The current status of the brown hare (*Lepus europaeus*) in Britain

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Foreword

Although the brown hare is not strictly a native of our islands, the Roman introduction of hares was long enough ago for most people to now consider them as a natural, distinctive and welcome component of the UK's biodiversity.

Unfortunately, there is no doubt that hares have been faring badly recently, certainly since the turn of the 20th Century. Prior to the Ground Game Act of 1880, the abundance of hares in some districts was described as "quite extraordinary" and they were even found on open areas within the City of London. At the turn of the century hares were considered abundant throughout Britain and even by 1920 they were described by Thorburn as "plentiful".

National Game Bag Records since then show a fall and subsequent rise (possibly due to the myxamotosis-induced fall in rabbits) in the hare population up to the 1960s, but thereafter a dramatic decrease. In 1960, for instance, the National Game Bag Census showed a mean bag of 12 hares killed per square kilometre, but this had fallen to less than 3 by the early 1980s.

Although Game Bag data are undoubtedly very useful, they are collected only from areas where hares are shot, and in the modern countryside this area is relatively small. Therefore, a national hare survey was commissioned by the JNCC to develop standardised monitoring methodologies and provide baseline population data from across the country in all habitats.

As you will read, the estimates that this survey produces are the lowest ever. Only a repetition of the national survey (hopefully at the forthcoming turn of the century) will provide us with reliable information on whether hares are continuing to decline across Britain. Whatever the case, we must now work together to manage the countryside so that hare numbers do not become irreversibly low, and the brown hare remains part of our biodiversity. In this respect, recent agri-environmental mechanisms such as set-aside may prove to be important and beneficial initiatives.

The authors acknowledge the huge part played by the many volunteers who collected data for this survey. I would like to add my thanks to all those who took part, unfortunately too numerous to mention by name, without whom this first-ever national survey would not have been possible.

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Executive summary

1. Using game bag records and county mammal reports, past changes in the numbers of hares in Britain are described. There appears to have been a widespread decline in hare numbers following the introduction of the Ground Game Act 1880, with declines occurring even earlier in parts of the west, where hare numbers have shown little signs of recovery thereafter. In central and eastern areas, hare numbers increased at various rates up to the Second World War.

2. The reversion to traditional farming methods during the Second World War, and the decline in rabbit numbers following the introduction of myxomatosis in 1953, led to an increase in hare numbers, so that in central and eastern areas hare numbers in 1961 were either a little or substantially higher than in 1939.

3. From the early 1960s, hare numbers declined steadily over the next twenty years, although game bag records and sighting indices collected by hare hunters suggest that since the early 1980s the hare population has remained relatively stable. Since both these sources of data were collected from specialised habitat types and/or areas of high hare density, it is unclear whether the hare population is stable in the countryside generally.

4. This pattern of recent decline was also seen in much of Europe, and a number of factors have been suggested as contributing to the decline. These include farming intensification and other changes in the pattern of land use, increased predation levels, disease and hard winters. There is no conclusive evidence as to the relative importance of any of these factors. However, in view of the different pattern and timing of the decline in different regions of Britain, it seems likely that more than one factor contributed to the change in the size and distribution of the hare population.

5. There were no previous reliable hare population estimates based on a properly structured survey, and so this survey was designed to provide a baseline against which to monitor future changes in the size of the hare population. In view of the need to sample the whole country and a wide range of habitat types with equal efficiency, and the importance of using a simple survey technique that could be applied reliably by a large number of volunteers, the first step was to compare potential survey methods. This showed that the most appropriate survey technique was to use line transect sampling. On average the transect was nearly three kilometres long around a one-kilometre square. Each transect was walked three times, once a month between mid-October and mid-January.

6. The survey was stratified using the Institute of Terrestrial Ecology's four land class groups i.e. arable, pastoral, marginal upland and upland; these constitute 34, 29, 16 and 21 percent of Britain respectively. Data were collected for 751 one-kilometre squares. From these, 738 were used to produce the population estimate and 710 were used to analyse the relationships between hare numbers and patterns of land use, and the effects of gamekeeping and field sports on hare numbers.

7. Before the detailed analyses were undertaken, the data were carefully checked to ensure that there was an adequate sample size, that the data were comparable across the three walks and the two winters covered by the survey, and that the data collected were of uniform quality. For calculations other than the population estimate, a correction factor was applied to the data collected in closed habitats to account for hares missed in the dense vegetation. All these tests showed that the data were of a high and uniform quality and could be pooled for further analysis.

8. The DISTANCE program was used to analyse the transect data, using four models to compare the results within each of the four land class groups. The population estimate, based on the Fourier series model, was 817,520±137,251 hares. This estimate is for the adult hare population in mid-January, before the onset of the main culling period. Thus it is not the minimum population size, and there will be a substantial further reduction in population size in areas with large driven hare shoots.

9. There was a marked east/west divide in the distribution of the hare population. Thus the mean hare density in arable areas was over twice that in pastoral areas; 60.3 percent of the hare population was in arable areas, 23.5 percent in pastoral areas, 10.8 percent in marginal upland areas and 5.4 percent in upland areas. The hare population was also locally distributed. No hares were recorded in 61.8 percent of the squares surveyed, and 19.8 percent of the hare population was found in just three counties (Cambridgeshire, Norfolk and Suffolk), which constitute only 5.1 percent of the land area of Britain. This clumped and localised distribution was in marked contrast to the situation at the turn of the century, when hares were much more generally distributed.

10. When looking at the habitats selected as diurnal lying-up sites, no habitat was strongly preferred in any of the land class groups, and only the arable and pastoral land class groups had habitats that were avoided. Habitats that offered shelter appeared to be favoured in upland areas, and there was an increase in the use of broad-leaved woodland in lowland areas during inclement weather. Hares avoided lying up in fields used by livestock. The importance of lying-up sites to hares is discussed, and in particular the risk to hares from lying-up in fields that are sprayed or cut for silage.

11. In arable and pastoral areas, the habitats associated with high hare numbers were mainly arable crops, with these increasing in importance in pastoral areas. In arable and pastoral areas, some types of grassland, woodland and moorland were associated with low hare numbers. In upland areas, high hare numbers were associated with a combination of grassland and arable crops, particularly root crops.

12. Increasing habitat richness was associated with higher hare numbers; in lowland areas this association levelled off with ten or more habitats per one-kilometre square, and in upland areas with seven or more habitats. Habitat diversity had no effect on hare numbers.

13. The presence of set-aside was associated with higher hare numbers in arable areas, and this is probably due to an increase in habitat richness. The presence of set-aside had no effect on hare numbers in pastoral and marginal upland areas.

14. Using a logistic regression model based on four habitat variables, 73.04 percent of all lowland one-kilometre squares could be correctly classified as having high or low hare densities, which were defined as more or less than three hares per square kilometre.

15. When examining the effects of the activities of a gamekeeper on hare numbers, higher hare numbers were associated with the presence of a gamekeeper in the arable, pastoral and marginal upland land classes and in East Anglia. However, in pastoral areas this association was due to the increased habitat richness on estates with a gamekeeper rather than any other factor. There was little evidence that where higher hare numbers were associated with a gamekeeper, this was due to predator control. Instead, the relationship was probably due to increased protection from poachers and the tendency to reduce hare numbers to deter poachers in areas away from shooting estates.

16. Shooting and hunting with packs of hounds were undertaken in areas with higher hare numbers, and this was probably associated with increased tolerance and/or protection afforded to the hares in these areas. Surprisingly, coursing was not associated with high hare numbers, and during the survey a number of reports were collected of hares being caught and transported to re-stock coursing areas. These observations, and the results of this survey, suggest that in some areas at least hare numbers may be too low to maintain traditional coursing.

17. When repeating the logistic regression analysis, the predictive power of the model was increased when using one hunting and two habitat variables, so that 80.70 percent of lowland one-kilometre squares were correctly classified as having high or low hare numbers. Most of this gain was in the ability of the model to correctly classify squares with high hare numbers.

18. The data from the survey were used to estimate the size of the brown hare population in 1880; a conservative figure is a mid-winter population of 4,000,000 hares. Thus the hare population today is probably at best only 20 percent of that present just over a hundred years ago.

19. Factors likely to affect future changes in hare numbers are discussed. In arable areas changes in landscape management are likely to have less impact on hare numbers than increased levels of protection, whereas in pastoral areas hare numbers are only likely to increase with substantial changes in stocking densities and the pattern of silage cutting.