scope .....	7
Summary of findings .....	8
Implications for the conservation of Irish mammals .....	9
Format of Species Accounts .....	13
Order Insectivora .....	14
<i>Erinaceus europaeus</i> Linnaeus .....	14
<i>Sorex minutus</i> Linnaeus .....	15
Order Chiroptera.....	16
<i>Myotis brandtii</i> Eversmann.....	16
<i>Myotis daubentonii</i> Kuhl.....	17
<i>Myotis mystacinus</i> Kuhl.....	18
<i>Myotis nattereri</i> Kuhl.....	19
<i>Nyctalus leisleri</i> Kuhl.....	20
<i>Pipistrellus nathusii</i> Keyserling & Blasius .....	21
<i>Pipistrellus pipistrellus</i> Schreber .....	22
<i>Pipistrellus pygmaeus</i> Leach .....	23
<i>Plecotus auritus</i> Linnaeus .....	24
<i>Rhinolophus hipposideros</i> Bechstein .....	25
Order Rodentia.....	26
<i>Apodemus sylvaticus</i> Linnaeus.....	26
<i>Mus musculus domesticus</i> Ruddy .....	27
<i>Rattus rattus</i> Linnaeus .....	28
<i>Sciurus vulgaris</i> Linnaeus.....	29
Order Carnivora .....	30
<i>Canis lupus</i> Linnaeus .....	30
<i>Lutra lutra</i> Linnaeus.....	31
<i>Martes martes</i> Linnaeus.....	32
<i>Meles meles</i> Linnaeus .....	33
<i>Mustela erminea hibernica</i> Thomas & Barrett-Hamilton .....	34
<i>Vulpes vulpes</i> Linnaeus .....	35
Order Lagomorpha .....	36
<i>Lepus timidus hibernicus</i> Bell.....	36
<i>Oryctolagus cuniculus</i> Linnaeus.....	37
Order Artiodactyla.....	38
<i>Cervus elaphus</i> Linnaeus.....	38
<i>Dama dama</i> Linnaeus.....	39
Bibliography & Relevant Literature.....	40
Appendix 1 - Summary of the five criteria (A-E) used to evaluate taxa.....	47
Appendix 2 – Checklist of terrestrial mammals.....	48

## Executive Summary

- A new Red List of Irish terrestrial mammals is presented.
- All 26 terrestrial species native to Ireland, or naturalised in Ireland before 1500, are assessed.
- Of these, one was found to be regionally extinct (grey wolf *Canis lupus*), one achieved a threat status of Vulnerable (black rat *Rattus rattus*), three were found to be Near Threatened (Leisler's bat (*Nyctalus leisleri*), otter (*Lutra lutra*) and red squirrel (*Sciurus vulgaris*)), one was data deficient (Brandt's bat *Myotis brandtii*) and the remaining 20 were of least concern.
- While the Irish mammalian fauna in general is in good status a number of widespread threats such as unsympathetic woodland management, poor water quality, road-kill and persecution, are discussed. There are also concerns about the underlying status of many of the natural habitats on which these species rely.
- Most Irish universities now have active teams of mammal researchers. Much has been learned about the distribution, habitat preferences, diet, breeding biology and molecular ecology of many of our species. However, many questions remain to be answered.
- Ongoing cross-border research and monitoring projects have highlighted the benefits of actively sharing knowledge and experience between Northern Ireland and the Republic of Ireland. Further opportunities for cooperation on mammal survey and monitoring need to be explored.
- Some issues will require a cross-sectoral approach if progress is to be made, e.g. water quality. Collaborative projects which involve a range of state-bodies should be encouraged if we are to optimise synergies going forward.
- Future research priorities will include the impact and control of invasive alien mammals and the potential impacts of climate change.

## Acknowledgements

With thanks to all who participated in the workshops which informed these assessments. Additional thanks to Colin Lawton for discussions on the red squirrel and to Rebecca Jeffrey for her eagle-eyed proof-reading.

## Introduction

Mammals are particularly important for nature conservation, as they are generally charismatic flagship species whose welfare garners the support and sympathies of the general public. As umbrella species, with comparatively large home ranges, protecting enough habitat for their populations, will also protect adequate habitat for many other species (Hunter, 1995).

Ireland is comparatively poor in terms of mammal diversity, as it became isolated from mainland Europe relatively soon after the ice retreated following the last period of glaciation. As a result few mammals were able to cross the land-bridges between mainland Europe, Britain and Ireland before the island of Ireland reformed. Of the 204 terrestrial mammals found in Europe, only 27 are found in Ireland, or 13% (Temple & Terry, 2007), compared with 43 species found on the island of Britain (NHM, 2009).

Ireland has a long history of mammal recording, with an intense period of recording just prior to the publication of the An Foras Forbatha Atlases (Ní Lamhna, 1979; 1983). Subsequent mammal recording comes largely from single species surveillance or monitoring programmes that necessarily focus on species of conservation concern. Of particular note are several large scale studies of the badger (Smal, 1995; Feore, 1994), the otter (Chapman & Chapman, 1982; Lunnon & Reynolds, 1991; Preston *et al.*, 2004; Bailey & Rochford, 2006), the hare (Reid *et al.*, 2007, Reid *et al.* 2009) and the squirrels (Carey *et al.*, 2007)

We can learn much about the ecology and biology of Irish mammal species from studies conducted elsewhere in Europe, but there are important differences too. The paucity of species here and the consequent absence of con-generic or inter-generic competition in many cases, has allowed some mammals to exploit expanded niches in Ireland. For example, in Ireland, in the absence of the brown hare, the Irish hare (*Lepus timidus hibernicus*) is common in lowlands. Elsewhere in Europe, where the brown hare dominates the lowlands, *Lepus timidus* is an upland specialist. The Leisler's bat (*Nyctalus leisleri*) provides another example; in Ireland this is our only large bat species and it is widespread and abundant. In most other countries where Leisler's bat occurs it overlaps with at least one other large bat species (e.g. Noctule *Nyctalus noctula*) and is far less common.

Ireland's Atlantic climate and the fact that many mammals are at the north-western limit of their biogeographical range in Ireland has also led to some interesting ecological adaptations here. The probability of finding bats foraging on mild evenings in mid-winter, when their continental colleagues are hibernating deep in snow-drifted caves is one example.

These local differences displayed by Irish mammal species, supported in some cases by genetic and archaeological work, has led to a reappraisal of the historic and even taxonomic status of some Irish species (e.g. Finnegan *et al.*, 2007; Martinkova *et al.*, 2007).

Significant advances have been made in our understanding of Irish mammals since the first Red Data Book was published by Tony Whilde in 1993. Indeed that publication provided the impetus and focus for an increase in mammal research here, as it identified significant gaps in our knowledge of species ecology and status. Dedicated teams of mammal researchers are now present in most Irish universities and with the continuing development of both field and laboratory techniques and equipment, our understanding of Irish mammals is being advanced on

many fronts. A new emphasis in recent years has been on long-term species monitoring programmes (e.g. Roche *et al.*, 2009, Aughney *et al.*, 2009). This has been largely driven by the demands of the EU Habitats Directive [92/43/EEC], but the results will provide robust trend data for many of our mammal species which in turn will underpin future conservation priorities and initiatives.

While university-led research has produced many scientific publications on Irish mammals over the last 10 years, public interest has also been stimulated and detailed and popular accounts of Irish mammals can be found in Hayden and Harrington (2000), Fairley (2001) and Browne (2005).

### **Aim**

The Ireland Red List of Terrestrial Mammals aims:

- to provide a full and objective assessment of species using the IUCN categories and criteria (IUCN, 2001) in conjunction with their guidance on regional assessments (IUCN, 2003).
- to allow for direct comparisons with the European (Temple & Terry, 2007) and global (IUCN, 2009) mammal assessments.
- to update the assessment of terrestrial mammals carried out by Whilde (1993) to provide a current and easily updatable list.
- to identify those species most in need of conservation interventions.
- to identify the major threats to Ireland's terrestrial mammals so that mitigating measures can be implemented.
- to identify areas of mammal ecology in Ireland requiring further research.

### **Red list categories & criteria**

The IUCN Red List categories and criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk (IUCN, 2001).

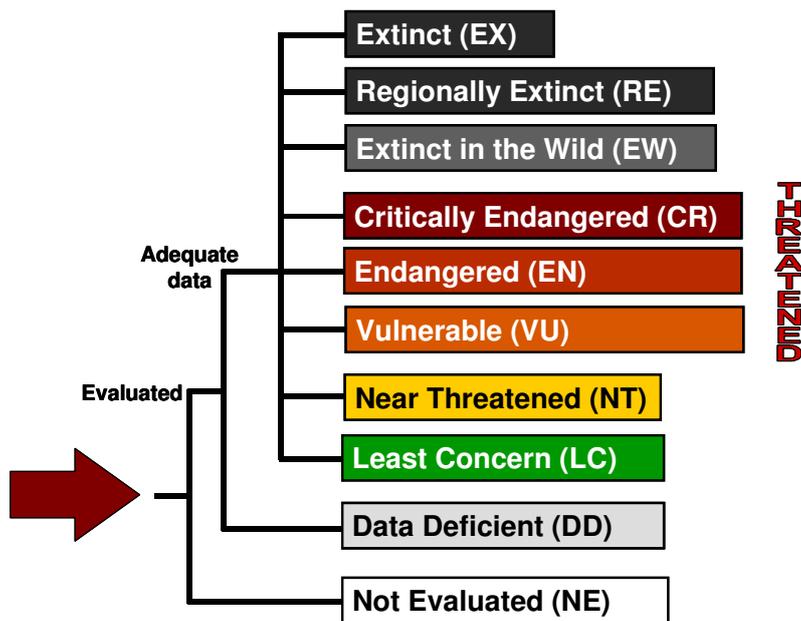
Various versions of the IUCN system have been in use for over 40 years, but since the late 1990s the categories and criteria have undergone an extensive review to produce a clearer, widely applicable, open and easy-to-use system. In recent years the IUCN have also provided detailed guidance on how to apply the categories and criteria (IUCN, 2008). Adoption of the IUCN system ensures consistency and comparability across taxonomic groups and regions.

The IUCN have provided guidance on how to apply the red list categories and criteria on a regional level (IUCN, 2003). Assessments for a geographically defined sub-global area, assist in conservation prioritisation at a regional level.

For the purposes of this assessment the additional category of "regionally extinct" was included, as recommended by the IUCN regional guidelines (IUCN, 2003). This category was not used in the 1993 assessment (Whilde, 1993). The "data deficient" category used in this assessment is

equivalent to the indeterminate (I) category used in the 1993 assessment. The full list of categories used in this assessment are listed in figure 1.

Appendix 1, taken from IUCN 2008, provides a summary of the five criteria (A-E) used to evaluate whether a taxon belongs in a threatened category (Critically Endangered, Endangered or Vulnerable). In order to complete the current red list, each species was evaluated against each criterion A-D systematically. Criterion E was not used, as sufficient data for a fully quantitative assessment was not available for any of the terrestrial mammals. Where a species met any one of the criteria it was noted, and the highest level of threat achieved by a species became its qualifying category. All of the criteria met at the highest level of threat were listed for each species.



**Figure 1** – Red List categories used for the purposes of this assessment. Further details and definitions for these categories and the criteria for achieving them are available in IUCN (2001, 2003) and Appendix 1.

### Workshops

Assessments for the bat species were all carried out as part of a workshop with bat experts on the 12<sup>th</sup> October 2006. Workshop participants who completed the assessments were Dr Tina Aughney (Bat Conservation Ireland [BCI]), Dr Sinéad Biggane (National Parks & Wildlife Service [NPWS] & BCI), Mr Conor Kelleher (BCI), Dr Naomi Kingston (NPWS), Dr Deirdre Lynn (NPWS), Ms Enda Mullen (NPWS), Dr Ferdia Marnell (NPWS), Dr Kate McAney (The Vincent Wildlife Trust [VWT]), Dr Niamh Roche (BCI) & Ms Mairéad Stack (Consultant with NPWS).

All other assessments were carried out on the 19<sup>th</sup> October 2006 by Dr Naomi Kingston (NPWS), Dr Declan Looney (Northern Ireland Environment Agency [NIEA]), Dr Ferdia Marnell (NPWS), Dr Donna Riordan (NIEA) and Dr Richard Weyl (NIEA).

More recent information on distribution and ecology has been included in the species accounts where available (e.g. Roche *et al.*, 2009; Aughney *et al.*, 2009, Harris & Yalden, 2008).

Complete reassessment of this list is recommended in 2016.

### Taxonomic and geographic scope

All 26 terrestrial species native to Ireland or naturalised in Ireland before 1500 were included in the assessment (table 1), as per the approach adopted by the European Mammal Red List (Temple & Terry, 2007).

The geographic scope of this assessment, as with Whilde (1993), covers the whole island of Ireland. The taxonomy follows Wilson & Reeder (2005).

Three native species have been added to the Irish mammal list since the 1993 assessment, Brandt's bat (*Myotis brandtii*) a cryptic species, Nathusius' pipistrelle (*Pipistrellus nathusii*), thought to be a recent coloniser, and soprano pipistrelle (*Pipistrellus pygmaeus*), separated taxonomically from common pipistrelle (*Pipistrellus pipistrellus*) in 1997.

**Table 1** – Terrestrial mammal species included in this red list assessment, listed according to their status.

Regionally extinct			
<i>Canis lupus</i>	Grey wolf		
Vulnerable			
<i>Rattus rattus</i>	Black rat/Ship rat		
Near Threatened			
<i>Lutra lutra</i>	Otter	<i>Sciurus vulgaris</i>	Red squirrel
<i>Nyctalus leisleri</i>	Leisler's bat		
Least concern			
<i>Apodemus sylvaticus</i>	Wood mouse	<i>Myotis mystacinus</i>	Whiskered bat
<i>Cervus elaphus</i>	Red deer	<i>Myotis nattereri</i>	Natterer's bat
<i>Dama dama</i>	Fallow deer	<i>Oryctolagus cuniculus</i>	Rabbit
<i>Erinaceus europaeus</i>	Hedgehog	<i>Plecotus auritus</i>	Brown long-eared bat
<i>Lepus timidus hibernicus</i>	Irish hare	<i>Pipistrellus nathusii</i>	Nathusius' pipistrelle
<i>Martes martes</i>	Pine marten	<i>Pipistrellus pipistrellus</i>	Common pipistrelle
<i>Meles meles</i>	Badger	<i>Pipistrellus pygmaeus</i>	Soprano pipistrelle
<i>Mus musculus</i>	House mouse	<i>Rhinolophus hipposideros</i>	Lesser horseshoe bat
<i>Mustela erminea hibernica</i>	Irish stoat	<i>Sorex minutus</i>	Pygmy shrew
<i>Myotis daubentonii</i>	Daubenton's bat	<i>Vulpes vulpes</i>	Red fox
Data deficient			
<i>Myotis brandtii</i>	Brandt's bat		

Nine species have been excluded on the basis that they are post 1500 introductions (table 2). Species which are known only from the fossil record, or that became extinct before 1500, such as the giant Irish deer or brown bear (Mitchell, 1976; N. Monaghan pers. comm.), have not been included.

**Table 2** – Terrestrial mammal species present in Ireland, but not included in this red list assessment on the basis that they are post-1500 introductions.

<i>Cervus nippon</i>	Sika deer	<i>Neovison vison</i>	American mink
<i>Crocidura russula</i>	Greater white-toothed shrew	<i>Rattus norvegicus</i>	Brown rat
<i>Lepus europaeus</i>	Brown hare	<i>Sciurus carolinesis</i>	Grey squirrel
<i>Myodes glareolus</i>	Bank vole	<i>Sus scrofa</i>	Wild boar
<i>Muntiacus reevesi</i>	Muntjac deer		

The feral goat (*Capra hircus*) has been excluded as it is known to be descended from ancient domestic animals. Finally, marine mammals have not been included.

### Summary of findings

The Red List assessment found that of the 26 species assessed, one was found to be regionally extinct (grey wolf *Canis lupus*), one achieved a threat status of Vulnerable (black rat *Rattus rattus*), three were found to be Near Threatened, 20 were of least concern, and one was data deficient (table 1; figure 2).

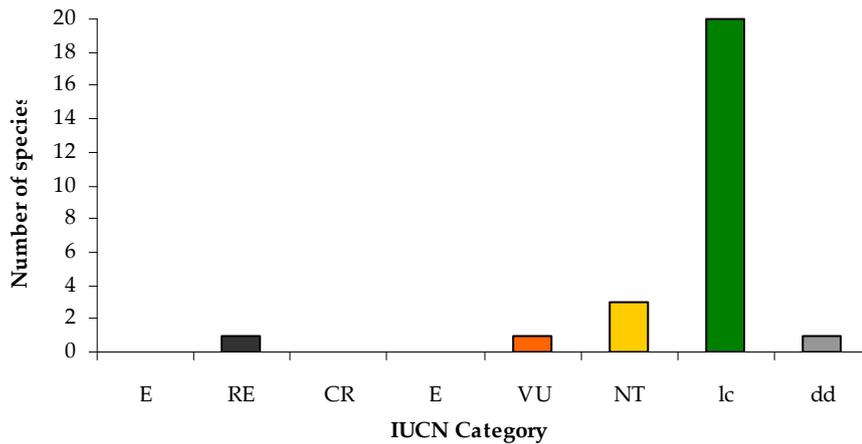


Figure 2 – The number of species in each of the IUCN categories in this assessment.

The new ‘Near Threatened’ category provides us with a ‘watch’ list of species that may need to be upgraded to a threat category prior to the next full list assessment in 2016 should their rate of decline increase. For the red squirrel (*Sciurus vulgaris*), there is good evidence from Britain that 10 year declines of up to 30% may be expected in the near future (Lloyd, 1983) – this would put the red squirrel in the Vulnerable category.

Of the three species considered to be Near Threatened, the Leisler's bat (*Nyctalus leisleri*), otter (*Lutra lutra*) and red squirrel (*Sciurus vulgaris*), only the otter is considered Near Threatened on a European scale (Temple & Terry, 2007). The otter is also listed as Near Threatened on a global scale (IUCN, 2009).

A previous assessment of the conservation status for terrestrial mammals in Ireland was undertaken by Whilde in 1993. That assessment used the same categories as the IUCN global red list for animals (IUCN, 1990), with an additional ‘Internationally Important’ category to reflect national responsibilities for protected globally threatened species (Whilde, 1993). It should be noted that these earlier categories differ considerably from the current system (IUCN, 2001; 2003), making a direct comparison difficult.

The 1993 assessment listed only one terrestrial mammal species, the black rat (*Rattus rattus*), as rare, although it noted ten species as internationally important, two as indeterminate and one as extinct, the grey wolf (*Canis lupus*).

A comparison between the 1993 and current lists shows a very similar picture. The only threatened species is still the black rat, primarily because of its small range at only a single locality. This species is considered a pest species in many situations, has been assessed as least concern both globally and in the European Union, and is not considered a priority for conservation action.

Two species were considered indeterminate in 1992, the Natterer's bat (*Myotis nattereri*) and whiskered bat (*Myotis mystacinus*); both were considered of least concern in this assessment. One newly recorded species is considered data deficient, Brandt's bat (*Myotis brandtii*). Research is underway to elucidate the status of the species in Ireland and it is hoped that adequate data will be available to assess this species fully in advance of the next complete list assessment in 2016.

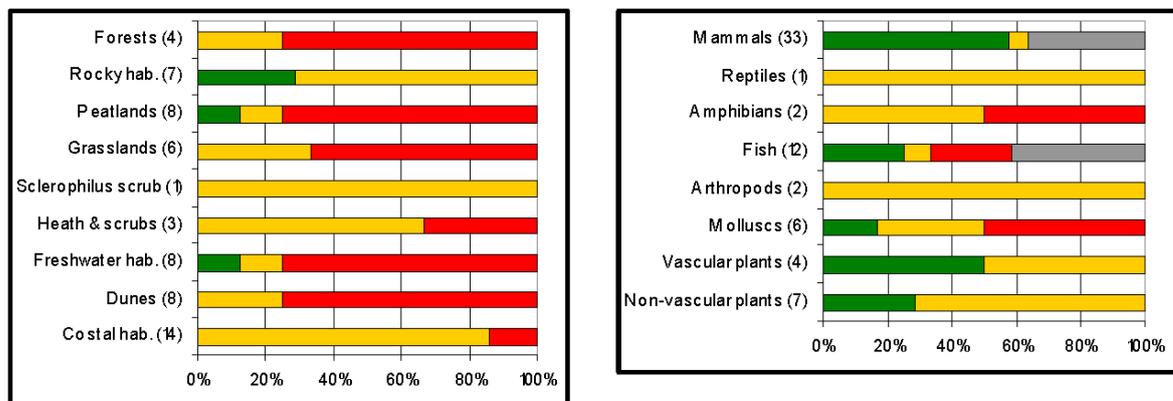
Most terrestrial mammals enjoy some level of legal protection in Ireland, with 13 listed on the EU Habitats Directive, 22 on national legislation in the Republic of Ireland, and 18 on national legislation in Northern Ireland.

It is notable that the black rat, theoretically Ireland's rarest terrestrial mammal is not protected either at a national or EU level. Similarly the rabbit (*Oryctolagus cuniculus*) benefits from no legal protection, although it is considered Near Threatened at a European level.

Appendix 2 includes a list of the species covered by this assessment, with their current and previous status in Ireland, together with their EU and global status.

### Implications for the conservation of Irish mammals

With only one of our 25 extant mammal species assessed as Vulnerable, and three as Near Threatened, the overall impression is that Ireland's mammal fauna is in good status. Similar conclusions can be drawn from the recent report on species protected in the Republic of Ireland under the EU Habitats Directive, where almost 60% of mammals were deemed to be in favourable conservation status and none were found to be in bad status (figure 3; NPWS, 2008). The picture is not so favourable for natural habitats, however, with the majority of those considered to be in poor or bad condition. While several mammal species have adapted well to managed landscapes, the underlying condition of our natural habitats is of concern.



**Figure 3** – The proportion of EU listed habitats and species in the Republic of Ireland categorised as Favourable (green), Poor (amber), Bad (red) and unknown (grey) in 2007 (European Commission, 2009).

### *Threats*

A number of threats are repeatedly cited in the species accounts below. Not surprisingly many of these relate to habitat management issues. Woodland management is an important factor for many mammals (e.g. bats, red squirrel, pine marten). The spread of forestry in recent decades, albeit predominantly of conifers, has been of some benefit for these species. However, careful planning, particularly at clear-felling, is essential if these habitats are to continue to support healthy populations. New biodiversity guidelines from the Forest Service are addressing some of these issues. Continued consultation between local wildlife officers and woodland managers will also be critical.

Water quality is another important underlying issue. While there is evidence that extreme pollution events, and the consequential fish kills they cause, are in decline (CFB, unpublished data), there is still some way to go if our rivers and lakes are to meet the requirements of the Water Framework Directive (EPA, 2008).

Significant numbers of mammals are killed on Irish roads every year. For widespread and common species road-kill is unlikely to play an important role in population control. However, for other species (e.g. otter, pine marten, lesser horseshoe bat) which are reliant on commuting corridors for dispersal and migration, road deaths may play a critical part in determining local population status. Newer national routes tend to have dedicated mammal underpasses and fencing and where these are well sited and well designed subsequent road-kill can be avoided. Retro-fitting mammal mitigation into older roads is more difficult, although some success is possible for bats and squirrels with high level ropes and baffles. A project to map road-kill nationally is ongoing with a view to determining seasonal and geographical patterns. This will help to inform future road building projects and, where feasible, be used to address current accident black spots ([www.biology.ie](http://www.biology.ie)).

Some mammals, despite legal protection, continue to suffer from various forms of persecution. The mustelids in particular, and the bats to a lesser extent, are targeted. Badger baiting still occurs in Ireland and interference with setts is not uncommon. Stoat and pine marten are seen as a threat to game birds and are illegally trapped and shot. Further efforts will be required by the statutory authorities in both jurisdictions to combat these illegal activities. A combination of enhanced education and enforcement will be required. The tendency of some bat species to roost in attics can bring them into conflict with humans. However, much of this conflict arises from misinformation and the education work of BCI and the Northern Ireland Bat Group together with the NIEA and the NPWS is helping address this (e.g. [www.npws.ie/en/WildlifePlanningtheLaw/Batsinhouses/](http://www.npws.ie/en/WildlifePlanningtheLaw/Batsinhouses/)).

### *Conservation actions*

To a large extent, but not exclusively, conservation activities over the last decade have been focused on the mammal species listed in the EU Habitats Directive. Detailed distributional and habitat surveys in both Northern Ireland and the Republic of Ireland have been completed for otter, hare, pine marten, squirrels, deer and many bat species. Many smaller scale studies are also underway across the island, including work on small mammals, hedgehogs and deer. Publication of the findings of all these studies will further advance our knowledge of the Irish mammal fauna.

It is also worth mentioning that ongoing bird research is also advancing our knowledge of Irish mammals, the recent discovery of the greater white-toothed shrew (*Crocidura russula*) being a case in point (Tosh, 2008).

In some cases surveys have been repeated and robust monitoring programmes are in place. For example, Ireland's Bat Monitoring Programme includes four separate annual schemes which together collect robust data for six of our ten bat species. Two of the schemes are run on an all-island basis with funding from NPWS and NIEA, while Waterways Ireland, a cross-border body, also supports one of the schemes. The newly created Centre for Irish Bat Research (CIBR), a joint initiative between University College Dublin and Queen's University Belfast, funded by NPWS, provides another example of the potential benefits of actively sharing knowledge and experience between the two jurisdictions. Further opportunities for cross-border cooperation on mammal survey and monitoring need to be explored.

All-Ireland Species Action Plans (SAPs) have been prepared for a number of mammal species, namely red squirrel, Irish hare and vesper bats (see [www.npws.ie/en/PublicationsLiterature](http://www.npws.ie/en/PublicationsLiterature)). Implementation of these plans to date, however, has been haphazard. NPWS have developed a more expansive form of plan, known as a Threat Response Plan (TRPs), for certain species in response to a European Court of Justice judgement against Ireland. These plans (for otter and vesper bats) are also published on [www.npws.ie/en/PublicationsLiterature](http://www.npws.ie/en/PublicationsLiterature). They provide detailed information on the distribution, habitat and populations of the species concerned before examining the major threats they face and identifying the actions required to manage these threats. The TRPs are being actively implemented.

#### *Current and future research priorities*

Most Irish universities now have active teams of mammal researchers. Much has been learned about the distribution, habitat preferences, diet, breeding biology and molecular ecology of many of our species. Inevitably some species have received more attention than others. The Irish hare has done particularly well, but concerns about potential hybridization and the impacts of coursing are likely to continue to generate interest in the species. The red squirrel has also been well served, but as one of our most threatened species further work on its interaction with the invasive grey squirrel (*Sciurus carolinensis*) is required. There has also been a steady interest in Irish bats, although the lesser horseshoe (*Rhinolophus hipposideros*) and Leisler's (*Nyctalus leisleri*) have probably received more than their fair share. The work underway in the Centre for Irish Bat Research will hopefully answer some outstanding questions about our rarer *Myotis* species, (including *Myotis brandtii* deemed data deficient here), but it will undoubtedly raise more questions too.

Notwithstanding the recent research on badger diet (Cleary *et al.*, 2009) and the original surveys by Smal (1994) and Feore (1994), most of the studies on the badger to date have focused on its role in bovine tuberculosis (TB). Given the size and charismatic nature of the animal it is surprising that it has not attracted more widespread research.

The decline of the otter has been charted by large scale national surveys. The actual causes of decline, however, remain unclear. Unraveling this problem will require cross-sectoral collaboration

between the bodies responsible for nature conservation, fisheries management and water quality in both jurisdictions. Meanwhile, the pine marten is expanding its range and this is likely to both prompt and facilitate further investigations into this species' habits in Ireland.

The hedgehog (*Erinaceus europaeus*) and the stoat (*Mustela erminea hibernica*) would appear to have been underrepresented in Irish mammal research to date and more research on the ecology and conservation status of these species would be valuable.

Further research on the impact and control of invasive alien mammals is also required. This should include studies focusing on how to manage the less obvious interactions, such as the hybridising potential of brown hare on Irish hare and of sika deer on red deer. The impact of invasive mammals on native habitats is another area requiring study e.g. the destructive browsing affect of the recently introduced muntjac deer on forestry plantations and on ground flora. Bird populations may also be effected. The threat posed by American mink to ground nesting birds has been widely reported and discussion are now required on how best to manage this species in Ireland in light of the recent review by Roy *et al.* (2009). Unexpected results may also occur from mammal introductions; the barn owl may benefit from the recent accidental introduction of the greater white-toothed shrew to the south midlands, although it is unclear what impact this introduction may be having on the native shrew population.

And finally, one of the most significant priorities for mammal research in the coming years relates to the potential impacts of climate change. Studies that help elucidate and anticipate how this global phenomenon will affect the distribution, habitat use and feeding ecology of Irish mammals will be required, to underpin future conservation management strategies.

### Format of Species Accounts

Each Red List of Ireland's Mammals species account follows the format outlined below:

- *Species name and taxonomic authority*
- *English language common name*
- *Irish language common name*
- *Irish status* – Red list status for Ireland based on this assessment
- *European status* – Red list status for Europe, based on Temple & Terry (2007)
- *Global status* – global Red List status, taken from IUCN Red List of Threatened Species (IUCN, 2009)
- *Proportion of global population occurring in Ireland* – for species with a significant proportion of their global populations occurring in Ireland. This is estimated based on available data for endemic and near endemic species, or best expert judgement for species with wider distributions.
- *Rationale for assessment* – a description of how the IUCN category was determined. This will include details of any previous red list status for Ireland, and the rationale behind any population estimates. This section should be read in conjunction with the IUCN guidance documents that were referred to for this assessment (IUCN, 2001; 2003; 2005; 2008) and the previous Irish assessment (Whilde, 1993).
- *Legal Status* – Any legal protection afforded to the species. This will be one or more of the EU Habitats Directive [92/43/EEC], Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 or Wildlife (N.I.) Order of 1985. Where the species is covered by international laws (e.g. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)) this is also included. Legislated hunting seasons have been included where appropriate. For species listed on the EU Habitats Directive, the number of Special Areas of Conservation (SACs) for which the species is listed as a qualifying interest is also included.
- *Distribution* – a general description of the global distribution of the species, followed by a more detailed description of its distribution in Ireland. Where available, an estimate of the species range in Ireland (in square kilometres) is given.
- *Population in Ireland* – an estimate of the effective population size (i.e. breeding population) in Ireland, where available, and a description of whether the population is stable, increasing or declining.
- *Ecology and habitat in Ireland* – a brief summary of the available ecological information for the species, including a description of the species broad habitat preferences in Ireland.
- *Threats* – a brief outline of any significant threats to, or activities impacting on, the species conservation status in Ireland.

**Order Insectivora**

*Erinaceus europaeus* Linnaeus

**Common name:** Hedgehog

**Irish name:** Gráinneog

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Mike Brogan



**Rationale for assessment:** Previously assessed as internationally important. Improved data, different categories and the European status of least concern justify this assessment.

**Legal Status:** Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Not protected in N. Ireland.

**Distribution:** Found throughout Western Europe, from Ireland to Poland and Scandinavia to Italy. Replaced in Eastern Europe by *E. concolor*. (Mitchell-Jones *et al.*, 1999).

Widespread throughout Ireland, with records from every county (Hayden & Harrington, 2000; Ní Lamhna, 1979)

**Population in Ireland:** While there is no population estimate available for Ireland, there is no evidence of a population decline.

**Ecology and habitat in Ireland:** Present in all lowland habitats where there is sufficient food and cover for nesting (Harris & Yalden, 2008). Most abundant where grassland meets woodland or scrub. Common in suburban areas. Scarce in coniferous woods, marsh and bog and areas of intensive agriculture. Primarily nocturnal and solitary. Populations can fluctuate from year to year depending on food availability.

**Threats:** Hedgehogs are vulnerable to pesticides used in gardens and many are killed by eating poisoned slugs. Severe winters may kill hibernating hedgehogs. Many hedgehogs are killed on roads although these incidents tend to be most frequent when hedgehog population densities are high and road-kill is probably not a factor controlling populations.

*Sorex minutus* Linnaeus

**Common name:** Pygmy shrew

**Irish name:** Dallóg fhraoigh

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Mike Brown



**Rationale for assessment:** Not previously assessed. Widespread distribution, presence in broad range of habitats and the European status of least concern justify current Irish assessment.

**Legal Status:** Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 . Not protected in N. Ireland, but proposed for addition to Schedule 6.

**Distribution:** The pygmy shrew occurs throughout Europe except for southern Iberia and the Mediterranean coast. In southern latitudes it is often confined to higher ground, but in Northern Europe it is widespread and often common (Mitchell-Jones *et al.*, 1999).

No detailed, systematic survey of this shrew has taken place in Ireland, but the species would appear to be common and widespread in Ireland wherever habitat is suitable.

**Population in Ireland:** While there is no population estimate available for Ireland, the population would appear to be stable.

**Ecology and habitat in Ireland:** Pygmy shrews are aggressively territorial and thus essentially solitary animals. They breed in summer and females may produce two or three litters (each with 4-7 young) and then die before winter. Population peaks in summer with smaller numbers of animals overwintering to breed the following spring maintaining the population (Hayden & Harrington, 2000).

The shrew occurs in a wide variety of habitats, from dunes and farmland to upland and wetland (Mitchell-Jones *et al.*, 1999; Hayden & Harrington, 2000). In all habitats it requires a rich plant cover and a supply of invertebrates.

**Threats:** The species reliance on insect prey makes its vulnerable to heavy use of pesticides. Its main predators are foxes and owls. The impact of the recently introduced greater white-toothed shrew (*Crocidura russula*) has yet to be established.

## Order Chiroptera

### *Myotis brandtii* Eversmann

**Common name:** Brandt's bat

**Irish name:** Ialtóg Brandt

**Irish status:** data deficient

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Rationale for assessment:** Cryptic species, difficult to separate from *M. mystacinus*. Little data available about its status in Ireland. Unknown in Ireland prior to 2003 and only two confirmed records since. Unclear if it is a vagrant, confined to unstudied habitats, or genuinely rare with disjunct distribution.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Palaearctic, from Ireland and eastern France to Korea and Japan (Mitchell-Jones *et al.*, 1999).

Recent discovery in Ireland. Only two records confirmed – one in Wicklow (Mullen, 2006), the other in Killarney (Kelleher, 2005). No known roosts.

**Population in Ireland:** Unknown, only two confirmed records for Ireland (Kelleher, 2005; Mullen, 2006).

**Ecology and habitat in Ireland:** No roosts known in Ireland. Elsewhere summer roosts are usually in buildings or trees (Marnell & Presetnik, 2009) and hibernation sites are normally underground in caves and mines. Centre for Irish Bat Research (CIBR) is re-surveying all known *M. mystacinus* roosts to determine if they contain *M. brandtii*. Swarming sites also being investigated.

Elsewhere in Europe, known to be a woodland species; tree lines, river corridors and farmland also used for foraging.

**Threat:** Building renovation and loss of foraging habitat are potential threats. Remedial timber treatment has caused declines in Wales (Mitchell-Jones *et al.*, 1999). More information is required on distribution and roosting habits in Ireland to inform conservation efforts.

*Myotis daubentonii* Kuhl

**Common name:** Daubenton's bat

**Irish name:** Ialtóg uisce

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Rationale for assessment:** Assessment used monitoring data and expert opinion to estimate the species range, population size and trends. Previously assessed as internationally important. Improved data, different categories and the global status of least concern justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Found from western Europe to Japan and Korea; from Portugal and Italy to southern Scandinavia (Mitchell-Jones *et al.*, 1999).

Widespread in Ireland and found in all counties (Aughney *et al.*, 2009).

**Population in Ireland:** The population in Ireland is thought to be stable, and is estimated to comprise 10,000+ mature individuals.

**Ecology and habitat in Ireland:** Roosts in small numbers in crevices under bridges and in old stone buildings near water (Smiddy, 1991; Shiel, 1999). Also reported from roofs of old houses (Allen *et al.*, 2000) and from bat boxes and tree crevices (McAney, 2006). Winter cave roosts have been reported (Hopkirk, 1996), but seldom recorded in hibernation as it roosts in cracks and crevices (McAney, 1994; 1997).

Normally forages along tree-lined rivers and over lakes. The majority of the diet is made up of midges and caddis flies gaffed from the water surface or caught in the air using the tail membrane (Sullivan *et al.*, 1993; Flavin *et al.*, 2001; Warren *et al.*, 2000). Can also be found in other habitats, such as woodland (Russ, 1999).

**Threats:** Wetland drainage and serious water pollution are concerns, although some eutrophication may benefit this species (Mitchell-Jones *et al.*, 1999). Unsympathetic repairs to old bridges and disturbance during hibernation can damage local populations.

*Myotis mystacinus* Kuhl

**Common name:** Whiskered bat

**Irish name:** Ialtóg ghiobach

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Rationale for assessment:** Ongoing work at Centre for Irish Bat Research (CIBR) and expert opinion used to estimate the species range, population size and trends. Previously assessed as indeterminate. Improved data, different categories and the global status of least concern justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Mainly palaeartic; from northern Iberia and Morocco to far east. Absent from northern Scotland and northern Scandinavia (Mitchell-Jones *et al.*, 1999).

Records from throughout Ireland, from Donegal to Wexford, but not common (O'Sullivan, 1994; CIBR, pers. comm.).

**Population in Ireland:** The population in Ireland is thought to be stable, and is estimated to comprise 5,000+ mature individuals.

**Ecology and habitat in Ireland:** Summer roosts are normally in buildings. Usually only small numbers of bats are present, often between rafters and felt and other narrow spaces where they are difficult to locate. Bridge roosts are also known (Smiddy, 1991; Shiel, 1999). Wintering animals are rarely found but a small number have been recorded in caves (McAney, 1994; 1997). Autumn swarming behaviour is being investigated at CIBR.

Work is also ongoing at CIBR to establish the habitat and dietary preferences of this species in Ireland. Known to be a woodland species, tree lines, river corridors and farmland also used for foraging.

**Threats:** Building renovation and loss of foraging habitat are potential threats.

*Myotis nattereri* Kuhl

**Common name:** Natterer's bat

**Irish name:** Ialtóg Natterer

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Rationale for assessment:** Ongoing work at Centre for Irish Bat Research (CIBR) and expert opinion used to estimate the species range, population size and trends. Previously assessed as indeterminate. Improved data, different categories and the global status of least concern justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** A widespread species, found from Portugal and north-west Africa to the Urals and the near East (Mitchell-Jones *et al.*, 1999).

Widespread in Ireland, but seldom recorded; no records from western seaboard or from Donegal (McAney, 2006; NPWS, 2007).

**Population in Ireland:** The population in Ireland is thought to be stable, and is estimated to comprise 5,000+ mature individuals.

**Ecology and habitat in Ireland:** Summer roosts are normally in buildings. Usually only small numbers of bats are present, often between rafters and felt and other narrow spaces where they are difficult to locate. Bridge roosts are also known (Smiddy, 1991). Larger roosts (>50 bats) have been found in Church of Ireland churches (McAney, 2006). In winter individuals have been observed in bridges, mines and caves (McAney, 1994; 1997).

This bat gleans most of its prey from foliage, rather than catching it in the air (Shiel *et al.*, 1991). Woodland habitats and river corridors appear to be favoured for foraging (Mitchell-Jones *et al.*, 1999).

**Threats:** Further work on the ecology and roosting behaviour of this species is required to determine whether it is at risk from specific threats. However, woodland management and building and bridge renovations are potential threats.

*Nyctalus leisleri* Kuhl

**Common name:** Leisler's bat

**Irish name:** Ialtóg Leisler

**Irish status:** Near Threatened

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Proportion of global population in Ireland:** Estimated at 20-25% (C. Kelleher / C. Shiel, pers. comm.).

**Rationale for assessment:** Assessment used recent monitoring data (Roche *et al.*, 2009) and expert opinion to estimate the species range, population size and trends. Previously assessed as internationally important. Improved data, different categories and the fact that Ireland is considered a world stronghold for the species justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Found throughout Europe except for Scandinavia, Estonia and Northern Russia.

Ireland is considered to be the world stronghold for the species (Mitchell-Jones *et al.*, 1999). Occurs throughout the country; probably the third most common bat species (Roche *et al.*, 2009).

**Population in Ireland:** The population in Ireland is thought to be stable, and is estimated to comprise 20,000+ mature individuals.

**Ecology and habitat in Ireland:** Nursery roosts are usually in attics of buildings. Some tree roosts are also known. Will also occupy bat boxes (McAney, 2006). Hibernation in trees and buildings recorded (Hopkirk & Russ, 2004; McAney, 2006).

Wide variety of habitats used for foraging including pasture, canal, orchards, open water and roadside hedgerows. Small to medium sized swarming insects make up much of the prey (Shiel *et al.*, 1998).

**Threats:** Accidental and deliberate exclusion of nursery roosts from buildings is the main threat to this species. Unsympathetic woodland management is also of concern (McAney, 2006).

*Pipistrellus nathusii* Keyserling & Blasius

**Common name:** Nathusius' pipistrelle

**Irish name:** Ialtóg Nathusius

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Rationale for assessment:** Bat monitoring data and expert opinion used to estimate range, population size and trends. Unknown in Ireland prior to 1996, so not previously assessed.

**Distribution:** From Urals to Northern Iberia and southern Scandinavia to the Mediterranean (Mitchell-Jones *et al.*, 1999). Highly migratory, moving south-west for winter and returning to northern latitudes for spring.

First recorded in Ireland in 1996; maternity colony located in 1997 in Co. Antrim (Russ *et al.*, 1998) confirmed it as a resident here. Since reported from many other counties (Roche *et al.*, 2009).

**Population in Ireland:** Showed rapid spread in 2006, but this has not continued and most recent data suggest numbers have dropped again (Roche *et al.*, 2009).

Occasional records of the species continue to be collected by the car-based monitoring scheme (Roche *et al.*, 2009). In Ireland, where the winters are mild, normal migratory behaviour may give way to sedentary lifestyle (Russ *et al.*, 1998). Resident bats may be supplemented during winter by migratory individuals returning from the north-east of the species range (Russ *et al.*, 2001).

**Ecology and habitat in Ireland:** No known maternity roosts in the Republic. In Northern Ireland they occur in cavity walls / under slates of old brick buildings. On the continent they use hollow trees, bat and bird boxes, wooden churches and buildings during summer and crevices in cliffs, hollow trees and buildings in winter (McAney, 2006; Marnell & Presetnik, 2009; Russ, 2008).

Considered a woodland species on mainland Europe but more associated with lakes in Ireland; aquatic Diptera and non-biting midges appear to be its main prey. Also forages along woodland rides and edges.

**Threats:** Main threats include roost disturbance and destruction of insect-rich foraging habitats such as wetlands, riparian woodland and unimproved grassland. Badly sited windfarms may be a particular threat to this species given its migratory nature.

*Pipistrellus pipistrellus* Schreber

**Common name:** Common pipistrelle

**Irish name:** Ialtóg fheascrach

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Introduction:** Species formerly known as the pipistrelle (*Pipistrellus pipistrellus*) now known to be two separate, cryptic species: common pipistrelle (*P. pipistrellus*) and soprano pipistrelle (*P. pygmaeus*) (Barratt *et al.*, 1997; Barlow & Jones, 1997). Impossible to distinguish which species was intended in historical data, but sufficient recent information to allow separate assessments here.

**Rationale for assessment:** Assessment used monitoring data and expert opinion to estimate species range, population size and trends. Previously assessed as internationally important. Improved data, new taxonomy and revised IUCN categories and criteria justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Occurs across much of western and central Europe and along the north African coast. Rare or absent in Scandinavia, Greece and Italy (Harris & Yalden, 2008).

Most frequently encountered species during Irish car based monitoring. This monitoring suggests it may be most abundant in south and east and absent from extreme west (Roche *et al.*, 2009).

**Population in Ireland:** The population in Ireland is thought to be stable, and is estimated to comprise 100,000+ mature individuals.

**Ecology and habitat in Ireland:** Summer roosts usually in buildings, including modern houses, old abandoned mansions, churches, amenity buildings and farm sheds (e.g. Roche, 1998; 2001; McGuire, 1998). Normally roost in very confined spaces, such as behind window sashes, under tiles and weather-boards, behind fascia and soffits, and within the cavities of flat roofs (O'Sullivan, 1994). Thought to hibernate in buildings and trees but seldom recorded (McAney, 2006).

Forages in a broad range of habitat types including woodlands, lakes, rivers and grasslands (Sullivan *et al.*, 1993; Russ & Montgomery, 2002; Guillot, 2003).

**Threats:** Use of pesticides; removal of hedgerows, copses and scrub; and illegal disturbance of roosts in domestic dwellings and other buildings are the main threats identified for these species.

*Pipistrellus pygmaeus* Leach

**Common name:** Soprano pipistrelle

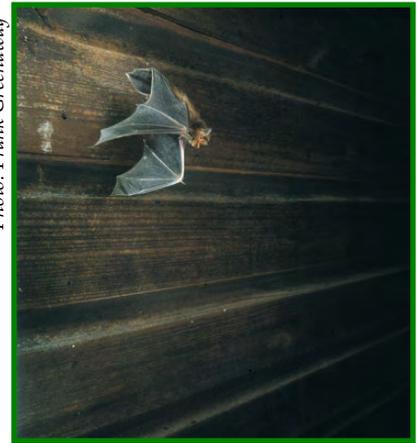
**Irish name:** Ialtóg fheascrach sopránach

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Rationale for assessment:** Assessment used monitoring data and expert opinion to estimate the species range, population size and trends. As this is a new taxon, it was not previously assessed for Ireland.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Occurs sympatrically with the common pipistrelle across much of central Europe, but while the soprano pipistrelle appears to be absent from much of France and northern Iberia, its range extends into southern Scandinavia and Greece (Harris & Yalden, 2008).

Abundant and widespread in Ireland, occurring in all counties (NPWS, 2008; Roche *et al.*, 2009). Recent monitoring suggests it may be most abundant in the western half of the country (Roche *et al.*, 2009).

**Population in Ireland:** The population in Ireland is thought to be stable, and is estimated to comprise 100,000+ mature individuals.

**Ecology and habitat in Ireland:** Summer roosts usually in buildings, including modern suburban houses, old abandoned mansions, churches, amenity buildings and farm sheds (e.g. Roche, 1998; 2001; McGuire, 1998). They normally roost in very confined spaces, such as behind window sashes, under tiles and weather-boards, behind fascia and soffits, and within the cavities of flat roofs (O'Sullivan, 1994). Roosts of >1000 soprano pipistrelles are known (McAney, 2006). Thought to hibernate in buildings and trees, but seldom recorded (McAney, 2006).

Although known to forage in a broad range of habitat, *P. pygmaeus* shows some preference for aquatic habitats – riparian woodland, rivers and lakes (Sullivan *et al.*, 1993; Russ & Montgomery, 2002; Guillot, 2003).

**Threats:** Use of pesticides; removal of hedgerows, copses and scrub; and illegal disturbance of roosts in domestic dwellings and other buildings are the main threats identified for these species.

*Plecotus auritus* Linnaeus

**Common name:** Brown long-eared bat

**Irish name:** Ialtóg fhad-chluasach

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Frank Greenaway



**Rationale for assessment:** Assessment used recent monitoring data and expert opinion to estimate the species range, population size and trends. Previously assessed as indeterminate. Improved data, different categories and the global status of least concern justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex IV; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Widespread across Europe with records from southern Portugal, Italy and Greece in the south to Scotland and southern Scandinavia in the north (Mitchell-Jones *et al.*, 1999).

Considered by O'Sullivan (1994) as the second most abundant bat species in Ireland. Widely distributed throughout the island (Hayden & Harrington, 2000; Richardson, 2000). It has also been recorded on several off-shore islands, and at Tuskar Lighthouse, Co. Wexford (Fairley, 2001).

**Population in Ireland:** The population in Ireland is thought to be stable, and is estimated to comprise 10,000+ mature individuals.

**Ecology and habitat in Ireland:** Nursery roosts usually in houses; large, open attics are preferred and a high degree of site fidelity shown. Tend to cluster together, often in the angle created by the rafters where they join the ridge beam. Schwegler bat boxes also used (McAney, 2006). Tree holes and farm buildings used as temporary roosts when food is in short supply (Entwistle *et al.*, 1997). The few hibernating records come from caves and from ruined buildings (McAney, 1994; 1997).

This species has broad habitat preferences, foraging in broad-leaved woodlands and along tree lines, but also scrub, conifer plantations, gardens with mature trees, parkland and orchards (McAney, 2006). Main prey items include flies (craneflies and window-midges), moths, caddis flies and earwigs, centipedes and harvestmen (Shiel *et al.*, 1991).

**Threats:** Vulnerable to roost disturbance given their tendency to roost in buildings. Also considered to be particularly vulnerable to the chemicals used in timber treatment, because of their habit of roosting in close proximity to the timber (McAney, 2006).

Unsympathetic woodland management practices pose a risk to this species. Continuity of tree lines, hedgerows and other liner landscape features in the vicinity of known roosts is also important.

*Rhinolophus hipposideros* Bechstein

**Common name:** Lesser horseshoe bat

**Irish name:** Ialtóg crúshrónach/ Crú-ialtóg beag

**Irish status:** least concern

**European status:** Near Threatened

**Global status:** least concern

Photo: Frank Greenaway



**Rationale for assessment:** In addition to long-term monitoring data of known roosts, this assessment used expert opinion to estimate the species range, population size and trends. Previously assessed as indeterminate. Improved data, different categories and the global status of least concern justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex II & IV; 41 SACs listed. Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 .

**Distribution:** Widely distributed through western, central and southern Europe. Extends as far east as Kashmir and through northern Africa to Arabia, Ethiopia and Sudan (Mitchell-Jones *et al.*, 1999).

Ireland represents the most northerly and westerly limits of the species' distribution (Roche, 2001) and here it is confined to 6 west coast counties: Mayo, Galway, Clare, Limerick, Cork and Kerry (McAney, 1994). A single animal was recorded in Co. Roscommon in 2004 (B. Keeley, pers. comm.). The species range in Ireland has been calculated as approximately 11,600km<sup>2</sup> (NPWS, 2008).

**Population in Ireland:** The population in Ireland is thought to be stable and may be increasing. It is estimated at approximately 12,500 mature individuals (NPWS, 2008).

**Ecology and habitat in Ireland:** The lesser horseshoe bat is the only member of the Rhinolophidae occurring in Ireland. Summer roosting sites are often in the attics of old or derelict buildings. They are faithful to a roost site and will return to the same site each year. Hibernation sites are typically caves, souterrains, cellars and icehouses (O' Sullivan, 1994; Kelleher, 2004).

Lesser horseshoes rely on linear landscape features (e.g. treelines, stonewalls and hedgerows) to navigate and commute from roosts to feeding sites and are reluctant to fly out in the open (Schofield, 2008). The bats forage predominantly in deciduous woodland and riparian vegetation normally within a few km of their roosts (Bontadina *et al.*, 2002, Motte & Libois, 2002).

**Threats:** Lesser horseshoe bats are sensitive to disturbance and normally do not occupy the same buildings as humans. Loss of roosting sites due to deterioration or renovation of old buildings, loss of commuting routes linking roosts to foraging sites and unsympathetic management of foraging sites are the major threats to this species (McAney, 1994; McGuire, 1998; Roche, 2001).

## Order Rodentia

### *Apodemus sylvaticus* Linnaeus

**Common name:** Wood mouse

**Irish name:** Luch fhéir

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern



Photo: Mike Brown

**Rationale for assessment:** Not previously assessed. Widespread distribution, presence in broad range of habitats and the European status of least concern justify current Irish assessment.

**Legal Status:** None

**Distribution:** Throughout Europe, except northern Scandinavia, and across Asia Minor (Mitchell-Jones *et al.*, 1999).

Ubiquitous in Ireland including many offshore islands.

**Population in Ireland:** While there is no population estimate available for Ireland, there is no evidence of a population decline.

**Ecology and habitat in Ireland:** Wood mice are mainly nocturnal. Inhabitants of dry woodland and most other dry habitats across the whole of the island. They also tend to have a higher density association with pastoral farmland (Montgomery & Dowie, 1993). Diet includes seeds, fruit, buds, insects, worms, centipedes, snails and fungi.

Important food item for mammalian predators and birds of prey including the barn owl.

**Threats:** Rodenticides. Not usually a pest of agriculture although may cause problems through seed removal of pulses and other crops in fields and greenhouses (Mitchell-Jones *et al.*, 1999).

*Mus musculus domesticus* Ruddy

**Common name:** House mouse

**Irish name:** Luch thí

**Irish status:** least concern

**European status:** least concern [*M. musculus*]

**Global status:** least concern [*M. musculus*]



Photo: Eddie Dunne

**Rationale for assessment:** Not previously assessed. Widespread distribution, adaptability to human settlement and the European status of least concern justify current Irish assessment.

**Legal Status:** None

**Distribution:** One of the most widespread of all mammals. In Americas, Australia, Africa and much of Asia. Found in western and southern Europe. Slight overlap with range of *M. musculus musculus* in eastern Europe (Mitchell-Jones *et al.*, 1999).

Found throughout Ireland including most inhabited offshore islands.

**Population in Ireland:** Stable with natural fluctuations.

**Ecology and habitat in Ireland:** Opportunistic omnivore. Populations can fluctuate several fold during the course of a year. Can reach high densities where food is abundant (e.g. intensive poultry and pig units, grain silos).

Generally regarded as highly commensal, but may also occur away from human habitation. Poor competitor and tends to avoid woodlands.

Important prey item of carnivorous birds and mammals.

**Threat:** Rodenticides, although evidence of resistance in some cases.

Significant pest species of stored food and crops. Also important vector of human disease (e.g. leptosporosis, salmonellosis). Captive bred strains widely used in laboratory experiments.

*Rattus rattus* Linnaeus

**Common name:** Black rat; Ship rat

**Irish name:** Francach dubh

**Irish status:** Vulnerable (D2)

**European status:** least concern

**Global status:** least concern



Photo: Eddie Dunne

**Rationale for assessment:** Now restricted to a single locality. Previously assessed as 'Rare'. Change in status here due to the use of the new IUCN system.

**Legal Status:** None

**Distribution:** Presumed to have originated in south-east Asia and to have spread historically with humans. Known from an early Christian site in Co. Down (Hayden & Harrington, 2000). Present in most European countries and widespread across southern Asia and north Africa (Mitchell-Jones *et al.*, 1999).

In Britain, confined to a few ports and islands. Only recent Irish records come from Lambay Island, off the coast of Dublin, where the species is still common (M. Jebb, pers. comm.).

**Population in Ireland:** Thought to be stable with natural fluctuations.

**Ecology and habitat in Ireland:** A good climber and a tree-living species in its original range. Now mostly associated with human habitation and especially ports (Harris & Yalden, 2008).

Opportunistic feeder with varied diet including fruit, grain, seeds and insects. On Lambay, known to target sea-bird chicks and eggs during the nesting season.

**Threats:** Its habit of eating the eggs and chicks of ground-nesting seas-birds has brought it into conflict with bird conservation interests.

The species is also a major pest of crops and stored food. Also an important vector for human disease.

*Sciurus vulgaris* Linnaeus

**Common name:** Red squirrel

**Irish name:** Iora rua

**Irish status:** Near Threatened

**European status:** least concern

**Global status:** least concern

Photo: Eddie Dunne



**Rationale for assessment:** c. 20% decline in range since 1911 with as much as half of that lost in last decade (C. Lawton unpublished data). Competition from N. American grey squirrel (*Sciurus carolinensis*) most important factor. Rate of decline likely to continue to increase based on evidence from Britain where 30% decline recorded between 1959-1971 (Lloyd, 1983).

**Legal Status:** Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Palaearctic from Ireland to north-east China and Hokkaido. Found throughout most of Europe, bar parts of Iberia and southern Britain (Mitchell-Jones *et al.*, 1999).

In Ireland, still considered widespread and common in many areas, although reductions in range have been recorded in parts of Northern Ireland (O'Neil & Montgomery, 2003) and the species is rare or extinct in Meath, Westmeath, Kilkenny, Carlow and Louth (Carey *et al.*, 2007).

**Population in Ireland:** Estimated population of 40,000 (NPWS & EHS, 2008). Irish population largely derived from re-establishments to about 10 sites between 1815 and 1856, following significant decline and possible extinction in the 18<sup>th</sup> century (Barrington, 1880; Finnegan *et al.*, 2007). c. 20% decline in range since 1911 with as much as half of that lost in last decade (C. Lawton, unpublished data).

**Ecology and habitat in Ireland:** Found in forests, parks and gardens from sea level to tree line (Mitchell-Jones *et al.*, 1999). Seeds from both conifer and broadleaf trees important, also feeds on berries, fruit and fungi (Hayden & Harrington, 2000; Harris & Yalden, 2008). Generally solitary but communal nesting occurs during winter and spring. Home range depends on population density and food supply (Hayden & Harrington, 2000).

Breeding season extends from December to following September but may be shorter in years when food is scarce. Litters may be as large as six but three is more usual (Hayden & Harrington, 2000).

**Threats:** Although co-existence with greys has been recorded (e.g. O'Teangana, 1999), reds normally become rare once greys expand into an area. Loss of suitable habitat, unsympathetic woodland management and the potential impact of squirrel pox virus also considered as threats.

**Order Carnivora**

*Canis lupus* Linnaeus

**Common name:** Grey wolf

**Irish name:** Mac tíre

**Irish status:** Regionally Extinct

**European status:** least concern

**Global status:** least concern



*Photo: Dublin Zoo*

**Rationale for assessment:** previously assessed as extinct. No change.

**Distribution:** Holarctic, from Scandinavia and Mediterranean through Russia and central Asia to North America (Mitchell-Jones *et al.*, 1999).

**Population in Ireland:** Once widespread in Ireland, but de-forestation and hunting reduced the population. Active persecution during 17<sup>th</sup> century, brought about extinction, with the last animal reportedly shot in Carlow in 1786 (Fairley, 1984; Harris & Yalden, 2008).

*Lutra lutra* Linnaeus

**Common name:** Otter

**Irish name:** Dobharchú

**Irish status:** Near Threatened

**European status:** Near Threatened

**Global status:** Near Threatened

Photo: Eddie Dunne



**Legal Status:** EU Habitats Directive [92/43/EEC] Annex II & IV. Nine SACs listed for otter in N.I., 47 listed in RoI. Wildlife Act, 1976; Wildlife (Amendment) Act, 2000; Wildlife (N.I.) Order of 1985; CITES Appendix 1.

**Rationale for assessment:** In addition to monitoring data from the 1980s, 1990s and 2005, this assessment used expert opinion to estimate the species range, population size and trends. Previously assessed as internationally important. Improved data, which shows a 20-25% decline between 1980-2005 (Bailey & Rochford, 2006), different categories and the European and global status of Near Threatened, justify this assessment.

**Distribution:** Widespread species ranging from Ireland to Japan and Indonesia, and from the Arctic to north Africa (Mitchell-Jones *et al.*, 1999).

Found throughout Ireland in freshwater and coastal habitats, including offshore islands (Bailey & Rochford, 2006; Hayden & Harrington, 2000; Preston *et al.*, 2004).

**Population in Ireland:** This species has shown a decline of 20-25% between 1980 and 2006, with most of that occurring in the first decade (i.e. 1980-1990), although the cause of this decline is unclear (Bailey & Rochford, 2006). The population size is estimated at 16-22,000, excluding juveniles under four months (O'Neill, 2008).

**Ecology and habitat in Ireland:** Seldom seen, but occurs on rivers, lakes, canals and coasts throughout the country, even in urban areas.

An opportunistic predator. Favoured prey includes sticklebacks, salmonids, frogs, eels and crayfish, while rockling and wrasse make up much of the diet along the coast (Bailey & Rochford, 2006).

**Threats:** Many otters are killed on the roads each year; a smaller number are killed in fishing nets and lobster pots (Poole *et al.*, 2007).

Severe water pollution incidents leading to fish kills and removal of riparian habitats reduce habitat suitability for otters. Decline in eel numbers may have played significant role in recent otter declines.

*Martes martes* Linnaeus

**Common name:** Pine marten

**Irish name:** Cat crainn

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Eddie Dunne



**Rationale for assessment:** Assessment used recent survey data (D. O'Mahony pers. comm.; NPWS, 2007) and expert opinion to estimate the species range, population size and trends. Previously assessed as internationally important. Improved data, different categories and the global status of least concern justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex V; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Found across much of Europe into western Siberia, Caucasus and Asia Minor. Absent from southern Iberia and Greece.

Becoming widespread in Ireland. Expanding from stronghold in Clare and Galway (O'Sullivan, 1983), with recent records as far as eastern seaboard (Carey *et al.*, 2007). Now common in Sligo-Leitrim-Fermanagh (D. O'Mahony, pers. comm.), with regular sightings from Waterford to Antrim. Population introduced to Killarney c. 1990 well established and expanding.

**Population in Ireland:** The population is thought to be increasing, and is estimated at 3-10,000 mature individuals (NPWS, 2007).

**Ecology and habitat in Ireland:** Woodland and scrub habitats favoured, but also mature gardens. Dens in hollow trees, burrows, brash and buildings.

Opportunistic feeder on small mammals, berries, nuts, frogs, lizards, birds and invertebrates.

**Threats:** Suffered extensive persecution before legal protection. Recent expansion may bring renewed threat of poisoning and trapping from gun clubs and game keepers. Tendency to den in houses also likely to lead to conflict as the species spreads.

Habitat loss and fragmentation a concern. Woodland management practices also important.

*Meles meles* Linnaeus

**Common name:** Badger

**Irish name:** Broc

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Mike Brown



**Rationale for assessment:** Previously assessed as Internationally Important. Widespread distribution, presence in broad range of habitats and the European status of least concern justify this assessment.

**Legal Status:** Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

**Distribution:** Widespread across Europe and Asia, but absent from Iceland, northern Scandinavia and the islands of the Mediterranean (Harris & Yalden, 2008).

Found throughout Ireland in areas of suitable habitat (Hayden & Harrington, 2000).

**Population in Ireland:** Stable population, estimated in Northern Ireland as 33,500 (Reid *et al.*, 2008) and in the Republic of Ireland as 84,000 (Sleeman *et al.*, 2009).

**Ecology and habitat in Ireland:** Adaptable species of lowland grassland and woodland habitats, also occasionally in upland and suburban areas. Group size typically 4-5 animals (Feore, 1994; Smal, 1995). In Northern Ireland, hedgerows are most important habitat for sett location, reflecting the lack of woodland and abundance of hedgerow (Feore, 1994).

Opportunistic foragers that exploit a broad range of prey. Earthworms are common in the diet but account for little of the bulk. Seasonally abundant food sources are important including insect larvae (beetles, noctuids and tipulids) and frogs (Cleary *et al.*, 2009).

**Threats:** No natural predators in Ireland. Anthropogenic threats include illegal persecution (snaring, hunting with dogs, disturbance of setts) and road casualties.

Bovine tuberculosis is endemic in the Irish badger population with up to 25% of animals infected (Hayden & Harrington, 2000). Badgers are implicated in the spread of bovine tuberculosis to cattle and localised control programmes in response to TB outbreaks are operated by Department of Agriculture, Fisheries & Food in Republic of Ireland (e.g. Olea-Popelka, 2003). Development of a badger vaccine against TB is also underway.

*Mustela erminea hibernica* Thomas & Barrett-Hamilton

**Common name:** Irish stoat

**Irish name:** Easóg

**Irish status:** least concern

**European status:** least concern [*M. erminea*]

**Global status:** least concern [*M. erminea*]

Photo: Mike Broun



**Proportion of global population in Ireland:** Near endemic sub-species (also occurs in Isle of Man). >90% of global population estimated to occur in Ireland.

**Rationale for assessment:** Not previously assessed. Added conservation value because of its status as near endemic. Widespread distribution and presence in broad range of habitats justify current Irish assessment.

**Legal Status:** Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; not protected in N. Ireland.

**Distribution:** *Mustela erminea* has a circumpolar distribution and is found throughout Europe except for the Mediterranean (Mitchell-Jones *et al.*, 1999). Several subspecies are recognised including *hibernica*, which is restricted to Ireland and the Isle of Man (Martinkova *et al.*, 2007).

Widespread throughout Ireland, with records from every county.

**Population in Ireland:** While there is no population estimate available for Ireland, there is no evidence of a population decline.

**Ecology and habitat in Ireland:** Primarily carnivorous, feeding on small mammals and birds. Able to kill prey several times own weight (e.g. rabbit).

Solitary, territorial species. Found in wide variety of habitats from coastal grasslands to woodlands and uplands. Tends to avoid open habitats, travelling along hedgerows and stone walls.

Archaeological records from before last glaciation [27-35,000BP] and around time of last cold interstadial [10,000BP] (Harris & Yalden, 2008) suggests that if this species did not survive the glacial maximum in Ireland it was certainly, along with the hare, among the earliest colonists.

**Threats:** Persecution by game-keepers can be a problem locally, because of perceived threat to game birds.

*Vulpes vulpes* Linnaeus

**Common name:** Red fox

**Irish name:** Sionnach

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern

Photo: Mike Brown



**Rationale for assessment:** Not previously assessed. Widespread distribution, presence in broad range of habitats and the European status of least concern justify current Irish assessment.

**Legal Status:** None

**Distribution:** Occurs throughout much of Northern Hemisphere. Widespread in Europe bar some Mediterranean islands (Harris & Yalden, 2008).

Distributed throughout Ireland and found in all counties (Hayden & Harrington, 2000).

**Population in Ireland:** Accurate statistics not available, but breeding population estimated at between 150,000 to 200,000 (Hayden & Harrington, 2000). There is no evidence of a decline.

**Ecology and habitat in Ireland:** Adept opportunist, typically found in woodland habitat and grassland areas, but with increasing presence in urban areas. Rabbits and sheep carrion important dietary components in upland areas, but wide ranging diet utilizing various bird, insect and plant species (Looney, 2001). Fox predation on lambs (as opposed to post mortem scavenging) is likely to be at low levels on a countrywide basis (Looney, 2001).

Vixens in Northern Ireland conceive between mid-January and mid-February with an average litter size of 4-5 cubs (Looney, 2001). Average male life expectancy 18 months, females 23 months (Looney, 2001).

**Threats:** Hunted throughout Ireland for sporting or livestock protection purposes. Unlikely to have a significant effect on the general population, although activities such as spotlight shooting with rifles may have significant local effects. Previously large numbers of fox pelts were exported for the fur trade but this practice decreased during the 1980s (Hayden & Harrington, 2000).

Sarcoptic mange may exert a significant influence on urban populations.

## Order Lagomorpha

*Lepus timidus hibernicus* Bell

**Common name:** Irish hare

**Irish name:** Giorria

**Irish status:** least concern

**European status:** least concern [*L. timidus*]

**Global status:** least concern [*L. timidus*]

**Proportion of global population in Ireland:** 100%

Photo: Mike Brogan



**Rationale for assessment:** Endemic subspecies to Ireland. Comprehensive distribution and abundance data is available for this assessment. Previously assessed as internationally important. Improved data and different IUCN categories justify this assessment.

**Legal Status:** EU Habitats Directive [92/43/EEC] Annex V; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

Open season (RoI): 26 September - 28 February.

**Distribution:** Northern Palaearctic from Ireland and Scotland across Scandinavia and Russian Federation to Japan. Also in the Alps (Mitchell-Jones et al., 1999).

Widespread in Ireland. In contrast to other *timidus* species, commonly found from the inter-tidal zone (Wolfe et al., 1996; Hayden & Harrington, 2000) to mountain tops (Walker & Fairley, 1968).

**Population in Ireland:** Stable, but with population fluctuations. Most recent estimates of 27,400 for the north of Ireland (Reid et al., 2009) and 535,000 for Republic (Reid et al., 2007).

**Ecology and habitat in Ireland:** Selects improved grassland over any other habitat types (Reid & Montgomery, 2007); rushes and hedgerows important for cover (Dingerkus, 1997).

Breeding season extends from January to September. In good years breeding is almost continuous (Hayden & Harrington 2000). Population studies have confirmed the potential for wide annual fluctuations. (NIEA, unpublished data; Reid et al., 2007).

**Threats:** Modern agricultural methods (e.g. silage cutting), may increase mortality, particularly of juveniles. Habitat loss and fragmentation lead to isolation and inbreeding. Current agri-environment schemes in N. Ireland unlikely to provide conditions that suit hares (Reid, 2006).

Recent verification of brown hare populations in N. Ireland and subsequent confirmation of hybridisation (Hughes et al., 2009) potential concern (Reid & Montgomery, 2007). Further work on impact of coursing on breeding dynamics and dispersal required.

*Oryctolagus cuniculus* Linnaeus

**Common name:** Rabbit

**Irish name:** Coinín

**Irish status:** least concern

**European status:** Near Threatened

**Global status:** Near Threatened

Photo: Mike Brown



**Rationale for assessment:** Not previously assessed. Widespread distribution and presence in broad range of habitats justify current Irish assessment. The global assessment does not consider Ireland as part of the species natural range.

**Legal Status:** None

**Distribution:** Original range limited to Iberia. Following introductions and natural spread, now found throughout western Europe, bar northern Scandinavia and most of the Balkan countries (Mitchell-Jones *et al.*, 1999; Hayden & Harrington, 2000).

First introduced into Ireland by the Normans in the 12<sup>th</sup> century. Now found in all counties, but appears to be most common in south and east (Reid *et al.*, 2007).

**Population in Ireland:** While there is no population estimate available for Ireland, there is no evidence of a population decline. Stable, but with large natural population fluctuations.

**Ecology and habitat in Ireland:** Found in a wide range of habitats, although appears to avoid coniferous forest. Feeds on a variety of plants including cereals, crops and young trees, but with a strong preference for grasses. Can exert a major influence on plant communities and at high densities prevent the proliferation of scrubland species.

Mainly nocturnal, although often diurnal in areas with low levels of disturbance. Prefers relatively well drained soils for burrows although may occasionally nest in dense cover. May breed throughout the year, but main season extends from January to August (Hayden & Harrington, 2000).

**Threats:** Predated on by a wide range of species, including foxes, stoats, badgers, domestic/feral cats and buzzards. Populations respond positively to predator control although predation unlikely to exert any major impact on recruitment.

Widely regarded as an agricultural pest and hunted with dogs, shot, trapped and snared. At high densities may damage coastal habitats.

Becoming increasingly immune to myxomatosis. Rabbits studied in Northern Ireland appear to have immunity to viral haemorrhagic disease (A. Bell, pers. comm.)

**Order Artiodactyla**

*Cervus elaphus* Linnaeus

**Common name:** Red deer

**Irish name:** Fia rua

**Irish status:** least concern

**European status:** least concern

**Global status:** least concern



Photo: Mike Brown

**Rationale for assessment:** Not previously assessed. Expanding distribution and population, together with the European status of least concern justify current Irish assessment.

**Legal Status:** Wildlife Act, 1976; Wildlife (Amendment) Act, 2000 ; Wildlife (N.I.) Order of 1985.

Open season (RoI): Stags: 1 September - 31 December (except Kerry); Hinds: 1 November - 28 February.

Close season (NI): Stags: 1 May - 31 July; Hinds: 1 March - 31 October

**Distribution:** Widespread Holarctic species, found from Ireland to China and North America; from southern Norway to north Africa.

In Ireland, established populations in Wicklow, Donegal, Galway and Kerry, with smaller scattered populations elsewhere. Greater than 600% increase in range estimated between 1978 and 2008 (Carden *et al.* in rev.), largely as a result of escapes and deliberate introductions.

**Population in Ireland:** While there is no population estimate available for Ireland, there is evidence that the population is increasing (Carden *et al.*, in rev.).

**Ecology and habitat in Ireland:** In upland areas, red deer can be found in open moorland and woodland habitats. Will migrate to lower altitudes in winter, relying on conifer plantations and secluded woodlands for shelter.

Opportunistic browser and grazer, feeding on grasses, shoots of deciduous and coniferous trees, leaves of heather, oak and holly as well as berries, acorns and other fruit.

**Threats:** Hybridises with sika deer, although genetic studies have shown that this occurs less than previously thought (McDevitt *et al.*, 2009).

Range and population increases leading to growing concerns about damage to forestry and potential traffic collisions and to calls for population culls.

*Dama dama* Linnaeus

**Common name:** Fallow deer

**Irish name:** Fia buí

**Irish Red list status:** least concern

**European Red list status:** least concern

**Global Red list status:** least concern



Photo: Eddie Dunne

**Rationale for assessment:** Not previously assessed. Widespread and expanding distribution, evidence of increasing population, and the European status of least concern justify current Irish assessment.

**Legal status:** Wildlife Act, 1976 and Wildlife (Amendment) Act, 2000 . Wildlife (N.I.) Order of 1985.

Open season (RoI): Buck: 1 September - 31 December; Doe: 1 November - 28 February

Close season (NI): Buck: 1 August - 31 July; Doe: 1 March - 31 October

**Distribution:** Original range believed to have been in Turkey and Iran but introduced to Mediterranean in the Neolithic and more widely from there by the Romans. Numerous introductions worldwide at the end of the 19<sup>th</sup> century and start of the 20<sup>th</sup> century (Mitchell-Jones *et al.*, 1999; Harris & Yalden, 2008).

First introduced to Ireland in the 13<sup>th</sup> century. Popular in deer parks. Subsequent wild populations have established and spread throughout the Irish lowlands from Antrim to Cork. Significant increase in range in recent decades following protection under wildlife legislation and expansion of forestry (Carden *et al.*, in rev.).

**Population in Ireland:** No national population data available. However, steady year on year increase in numbers being shot under licence (over 11,000 shot in 2008/2009 season (NPWS data)) is apparently having no impact on continued range expansion. Population is likely to be > 150,000.

**Ecology and habitat in Ireland:** Lowland species favouring mix of cover and open grassland. Predominantly grazers but will browse leaves and herbs and take nuts and berries in season. Small stable groups may aggregate into large herds at favourable feeding grounds. Autumn rut, fawns born in summer.

**Threats:** Damage to woodland, in particular young, broadleaf plantations, is bringing this species into conflict with landowners and forest managers. At high density may also damage ground flora and regenerating potential of established native woodlands. There have been calls for longer open season and population culls.

## Bibliography & Relevant Literature

- Allen, P., Forsyth, I., Hale, P. & Rogers, S. (2000) Bats in Northern Ireland. *Irish Naturalists' Journal*. Special Zoological Supplement.
- Aughney, T., Langton S. and Roche, N. (2009) All Ireland Daubenton's Bat Waterway Monitoring Scheme 2006-2008. *Irish Wildlife Manuals*, No. 42. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
- Baggoe, H.J. (1973) Taxonomy of two sibling species of bats in Scandinavia *Myotis mystacinus* and *Myotis brandtii* (Chiroptera). *Videnskabelige Meddelelser fra Dansk Naturhistorisk* 136: 191-216.
- Bailey, M. & Rochford J. (2006) Otter Survey of Ireland 2004/2005. *Irish Wildlife Manuals*, No. 23. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
- Barlow, K.E. & Jones, G. (1996) *Pipistrellus nathusius*' (Chiroptera: Vespertilionidae) in Britain in the mating season. *Journal of Zoology, London*: 240: 767-773.
- Barlow, K.E. (1997) The diets of two phonic types of the bat *Pipistrellus pipistrellus* in Britain. *Journal of Zoology, London*. 243: 579-609.
- Barlow, K.E. & Jones, G. (1997) Roosts, echolocation calls and wing morphology of two phonic types of *Pipistrellus pipistrellus*. *Z. Saugetierkunde*. 64:257-268.
- Barratt, E.M., Deaville, R., Burland, T.M., Bruford, M.W., Jones, G., Racey, P.A., & Wayne, R.K. (1997) DNA answers the call of pipistrelle bat species. *Nature*, 387: 138-139.
- Barrington R.M. (1880) On the introduction of the squirrel into Ireland. *Scientific Proceedings of the Royal Dublin Society* N.S 2: 615-31
- Bat Conservation Group Dublin (1999) *Bats in houses*. A report to the Heritage Council.
- Bontadina, F., Schofield, H. & Naef-Daenzer, B. (2002) Radio-tracking reveals that lesser horseshoe bats (*Rhinolophus hipposideros*) forage in woodland. *Journal of Zoology, London*. 258: 281-290.
- Boonman, M. (2000) Roost selection by noctules (*Nyctalus noctule*) and Daubenton's bats (*Myotis daubentonii*). *Journal of Zoology, London*. 251, 385-389
- Briggs, B. & King, D. (1998) *The Bat Detective: A field guide for bat detection*. Stag Electronics.
- Browne, J. (2005) *Ireland's Mammals*. Browne Books, Co. Kildare, Ireland.
- Buckley, D.J. (2005) *The emergence behaviour and foraging habitat preferences of the Whiskered bat (Myotis mystacinus) in a lowland landscape in mid-Cork*. B.Sc. Thesis, National University of Ireland Cork.
- Carden, R.F., Carlin, C.M. Marnell, F., McElholm, D., Hetherington, J. & Gammell, M.P. (in review) Distribution and range expansion of deer in Ireland. Submitted to *Mammal Review*.
- Carey, M., Hamilton, G., Poole, A. & Lawton, C. (2007) *The Irish squirrel survey 2007*. COFORD, Dublin
- Catto, C., Russ. J. & Langton, S. (2004) *Development of a Car Survey Monitoring Protocol for the Republic of Ireland*. A report prepared for the Heritage Council by the Bat Conservation Trust.
- Chapman, P.J. & Chapman, L.L. (1982) *Otter Survey of Ireland 1980-81*. The Vincent Wildlife Trust, London.
- Childs, J. (2003) *Bat Crime*. A report published by the BCT/RSPB.
- Cleary, G.P., Corner, L.A.L., O'Keeffe, J. & Marples, N.M. (2009) The diet of the badger *Meles meles* in the Republic of Ireland. *Mammalian Biology* 74: 438-447.
- Crawford, K., McDonald, R.A. & Bearhop, S. (2008) Applications of stable isotope techniques to the ecology of mammals. *Mammal Review*, 38(1): 87-107.
- Davidson-Watts, I. & Jones, G. (2006) Differences in foraging behaviour between *Pipistrellus pipistrellus* (Schreber, 1774) and *Pipistrellus pygmaeus* (Leach, 1825). *Journal of Zoology, London* 268: 55-62.
- Entwistle, A.C., Racey, P.A. & Speakman, J.R. (1996) Habitat exploitation by a gleaning bat *Plecotus auritus*. *Phil. Trans. R. Soc. London*, B351: 921-931.

- Entwistle, A.C., Racey, P.A. & Speakman, J.R. (1997) Roost selection by the brown long-eared bat (*Plecotus auritus*). *Journal of Zoology, London*. 252: 11-17.
- EPA (2008) *Ireland's Environment 2008*. Environmental Protection Agency. Wexford, Ireland.
- European Commission (2009) *Composite Report on the Conservation Status of Habitat Types and Species as required under Article 17 of the Habitats Directive – National Summary for Ireland*. Report from the commission to the council and the European Parliament, Brussels.
- Fairley, J.S. (1969) Tagging studies of the Red Fox, (*Vulpes vulpes*) in north-east Ireland. *Journal of Zoology, London*. 159: 527-32.
- Fairley, J. (1984) *An Irish beast book*. 2nd Edition. Blackstaff Press. Belfast.
- Fairley, J. (2001) *A Basket of Weasels*. Published by the author.
- Feore, S. (1994) *The distribution and abundance of the badger Meles meles L. in Northern Ireland*. Ph.D. thesis, Queens University Belfast.
- Feyerabend, F. & Simon, M. (2000) Use of roosts and roost switching in a summer colony of 45 kHz phonic type pipistrelle bats (*Pipistrellus pipistrellus* Schreber, 1774) *Myotis* 38: 51-59
- Finnegan, L.A., Edwards, C.J. & Rochford, J.M. (2007) Origin of, and conservation units in, the Irish red squirrel (*Sciurus vulgaris*) population. *Conservation Genetics* 9: 1099-1109.
- Flavin, D.A., Biggane, S.S., Shiel, C.B., Smiddy, P. & Fairley, J.S. (2001) Analysis of the diet of Daubenton's bat *Myotis daubentonii* in Ireland. *Acta Theriologica* 46(1): 43-52.
- Gerell, R. & Lundberg, K. (1985) Social organisation in the bat *Pipistrellus pipistrellus*. *Behavioural Ecology Sociobiology*. 16: 177-184.
- Gerell-Lundberg, K. & Gerrell, R. (1994) The mating behaviour of the pipistrelle and the Nathusius' pipistrelle (Chiroptera) – a comparison. *Folia Zoologica*. 43: 315-324.
- Glover, A. & Altringham, J. (in prep.) *A review of Automated Bat Counting Systems*. A report for Countryside Council for Wales.
- Greenaway, F. & Hutson, A.M. (1990) *A field guide to British Bats*. Bruce Coleman Books.
- Guillot, F. (2003) *Diet of the pipistrelle bat by analysis of faecal pellets collected in bat boxes in County Galway*. An unpublished B.Sc. thesis. National University of Ireland, Galway.
- Haddow, J.F. (1995) Night roosting Natterer's bats. *Scottish Bats*. 3: 20-22.
- Harris, S. & Yalden, D.W. (2008) *Mammals of the British Isles: Handbook, 4<sup>th</sup> Edition*. The Mammal Society, Southampton, England.
- Hayden, T. & Harrington, R. (2000) *Exploring Irish mammals*. Town House & Country House Ltd., Dublin. Ireland.
- Herman, J.S. & Smith, S. (1995) Pipistrelles hibernating in an underground site in Dumfriesshire. *Scottish Bats*. 3: 18
- Hill, D.A., & Greenaway, F. (2005) Effectiveness of an acoustic lure for surveying bats in British woodlands. *Mammal Review*. 35(1), 116-122.
- Hopkirk, A. (1996) *The bat hibernacula survey of north-west Ireland*. Unpublished report.
- Hopkirk, A. & Russ, J. (2004) *Pre-hibernal and hibernal activity and dispersal patterns of Leisler's bats Nyctalus leisleri in Northern Ireland*. A report for the Environment and Heritage Service, Northern Ireland.
- Hughes, M., Reid, N., Montgomery, W.I. & Prodohl, P.A (2009) *Verification of hybridisation between introduced European and native Irish hares*. Report prepared by the Natural Heritage Research Partnership, *Quercus* for the Northern Ireland Environment Agency, Northern Ireland, UK.
- Hunter Jr., M.L. (1995) *Fundamentals of Conservation Biology*. Blackwell Science, Cambridge, Massachusetts.

- Hutson, A.M., Mickleburgh, S.P. & Racey, P.A. (compilers) (2001) *Microchiropteran Bats: Global Status Survey and Conservation Action Plan*. IUCN/SSC Chiroptera Specialist Group. IUCN, Gland, Switzerland, and Cambridge, UK.
- IUCN (1990) *The 1990 IUCN Red list of threatened animals*. IUCN, Gland, Switzerland.
- IUCN (2001) *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN (2003) *Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN (2005) *Guidelines for Using the IUCN Red List Categories and Criteria*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN (2008) *Guidelines for Using the IUCN Red List Categories and Criteria*. Version 7. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN (2009) *IUCN Red List of Threatened Species*. Ver. 2009:1, IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- Kelleher, C. (2004) Thirty years, six counties, one species – an update on the lesser horseshoe bat *Rhinolophus hipposideros* (Bechstein) in Ireland. *Ir. Nat. J.* 27: 387-392
- Kelleher, C. (2005) *Bat Fieldcraft Workshop, Killarney National Park, Killarney, Co. Kerry*. A report to the National Parks and Wildlife Service. [www.npws.ie](http://www.npws.ie)
- Kokurewicz, T. (1995) Increased population of Daubenton's bat (*Myotis daubentonii* (Kuhl, 1819)) (Chiroptera: Vespertilionidae) in Poland. *Myotis* 32-33: 155-161
- Lloyd, H.G. (1983) Past and present distribution of red and grey squirrels. *Mammal Review* (13): 69-80.
- Looney, D.J.P. (2001) *The ecology of the red fox *Vulpes vulpes* in relation to sheep farming in County Antrim*. Unpublished PhD Thesis, Queens University, Belfast.
- Lunnon, R. & Reynolds, J. (1991) *Report on the National Otter Survey of Ireland 1990-91*. Unpublished Report to the Wildlife Branch, Office of Public Works, Dublin.
- McAney, C. & Fairley, J. (1990) Activity of Leisler's bat *Nyctalus leisleri* (Kuhl, 1817) at a summer roost in Ireland. *Myotis* 28: 83-91.
- McAney, C.M. (1994) The lesser horseshoe bat in Ireland – Past, Present and Future. *Folia Zoologica*. 43 (4): 387-392
- McAney, K. (1994) *West of Ireland winter hibernation survey*. A report for The Vincent Wildlife Trust.
- McAney, K. (1997) *Southern Ireland hibernation survey*. A report for The Vincent Wildlife Trust.
- McAney, K. (2006) A conservation plan for Irish vesper bats. *Irish Wildlife Manuals*, No. 20. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland
- McDevitt, A.D., Edwards, C.J., O'Toole, P., O'Sullivan, P., O'Reilly, C. & Carden, R.F. (2009) Genetic structure of, and hybridisation between, red (*Cervus elaphus*) and sika (*Cervus nippon*) deer in Ireland. *Mammalian Biology* 74: 263-273.
- McGuire, C. (1998) Survey of lesser horseshoe bats *Rhinolophus hipposideros* (Bechstein) and other bat species in north Co. Clare. *Irish Naturalists' Journal*. Vol. 26: 43-50.
- Marnell, F. & Presetnik, P. (2009) Protection of overground roosts for bats. *EUROBATS Publication Series No. 4*, Bonn.
- Martinkova, N., McDonald, R.A. & Searle, J.B. (2007) Stoats (*Mustela erminea*) provide evidence of natural overland colonisation of Ireland. *Proceedings of the Royal Society of London B*274: 1387-1393.
- Mitchell, G.F. (1976) *The Irish landscape*. Collins, London.
- Mitchell-Jones, A.J., Amori, G., Bogdanowicz, W., Krystufek, B., Reijnders, P.J.H., Spitzenberger, F., Stubbe, M., Thissen, J.B.M., Vohralik, V., & Zima, J. (1999) *The Atlas of European Mammals*. Poyser Natural History.

- Montgomery, W. I. & Dowie, M. (1993) The distribution of the wood mouse *Apodemus sylvaticus* and the house mouse *Mus domesticus* on farmland in north-east Ireland. *The Irish Naturalists' Journal*. 24: 199-204.
- Mortimer, G. (2005) *Natterer's bat Myotis nattereri and commercial coniferous plantations*. Abstracts of the Xth European Bat Research Symposium.
- Motte, G. & Libois, R. (2002) Conservation of the lesser horseshoe bat (*Rhinolophus hipposideros* Bechstein, 1800) (Mammalia: Chiroptera) in Belgium. A case study of feeding habitat requirements. *Belgian Journal of Zoology* 132 (10): 49-54.
- Mullen, E. (2006) Brandt's bat *Myotis brandtii* in Co Wicklow. *Irish Naturalists' Journal*, 28(8): 343.
- NHM (2009) *Checklist of British Native Mammals*. Natural History Museum, London. [www.nhm.ac.uk](http://www.nhm.ac.uk). Accessed 29/09/09.
- Ní Lamhna, E. (1979) (ed.) *Provisional distribution atlas of amphibians, reptiles and mammals in Ireland*. An Foras Forbartha, Dublin
- Ní Lamhna, E. (1983) (ed.) *Provisional distribution atlas of amphibians, reptiles and mammals in Ireland*. 2nd edition. An Foras Forbartha, Dublin
- NPWS (2007) *Martes martes (1357) Conservation Status Assessment Report*, Unpublished report to the National Parks & Wildlife Service.
- NPWS (2008) *The status of EU protected habitats and species in Ireland*. National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government. Dublin, Ireland.
- NPWS & EHS (2008) *All Ireland Species Action Plan for Bats*. [www.npws.ie](http://www.npws.ie)
- NPWS & EHS (2008) *All Ireland Species Action Plan for Red Squirrel*. [www.npws.ie](http://www.npws.ie)
- Oakley, S.F. & Jones, G. (1998) Habitat around maternity roosts of the 55 kHz phonic type of pipistrelle bats (*Pipistrellus pipistrellus*). *Journal of Zoology, London*. 245, 222-228.
- Ohlendorf, B., Hecht, B., Strasburg, D. & Agirre-Mendi, P.T. (2000) Fernfund eines Kleinabendseglers (*Nyctalus leisleri*) in Spanien. *Nyctalus*. 7: 239-242.
- Olea-Popelka, F.J., Griffin, J.M., Collins, J.D., McGrath, G. & Martin, S.W. (2003) Bovine tuberculosis in badgers in four areas in Ireland: does tuberculosis cluster? *Preventive Veterinary Medicine* 59: 103-111
- O'Neill, K. & Montgomery, I. (2003) *Recent changes in the distribution of red squirrels in Northern Ireland*. Queen's University Belfast & Environment and Heritage Service, Northern Ireland.
- O'Neill, L. (2008) *Population dynamics of the Eurasian otter in Ireland*. Unpublished PhD, Trinity College, Dublin.
- O'Sullivan, P.J. (1983) The distribution of the pine marten (*Martes martes*) in the Republic of Ireland. *Mammal Review* 13: 39-44.
- O'Sullivan, P. (1994) Bats in Ireland. *Irish Naturalists' Journal*. 24: Special Zoological Supplement.
- O'Teangana, D. (1999) *The distribution and ecology of the red squirrel (Sciurus vulgaris) and grey squirrel (Sciurus carolinensis) in Northern Ireland*. Unpublished PhD thesis. Queens University, Belfast.
- O'Teangana, D., Reilly, S., Montgomery, W. I. & Rochford, J. (2000) Distribution and status of the Red squirrel (*Sciurus vulgaris*) and Grey squirrel (*Sciurus carolinensis*) in Ireland. *Mammal Review*, 30: 45-56.
- Parsons, K.N., Jones, G., Davidson-Watts, I., & Greenaway, F. (2003) Swarming of bats at underground sites in Britain – implications for conservation. *Biological Conservation* 111: 63-70.
- Parson, K.N. & Jones, G. (2003) Dispersion and habitat use by *Myotis daubentonii* and *Myotis nattereri* during the swarming season: implications for conservation. *Animal Conservation* 6: 283-290.
- Podlutsky, A.J., Khritankov, A.M., Ovodov, N.D. & Austad, S.N. (2005) A new field record for bat longevity. *Journal of Gerontology: Biological Sciences* Vol. 60A, No. 11, 1366-1368.

- Poole, W.R., Rogan, G. & Mullen, A. (2007) Investigations into the impact of fyke nets on otter populations in Ireland. *Irish Wildlife Manuals*, No. 27. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
- Preston, J., Prodohl, P., Portig, A. & Montgomery, I. (2004) *Otter survey of Northern Ireland 2001/2002*. Report for the N.I. Environment & Heritage Service, Belfast.
- Reid, N. (2006) *Conservation Ecology of the Irish Hare (Lepus timidus hibernicus)*. Unpublished PhD thesis, Queens University, Belfast.
- Reid, N. & Montgomery, I. W. (2007) Is the naturalisation of the brown hare in Ireland a threat to the endemic Irish hare? *Biology and Environment: Proceedings of the Royal Irish Academy*, 107B: 129-138.
- Reid, N., Dingerkus, K., Montgomery, W.I., Marnell, F., Jeffrey, R., Lynn, D., Kingston, N. & McDonald, R.A. (2007a) Status of hares in Ireland. *Irish Wildlife Manuals*, No. 30. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
- Reid, N., McDonald, R.A. & Montgomery, W.I. (2007b). Mammals and agri-environment schemes: hare haven or pest paradise? *Journal of Applied Ecology* **44**, 1200-1208.
- Reid, N., Etherington, T.R, Wilson, G., Mc Donald, R.A. & Montgomery W.I. (2008) *Badger survey of Northern Ireland 2007/08*. Report prepared by Quercus and Central Science Laboratory for the department of Agriculture and Rural Development (DARD), Northern Ireland, UK.
- Reid, N., Harrison, A.T. & Robb, G.N. (2009) *Northern Ireland Irish hare survey 2009*. Report prepared by the Natural Heritage Research Partnership, Quercus for the Northern Ireland Environment Agency. Northern Ireland Environment Agency Research and Development Series No. 09/04
- Reid, N., Ruddock, M., Barratt, I., Robb, G.N. & Montgomery, W.I. (2008) *Northern Ireland Irish hare survey 2008*. Report prepared by Quercus for the Environment and Heritage Service (DOE, N.I.). UK.
- Richardson, P. (2000) *Distribution atlas of bats in Britain and Ireland, 1980-1999*. The Bat Conservation Trust. London.
- Rivers, N.M, Butlin, R.K. & Altringham, J.D. (2006) Autumn swarming behaviour of Natterer's bats in the UK: Population size, catchment area and dispersal. *Biological Conservation*. 127: 215-226.
- Roche, N. (1998) *A survey for bat roosts in Church of Ireland churches*. A report prepared for the Heritage Council.
- Roche, N. (2001) The status of lesser horseshoe bats *Rhinolophus hipposideros* Bechstein in Co. Limerick. *Irish Naturalists' Journal*. Vol. 26: 437-484.
- Roche N., Langton S. & Aughney T. (2009) The car-based bat monitoring scheme for Ireland: Synthesis report 2003-2008. *Irish Wildlife Manuals*, No. 39. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin, Ireland.
- Roche, N., Catto, C., Langton, S., Aughney, T. & Russ, J. (2005) Development of a car-based bat monitoring protocol for the Republic of Ireland. *Irish Wildlife Manuals*, No. 19. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin, Ireland.
- Rossiter, S.J., Jones, G., Ransome, R.D. & Barratt, E.M. (2001) Outbreeding increases offspring survival in wild greater horseshoe bats (*Rhinolophus ferrumequinum*). *Proceedings of the Royal Society, London (B)* 268, 1055-1061.
- Roy, S., Reid, N. & McDonald, R.A. (2009) A review of mink predation and control for Ireland. *Irish Wildlife Manuals*, No. 40. National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin, Ireland.
- Ruczynski, I., & Ruczynska, I. (2000) Roosting sites of Leisler's bat *Nyctalus leisleri* in Bialowieza Forest – preliminary results. *Myotis* 37: 55-60.
- Ruedi, M. & Mayer, F. (2001) Molecular systematics of bats of the genus *Myotis* (Vespertilionidae) suggests deterministic ecomorphological convergences. *Molecular Phylogenetics and Evolution* 21: 436-448.
- Russ, J.M. (1999) *The Microchiroptera of Northern Ireland: community composition, habitat associations and ultrasound*. Unpublished Ph.D thesis. The Queen's University of Belfast.

- Russ, J.M. (2008) *Nathusius' pipistrelle in Great Britain and Ireland*. <http://www.nathusius.org.uk>
- Russ, J.M. & Montgomery, W.I. (2002) Habitat association of bats in Northern Ireland: implications for conservation. *Biological Conservation*. 108: 49-58.
- Russ, J.M., Briffa, M. & Montgomery, W.I. (2003) Seasonal patterns in activity and habitat use by *Pipistrellus* spp. and *Nyctalus leisleri* in Northern Ireland, determined using a driving transect. *Journal of Zoology*. 259: 289-299.
- Russ, J.M., Montgomery, W.I., Racey, P.A. & Speakman, J.R. (2001) The status of *Nathusius' pipistrelle* (*Pipistrellus nathusii* Keyserling & Blasius, 1839) in the British Isles. *Journal of Zoology, London*. 254: 91-100.
- Russ, J.M., O'Neill, J.K. & Montgomery, W.I. (1998) *Nathusius' pipistrelle* bats (*Pipistrellus nathusii*, Keyserling & Blasius 1839) breeding in Ireland. *Journal of Zoology, London*. 245-349.
- Sargent, G. (1995) *Bats in Churches Project*. The Bat Conservation Trust, London.
- Schober, W. & Grimmberger, E. (1989) *A guide to the bats of Britain and Europe*. Hamlyn, London.
- Schofield, H.W. (2008) *The lesser horseshoe bat conservation handbook*. The Vincent Wildlife Trust. Herefordshire, U.K.
- Scottish Natural Heritage (1998) *The design and construction of bat boxes in houses*. [www.snh.org.uk](http://www.snh.org.uk)
- Shiel, C. (1999) *Bridge usage by bats in County Leitrim and County Sligo*. A report prepared for the Heritage Council.
- Shiel, C.B. & Fairley, J.S. (1998) Activity of Leisler's bat *Nyctalus leisleri* in the field in south-east County Wexford, as revealed by a bat-detector. *Biology & Environment*. Vol. 98B, No. 2. 105-112
- Shiel, C.B. & Fairley, J.S. (1999) Evening emergence of two nursery colonies of Leisler's bat *Nyctalus leisleri* in Ireland. *Journal of Zoology*. 247: 439-447.
- Shiel, C.B. & Fairley, J.S. (2000) Observations at two nursery roosts of Leisler's bat *Nyctalus leisleri* (Kuhl, 1817) in Ireland. *Myotis* 37: 41-53.
- Shiel, C.B., Duverge, P., Smiddy, P. & Fairley, J.S. (1998) Analysis of the diet of Leisler's (*Nyctalus leisleri*) in Ireland with some comparative analyses from England and Germany. *Journal of Zoology*. 246: 417-425.
- Shiel, C.B., McAney, C.M. & Fairley, J.S. (1991) Analysis of the diet of Natterer's bat *Myotis nattereri* and the common long-eared bat *Plecotus auritus* in the West of Ireland. *Journal of Zoology*. 223: 299-305
- Shiel, C.B., Shiel, R. E., & Fairley, J.S. (1999) Seasonal changes in the foraging behaviour of Leisler's bats (*Nyctalus leisleri*) in Ireland as revealed by radio-telemetry. *Journal of Zoology*. 249: 347-358.
- Sleeman, D.P., Davenport, J., More, T. A., Clegg, T.A., Collins, J.D., Martin, S.W., Williams, D.H., Griffin, J.M. & O'Boyle, I. (2009) How many Eurasian badgers *Meles meles* L. are there in the Republic of Ireland? *European Journal of Wildlife Research*. 55: 333-344.
- Smal, C. (1995) *The Badger and Habitat Survey of Ireland*. Unpublished Report to National Parks & Wildlife Service & Department of Agriculture, Food and Forestry.
- Smiddy, P. (1991) Bats and Bridges. *Irish Naturalists' Journal*. Vol. 23: 425-426.
- Smith, P.G. (2000) *Habitat preference, range use and roosting ecology of Natterer's bats* (*Myotis nattereri*) in a grassland-woodland landscape. Unpublished PhD thesis. University of Aberdeen.
- Smith, P.G. & Racey, P.A. (2002) *Habitat Management for Natterer's Bat*. Mammals Trust UK. [www.mtuk.org](http://www.mtuk.org)
- Smith, P.G. & Racey, P.A. (2005) The itinerant Natterer: physical and thermal characteristics of summer roosts of *Myotis nattereri* (Mammalia: Chiroptera). *Journal of Zoology* 266: 171-180.
- Speakman, J.R., Racey, P.A., Catto, C.M.C., Webb, P.I., Swift, S.M. & Burnett, A.M. (1991) Minimum summer populations and densities of bats in NE Scotland, near the northern borders of their distributions. *Journal of Zoology*. 225: 327-345.
- Stebbing, R.E. (1986) *Which Bat is it?* The Mammal Society & The Vincent Wildlife Trust.

- Sullivan, C.M., Shiel, C.B., McAney, C.M. & Fairley, J.S. (1993) Analysis of the diets of Leisler's *Nyctalus leisleri*, Daubenton's *Myotis daubentonii* and pipistrelle *Pipistrellus pipistrellus* bats in Ireland. *Journal of Zoology*. 231: 656-663.
- Swift, S.M. (1998) *Long-eared bats*. Poyser Natural History. London
- Temple, H.J. & Terry, A. (2007) *The Status and Distribution of European Mammals*. Office for Official Publications of the European Communities, Luxembourg.
- Tosh, D.G., Lusby, J., Montgomery, W.I. & O'Halloran, J. (2008) First record of greater white-toothed shrew *Crocidura russula* in Ireland. *Mammal Review* 38 (4): 321 - 326.
- UNEP-WCMC (2006) *UNEP-WCMC species database: CITES-listed species*. <http://www.cites.org/>.
- Vaughan, N. (1997) The diets of British bats (Chiroptera). *Mammal Review*. 27: 77-94.
- Walker, J. & Fairley, J.S. (1968) Winter food of Irish hares in County Antrim, Northern Ireland. *Journal of Mammalogy*, **49**, 783-785
- Wardaugh, T. (1992) Bats and their roosts in Cleveland and north east Yorkshire. *Naturalist*. 117:99-108.
- Warren, R.D., Waters, D.A., Altringham, J.D. & Bullock, D.J. (2000) The distribution of Daubenton's bats (*Myotis daubentonii*) and pipistrelle bats (*Pipistrellus pipistrellus*) (Vespertilionidae) in relation to small-scale variation in riverine habitat. *Biological Conservation* 92: 85-91.
- Waters, D., Jones, G. & Furlong, M. (1999) Foraging ecology of Leisler's bat (*Nyctalus leisleri*) at two sites in southern Britain. *Journal of Zoology*. 249: 173-180.
- Whilde, A. (1993) *Threatened mammals, birds, amphibians and fish in Ireland*. Irish Red Data Book 2: Vertebrates. HMSO, Belfast.
- Wilson, D.E. & Reeder, D.M. (editors) (2005) *Mammal Species of the World. A Taxonomic and Geographic Reference (3rd edition)*. Johns Hopkins University Press.
- Wolfe, A., Whelan, J. & Hayden, T.J. (1996) Dietary overlap between the Irish mountain hare, *Lepus timidus hibernicus* and the rabbit *Oryctolagus cuniculus* on coastal grassland. *Biology and Environment: Proceedings of the Royal Irish Academy*, **96B**, 89-95.
- Yalden, D.W. (1985). *The Identification of British Bats*. An occasional publication of The Mammal Society.

**Appendix 1 - Summary of the five criteria (A-E) used to evaluate whether a taxon belongs in a threatened category - Critically Endangered, Endangered or Vulnerable (IUCN, 2008).**

Use any of the criteria A-E	Critically Endangered	Endangered	Vulnerable
<b>A. Population reduction</b>	Declines measured over the longer of 10 years or 3 generations		
<b>A1</b>	> 90%	> 70%	> 50%
<b>A2, A3 &amp; A4</b>	> 80%	> 50%	> 30%
<p><b>A1.</b> Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND ceased based on and specifying any of the following:</p> <ul style="list-style-type: none"> <li>(a) direct observation</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.</li> </ul> <p><b>A2.</b> Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1</p> <p><b>A3.</b> Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on any of (b) to (e) under A1.</p> <p><b>A4.</b> An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1.</p>			
<b>B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy)</b>			
<b>B1.</b> Either extent of occurrence	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
<b>B2.</b> or area of occupancy	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
and 2 of the following 3:			
(a) severely fragmented or # locations	= 1	≤ 5	≤ 10
(b) continuing decline in (i) extent of occurrence (ii) area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations or subpopulations and (v) number of mature individuals.			
(c) extreme fluctuations in any of (i) extent of occurrence, (ii) area of occupancy, (iii) number of locations or subpopulations and (iv) number of mature individuals.			
<b>C. Small population size and decline</b>			
Number of mature individuals and either <b>C1</b> or <b>C2</b> :	< 250	< 2,500	< 10,000
<b>C1.</b> An estimated continuing decline of at least up to a maximum of 100 years	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
<b>C2.</b> A continuing decline and (a) and/or (b)			
(a i) # mature individuals in largest subpopulation	< 50	< 250	< 1,000
(a ii) or % mature individuals in one subpopulation =	90-100%	95-100%	100%
(b) extreme fluctuations in the number of mature individuals			
<b>D. Very small or restricted population</b>			
Either (1) number of mature individuals or (2) restricted area of occupancy	< 50 na	< 250 na	< 1,000 typically: AOO < 20km <sup>2</sup> or # locations ≤5
<b>E. Quantitative Analysis</b>			
Indicating the probability of extinction in the wild to be at least	50% in 10 years or 3 generations (100 years max)	20% in 20 years or 5 generations (100 years max)	10% in 100 years

## Appendix 2 – Checklist of terrestrial mammals

**IRL 2009 Status** - Red list status for Ireland based on this assessment; RE - Regionally Extinct, VU – Vulnerable, NT - Near Threatened, dd - data deficient, lc – least concern; na – not assessed. **IRL 1993 Status** - Red list status for Ireland based on Whilde, 1993; Ex – Extinct, R – Rare, I – Indeterminate, II - Internationally important. **EU Status** - Red list status for Europe, based on Temple & Terry (2007). **Global Status** - Red List status, taken from IUCN (2009). **UK Status** – Conservation status in the UK; PS – Priority Species, SoCC – Species of Conservation Concern. **Protection** – EU – Listed on an EU Habitats Directive [92/43/EEC] Annex, RoI – Listed on the Irish Wildlife Acts; NI – Listed on the Wildlife (N.I.) Order of 1985.

Scientific name	Authority	Common name	IRL 2009 Status	IRL 1993 Status	EU Status	Global Status	UK Status	Protection
<i>Erinaceus europaeus</i>	Linnaeus	Hedgehog	lc	II	lc	lc	PS	RoI
<i>Sorex minutus</i>	Linnaeus	Pygmy shrew	lc	na	lc	lc		RoI
<i>Myotis brandtii</i>	Eversmann	Brandt's bat	dd	na	lc	lc	SoCC	EU; RoI; NI
<i>Myotis daubentonii</i>	Kuhl	Daubenton's bat	lc	II	lc	lc	SoCC	EU; RoI; NI
<i>Myotis mystacinus</i>	Kuhl	Whiskered bat	lc	I	lc	lc	SoCC	EU; RoI; NI
<i>Myotis nattereri</i>	Kuhl	Natterer's bat	lc	I	lc	lc	SoCC	EU; RoI; NI
<i>Nyctalus leisleri</i>	Kuhl	Leisler's bat	NT	II	lc	lc	SoCC	EU; RoI; NI
<i>Pipistrellus nathusii</i>	Keyserling & Blasius	Nathusius' pipistrelle	lc	na	lc	lc	SoCC	EU; RoI; NI
<i>Pipistrellus pipistrellus</i>	Schreber	Common pipistrelle	lc	II	lc	lc	SoCC, PS	EU; RoI; NI
<i>Pipistrellus pygmaeus</i>	Leach	Soprano pipistrelle	lc	na	lc	lc		EU; RoI; NI
<i>Plecotus auritus</i>	Linnaeus	Brown long-eared bat	lc	II	lc	lc	SoCC	EU; RoI; NI
<i>Rhinolophus hipposideros</i>	Bechstein	Lesser Horseshoe bat	lc	II	NT	lc	SoCC, PS	EU; RoI
<i>Apodemus sylvaticus</i>	Linnaeus	Wood mouse	lc	na	lc	lc		None
<i>Mus musculus domesticus</i>	Rutty	House mouse	lc	na	lc [ <i>M. musculus</i> ]	lc [ <i>M. musculus</i> ]		None
<i>Myodes glareolus</i>	Schreber	Bank vole	na	na	lc	lc		None
<i>Rattus rattus</i>	Linnaeus	Black rat	VU (D2)	R	lc	lc		None
<i>Rattus norvegicus</i>	Berkenhout	Brown rat	na	na	na	lc		None
<i>Sciurus carolinesis</i>	Gmelin	Grey squirrel	na	na	na	lc		None
<i>Sciurus vulgaris</i>	Linnaeus	Red squirrel	NT	na	lc	lc	PS	RoI; NI
<i>Canis lupus</i>	Linnaeus	Grey Wolf	RE	Ex	lc	lc		None
<i>Lutra lutra</i>	Linnaeus	Otter	NT	II	NT	NT	SoCC, PS	EU; RoI; NI
<i>Martes martes</i>	Linnaeus	Pine marten	lc	II	lc	lc	SoCC, PS	EU; RoI; NI
<i>Meles meles</i>	Linnaeus	Badger	lc	II	lc	lc	SoCC	RoI; NI
<i>Mustela erminea hibernica</i>	Thomas & Barrett-Hamilton	Irish stoat	lc	na	lc [ <i>M. erminea</i> ]	lc [ <i>M. erminea</i> ]		RoI
<i>Neovison vison</i>	Schreber	American mink	na	na	na	lc		None
<i>Vulpes vulpes</i>	Linnaeus	Red fox	lc	na	lc	lc		None
<i>Lepus europaeus</i>	Pallas	Brown hare	na	na	lc	lc	SoCC, PS	None
<i>Lepus timidus hibernicus</i>	Bell	Irish hare	lc	II	lc [ <i>L. timidus</i> ]	lc [ <i>L. timidus</i> ]	PS	EU; RoI; NI
<i>Oryctolagus cuniculus</i>	Linnaeus	Rabbit	lc	na	NT	lc		None
<i>Cervus elaphus</i>	Linnaeus	Red deer	lc	na	lc	lc		RoI; NI
<i>Cervus nippon</i>	Temminck	Sika deer	na	na	na	lc		RoI; NI
<i>Dama dama</i>	Linnaeus	Fallow deer	lc	na	lc	lc	SoCC	RoI; NI