Background to the conservation assessment for the Mountain Hare *Lepus timidus (hibernicus)*

1. Introduction

In Ireland, *Lepus timidus* occurs as a distinct, endemic sub-species, *Lepus timidus hibernicus*, the Irish hare. *Lepus timidus* is widely distributed across northern Europe and Asia, ranging from Ireland in the west to Japan in the east.

Recent work indicates that the Irish hare's unique morphology and ecology is the result of genetic adaptation due to the isolation from other *Lepus timidus* populations for at least 35,000 - 57,000 years (Hughes *et al*., 2006). One of the notable differences between the Irish hare and *Lepus timidus* in other regions is that the former does not undergo complete winter whitening.

The Irish hare is the only native lagomorph species in Ireland and while a number of introductions of the brown hare (*Lepus europaeus*) are known from the nineteenth century, this latter species is only currently known from isolated populations in the northern half of Ireland (Fairley, 2001; Sheppard, 2004; Neil Reid, pers. comm). There is no evidence thus far that there is introgression of brown hare DNA into that of the Irish hare (Hughes *et al.*, 2006). Rabbits (*Oryctolagus cuniculus*) are believed to have been introduced to Ireland by the Normans some 800 years ago.

2. Range

A distribution map of Irish hare was published in 1979 (Ní Lamhna, 1979). This showed the species to be widespread throughout Ireland, with records from all counties and some offshore islands. A badger (*Meles meles*) survey carried out between 1989 and 1993 recorded the presence of hares in 503 of the 729 1 km squares surveyed (Smal, 1995). National surveys conducted in 2006 and 2007 also indicate a widespread distribution (N. Reid *et al*., in prep.). The present range [74, 900km^2] is calculated on the basis of the combined data from the badger survey, the recent national surveys and the biology.ie website.

2.1 Trends

As its range implies, the Irish hare is found in many different habitats including farmland and upland habitats such as bog and heath (see 4. Habitat section below for further details). Some of these have contracted, or have been modified, particularly by changes in farming practices, increased urbanisation and industrial development.

Research carried out between 1994 and 1997 that examined the distribution of the Irish hare in Northern Ireland suggested that while it was widely distributed, there was evidence of a reduction in range (Dingerkus & Montgomery, 2002). However, as discussed in the Population section below, due to large multi-annual fluctuations in population size, it is difficult to detect trends. Nonetheless, overall comparisons between the data published by Ní Lamhna and the most recent surveys (2006/07), suggest that while there may be changes at local level, the national range of the hare has remained stable.

2.2 Favourable reference range

The current range, covering almost the entire country, is sufficiently large to allow long term survival of the species. Thus, the favourable reference range is equal to the current range - 74, 900km^2.

3. Population

Population densities for Irish hare are known to be highly variable, both within and between populations. In addition, populations can rapidly increase and decrease in a short space of time.

A review of historical and contemporary hare distribution and abundance records in Northern Ireland suggested a decline in hare numbers (Dingerkus & Montgomery, 2002). Surveys carried out in Northern Ireland in 2004, 2005 and 2006 estimated the population to be 5.1, 3.1 and 2.6 hares / km^2 respectively (Tosh *et al.*, 2006; Hall-Aspland *et al.*, 2006).

The first national hare survey was carried out in Ireland in 2006 and repeated in 2007. (Reid *et al.* in prep.). The estimate produced from the 2007 data – 535,600 – is significantly higher than the 2006 estimate – 232,500 (see Table 1).

Table 1. *Density and abundance estimates for 2006 & 2007 stratified by region. (area of Republic of Ireland = 69,915km^2). From Reid et al. (in prep)*

Region	**2006**		**2007**	
	Mean density (hares/km^2)	**Mean individual abundance**	**Mean density** (hares/km^2)	**Mean individual abundance**
West and north-west	2.62 (1.30-4.67)	59,200 (29,400-105,400)	7.63 (4.58-15.19)	172300 (103,500-342,900)
East	4.20 (2.32-8.20)	96,700 (53,300-188,700)	9.13 (4.66-17.56)	210,100 (107,400-404,100)
South-west	3.16 (1.35-6.78)	76,700 (32,800-16,4500)	6.31 (3.08-11.81)	153200 (74,900-286,800)
Republic of Ireland	**3.33** (1.97-6.21)**	**232,500 (137,800-433,800)**	**7.66** (4.83-14.29)**	**535,600 (338,100-998,400)**

***Overall density significantly different between 2006 and 2007*

Smaller scale studies have revealed that hare populations can vary significantly over time. For example, on a farmland (improved grassland, arable and tillage) site in Co. Wexford, densities ranged between 11.1 and 50.5 hares / km^2 over a 10 year period (1995 to 2005) (R. Jeffrey, unpublished data).

3.1 Trends

As discussed above, and seen from the 2006 / 2007 survey data, Irish hare populations are capable of large and rapid fluctuations. The reasons for such multi-annual fluctuations are poorly understood, but it is important that natural, self-correcting trends can be distinguished from those that require conservation action (Reynolds *et al.,* 2006). More data is required before any underlying trends can be reliably determined.

3.2 Threats/pressures

Local factors likely to negatively influence hare numbers include loss of refuge areas for daytime shelter, such as hedgerows and rushy areas; changes in farming practices, such as the conversion of semi-natural grassland to ryegrass (*Lolium* spp.) dominated pasture or marginal land to forestry; increased urbanisation; hunting. During the coursing season (September to February), 6-7,000 hares are taken from the wild (under license), and run at coursing meetings. They are then returned to their place of capture. Re-release data suggests approximately 90% of hares are returned to the wild after coursing. However, further research is required to establish the reproductive viability of these hares post-coursing and the impact on local population demographics of hare removal and return.

There is a well established population of brown hare (*Lepus europaeus*) in Northern Ireland, but this species was not confirmed from the Republic during the recent survey work. While there is no evidence to suggest that there has been any introgression of brown hare DNA into that of the Irish hare (Hughes *et al.*, 2006), this is considered to be a potential threat.

The following pressures are thought to be important:

101 – modification of cultivation practices
103 – agricultural improvement
243 – trapping, poisoning, poaching
401 – continuous urbanisation
502 – routes / autoroutes

The following threats are also recognised:

101 – modification of cultivation practices
103 – agricultural improvement
141 – abandonment of pastoral systems
243 – trapping, poisoning, poaching
401 – continuous urbanisation
502 – routes / autoroutes
964 – genetic pollution

4. Habitat

The Irish hare occupies the typical *Lepus timidus* habitats such as upland heath and bog, but is also found in agricultural pastoral and arable landscapes and other lowland habitats such as coastal sand dune systems. Highly modified grasslands such as those found on golf courses, airports and even around industrial complexes are also utilised by hares in Ireland. A feature likely to be important in all these habitats is the availability of undisturbed lying-up areas, as well as suitable feeding grounds. Given the broad range of habitats used, the area of habitat is taken, at the 10km level, to equal the extent of occurrence - 74, 900km^2.

Diet in all these habitats tends to be dominated by grass species, but can also include herbs and shrubby species, where they are available..

Fairley (2001) suggests that hares are probably more common on agricultural land that on un-farmed uplands, but only where agricultural management is favourable for their survival. The recent national hare survey (Reid *et al*., in prep) produced density estimates stratified by habitat which show that hares are more abundant in lowland farmland habitat, while upland areas support lower densities of this species (see Table 2).

Table 2. *Density and abundance estimates for 2007 stratified by habitat within the Republic of Ireland. (Area of bog, moor heath & marsh = 12,166km^2, Mixed farmland = 10,876km^2, Pastoral farmland = 37,334km^2 and Other habitats = 9,539km^2). From Reid* et al. *(in prep)*

Habitats	**2007**	
	Mean density (hares/km^2)	**Mean individual abundance**
Bog, moor, heath & marsh	2.89 (1.27-6.53)	35,200 (15400-79500)
Mixed farmland	7.96 (2.96-17.49)	86,600 (32100-190300)
Pastoral farmland	9.18 (5.96-17.11)	342,700 (222,000-641,100)
Other	3.58 (0.00-8.14)	34,100 (0-77,800)
Republic of Ireland (all habitats)	**7.19 (5.46-11.07)**	**498,600 (326,400-966,000)**

4.1 Trends

Irish hares are adapted to live in most terrestrial habitats throughout Ireland and thus could be considered to be fairly immune to habitat change. However, while there is limited information available, changes to habitats where hare densities are highest (i.e. agricultural land), could have large impacts. Habitat management changes include the switch from spring to winter cereals; from hay to silage making; and from low to high livestock densities. Change in land cover between 1990 and 2000 was examined by the CORINE land cover project. In this period, the largest change occurred in the arable land class (including land used for silage production), which increased by 31 %. The largest change in absolute areas of land cover was a reduction in land used as pasture and mixed farmland (www.epa.ie). While these changes may not lead to a reduction in actual extent of habitat available to the hare, they can lead to reduced habitat quality.

Hares do occur in woodland, but this habitat is considered marginal for them. Consequently, the current rate of afforestation (which was running at an average of 12,300ha per year between 1980 and 2005 [Forest Service figures]) and the current afforestation target of c. 20,000ha per year to bring the national forest cover up to 17% by 2030, is a potential cause for concern.

Increased urbanisation, particularly suburban expansion, has reduced the extent of suitable habitats for hare. Furthermore, habitat fragmentation is occurring as a result of the intensive, ongoing road development programme.

Overall, these changes will have reduced the extent and quality of habitat for hares in Ireland, although this is not apparent at the 10km level. Further research is required to determine what impact these changes are having on the hare population.

5. Future prospects

An all Ireland Species Action Plan for the Irish hare was published in November 2005 (Anon, 2005). This identifies actions to be delivered in areas such as policy and legislation, site safeguard and management and research and monitoring. Implementation of the actions identified in ongoing.

The Rural Environment Protection Scheme (REPS) has almost 60,000 participants in Ireland. This scheme requires among other things, the retention of hedgerows as well as areas of un-cultivated land. Such areas are likely to be important for hares. However, continuing intensification of farming, with the use of larger and faster machinery is likely to negatively impact on hare populations as might the increased afforestation.

The hare remains widespread in Ireland and recent survey estimates suggest that the population is healthy. The hare is expected to survive and prosper in Ireland - good prospects.

6. Conclusions

6.1 Range

The current range of the Irish hare is the same as the favourable reference range, with no evidence of recent change. As the range is stable and not smaller than the favourable reference range, it can be considered to be Favourable.

6.2 Population

Hare density varies considerably between years e.g. from 3.33/km^2 in 2006 to 7.66/km^2 in 2007. The factors causing these changes are poorly understood, but may be largely governed by natural processes, which in turn may impact both directly and indirectly on hare numbers. E.g. wet springs can cause increased leveret mortality, but rainfall patterns will also influence agricultural operations which in turn will impact on hare survival. Because of the extent of inter-annual variation, it is not possible to identify a specific favourable reference value for population. Although the hare appears able to respond well to favourable conditions and has shown an ability to produce rapid population growth under such circumstances, more data on population cycles and trends is required for this species. This parameter is considered "unknown" at this stage.

6.3 Habitat

The Irish hare occurs in many habitats throughout Ireland. Data shows that these habitats support hares at different densities. However, changes to habitats and their management where hare densities have the potential to be at their highest (i.e. agricultural land), could have large impacts on populations.

Although there is still sufficient habitat available for the hare, some reduction in the extent and quality of hare habitats has occurred over recent decades. Consequently, this parameter is taken as Unfavourable – inadequate.

6.4 Future prospects

Despite the negative assessment of habitat, the future prospects of the hare in Ireland are considered to be favourable.

6.5 Overall assessment

Unfavourable – inadequate.

7. References

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