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Nestbox derived home range and location of the hibernaculum of the edible dormouse

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Abstract

Eighteen adult edible dormice were radio collared in autumn 2009 at a site in the Chilterns, where the population of this species has been monitored using PIT tags to enable the identification of individuals since 1996. After occasional daytime location of animals, twelve of the individuals were subsequently located in early winter at their hibernation sites. The nestbox-derived home ranges of these 18 animals were calculated using the past dataset from this population. The lifetime nestbox-derived home ranges for males were significantly larger than for females, it was also found that the males in this study used significantly more nestboxes in comparison to females. The distance travelled from the nestbox derived home range to the hibernaculum was calculated. Some animals hibernated far from their nestbox derived home range and females were moving further than males, though this difference was not significant. This was compared with ranging data and location of the hibernacula from radio-tracked animals from 1997. Examination of ten hibernation cavities indicated that exit holes had been filled in. Stores of acorns and beech mast were found on three occasions though they may not have been collected by the edible dormouse. Only 2 out of 13 cavities had communal hibernation, this is fewer than expected from a previous study of hibernating edible dormice in England.

Keywords: *Glis glis*, hibernation site, PIT tagging, radiotracking

1. Introduction

The edible dormouse (*Glis glis*) is an alien pest species in Britain and was introduced 1902. Currently, the only known population of this species in the UK is in the Chilterns area (Morris 2004). This species hibernates in the UK for about seven months (Morris & Morris 2010). The home range of the edible dormouse during its active season is reported to vary from 0.5 ha to 7 ha in mainland Europe (Properzi et al. 2003, Jurczyszyn 2006, Ściński & Borowski 2008) where male home ranges are significantly larger than females and confirmed from two animals tracked in England by Morris & Hoodless (1992). These radio-tracked home ranges resulted from nocturnal tracking in mainland Europe whilst daytime 'nestbox-derived' ranges in England are considerably less than 1 ha (Brooks 2008).

Edible dormice appear to mainly use underground chambers linked to tunnels in the forest floor as hibernation sites (Morris & Hoodless 1992). Edible dormice are sometimes a pest in woodland (Platt & Rowe 1956) and in houses and have also been found hibernating in drains and under floorboards (Thompson 1953). Previous work in the UK has shown evidence of communal hibernation amongst edible dormice (Morris & Hoodless 1992). Communal hibernation in other European countries, however, has not been seen very often, though Kryštufek (2007) noted many dozens entering small limestone caves. Jurczyszyn (2007) found that 77 of 83 hibernation cavities of free-living dormice contained single hibernating animals.

As part of research towards possible population control methods in woodland, this study examined the nestbox-derived home range and the location of hibernation sites of a selection of adult animals in a 40 ha mixed woodland site in the Chilterns. The range and distance to the hibernation site from the centre of the range were compared between the sexes. Data from a previously unpublished study in 1997 were also considered.

2. Material and methods

A large historical dataset had been previously compiled from marking and recapturing animals at the 40ha study site in the Chilterns (Morris & Morris 2010). Up to 230 nestboxes (c. 150 × 120 × 200 mm internally with a 55 mm entrance hole) have been located on trees at c. 2.5 metres above ground at 25–40 m distance in ten segments of the forest, though not providing a uniform forest-wide grid. Animals have been PIT tagged for individual identification, along with the weight, sex and nest box occupation since 1996. This dataset was used to identify adult individuals who were suitable for radio-collaring. In autumn 1997 nine *Glis* were radiotracked at night for a period of 5 days in early and again in late August. For four of them the location of the winter hibernation nest was found. In August 2009, eighteen adult animals were radio-collared (weight 5 gm, Biotrack Ltd) and located occasionally in their day refuges using an aerial and radio receiver until their hibernation site underground was determined. A female bias in choice was made as it was anticipated that females might show their naïve young where to hibernate. Resources were not available for nocturnal tracking. Where the hibernation site was indicated by the radio signal, it was carefully excavated by hand in December 2009 and the cavity and animals examined where possible for evidence of communal hibernation, cavity exit holes and food stores. The lifetime nestbox derived home range of each animal was calculated from the historical dataset by recording all boxes used by it up until radio collaring, then incorporating a buffer zone around each home range representing half the distance to the next (unused) nestbox recorded as a minimum convex polygon (MCP). The distance from the centre of the nestbox derived lifetime home range to the hibernaculum was measured. Two sample t-tests were used to compare the male and female home range area, number of nest boxes used and the minimum distance travelled to hibernaculum.

3. Results

The 18 animals chosen varied from a known minimum age of 3–7 years. Few different nestboxes were recorded as being used during their lifetime (range 1–7) and they were usually, but not always, adjacent. A previous regression analysis (Brooks 2008) of 21 *Glis* known to be 3–8 years old indicated that there was no significant increase of nestbox derived home range with age for adult edible dormice ($t = 0.429$, $p = 0.673$). Males in the current study used significantly more nestboxes throughout their lives in comparison to females ($t = -3.12$, $p = 0.019$). The lifetime nestbox-derived home range of the six males (see Fig. 1) was significantly larger than the 12 females (0.4 ha vs < 0.1 ha, $t = -2.35$, $p = 0.048$).

For the 1997 radio-tracking study the 10 day nocturnal home range (minimum convex polygon) of seven females varied from 0.71–1.21 ha and for two males 1.1 and 2.4 ha. Three females and one male were later located during hibernation. In three cases the location was just within or at the edge of the traced range but one female hibernated approximately 80 metres outside the tracked range, a distance away similar to the diameter of its radio-tracking revealed home range.

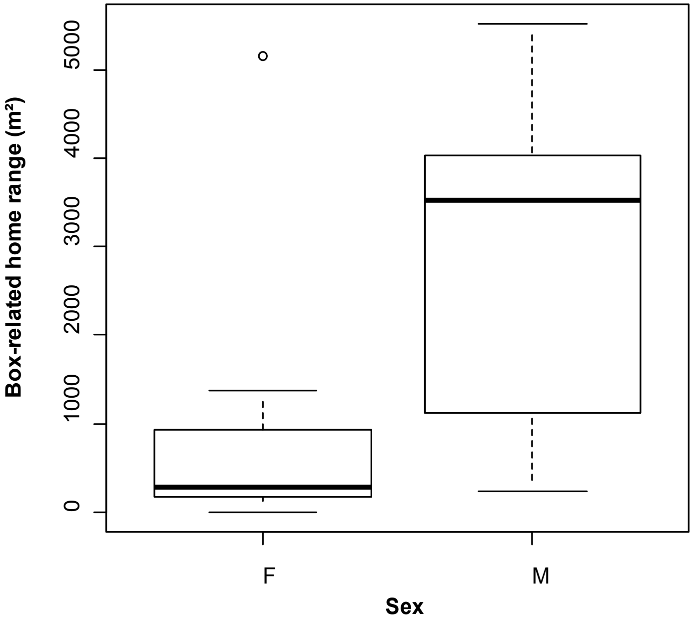

Fig. 1 Box and whisker plot (representing median, upper and lower quartiles, smallest and largest observation and outlier o) showing the difference in nestbox revealed home range between male and female edible dormice that were radio-collared in 2009.

The hibernation site of 8 females and 4 males collared in 2009 were successfully located. The distance travelled from the recorded range to the hibernation site was generally larger in females than males, although this difference was not quite significant for this small sample ($t = 2.09$, $p = 0.06$), see Figure 2. One female moved 460 m and another 450 m to hibernate, whilst the shortest distance was only 15 m.

Ten of the 12 hibernacula located by the radios were successfully excavated; one was in a badger set and another too deep to reach. Most were c. 40 cm below the soil surface (range 35–90 cm). Several additional cavities and animals that had not been radio collared were found during digging. In total, we excavated and examined 13 cavities, handled 10 collared animals, 4 un-collared (2 previously chipped) animals and one unchipped dead individual. Other observations made during this study included evidence of food stores, exit holes and communal hibernation. All cavities had their entrance holes filled with either earth, small stones or in one case, acorns. Food stores were found in three cavities, comprising beech mast and acorns. Out of the 14 live animals found hibernating during this study, 4 were hibernating communally. Two of the 13 cavities had more than one animal hibernating, including an unknown adult and juvenile female. The other case was a collared individual found c. 10 cm away from a cavity containing two previously microchipped dormice. Both cavities were part of a rotten tree stump and it is likely that the same entrance hole was used to gain access to both.

All 18 radio collared Glis in this study have since been found in nestboxes following hibernation. Even where collars failed early or the hibernation sites were not located individuals were subsequently seen in nestboxes in 2010 (when beech flowering was poor) or else in 2011. This demonstrates that radio collaring and carefully excavating and repairing the hibernacula were not detrimental to the animal's survival.

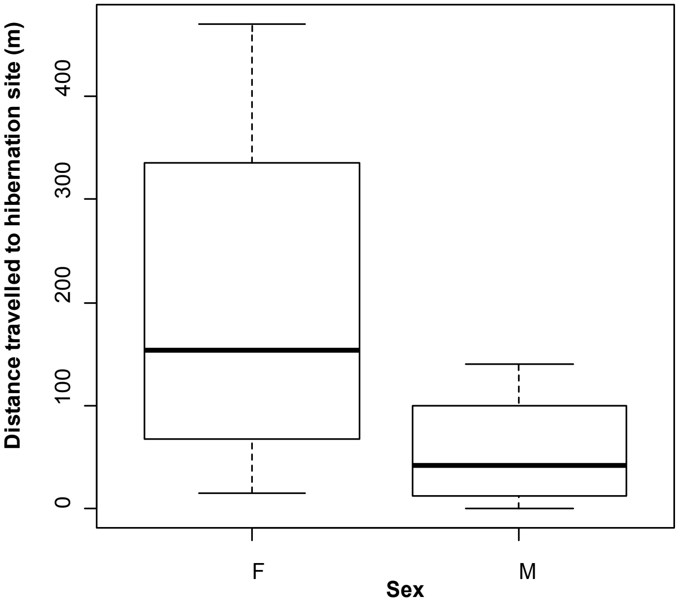

Fig. 2 Box and whisker plot (representing median, upper and lower quartiles, smallest and largest observation) showing the distance travelled from the centre of the nestbox derived range during its recorded lifetime to its hibernation site for male and female radio-collared edible dormice.

4. Discussion

The studies of 1997 and 2009 involved only small sample sizes and lacked extensive radiotracking data. The males in both studies had a larger home range than the females, significantly so in the 2009 group. This fits with other studies (Jurczyszyn & Zgrabczyńska 2007, Ściński & Borowski 2008). Morris & Hoodless (1992) reported from a different wood a single male range of 2.4 ha and one female of 0.3 ha. In our study area males used significantly more nestboxes during their life in comparison to females, this could be expected given the larger home range area of males. However, despite very small sample sizes the larger distance travelled by 8 females from their nestbox range to their hibernation site was close to being significantly larger than for 4 males, with most hibernating far outside their nestbox range polygon. One of two females radio-tracked in the 1997 study also had its hibernation site one whole home range diameter distance beyond the radio-tracked home range. This contrasts with the study of two animals by Morris & Hoodless (1992) where both hibernated only 5 metres from the outbuilding where they were first captured, although one of the 2009 males hibernated only 5 m from its centre of range. It is obvious that the nestbox derived range would likely be much smaller than the radiotracked data provided but we had no resource for night radiotracking and it would be beneficial to increase the number of active *Glis* tracked. This is not the first study to show longer distances travelled by females (Jurczyszyn 2006) though his circumstances were different. The dispersal distance travelled by newly translocated females was significantly larger than by males and the home range of newly translocated females was significantly larger than the home range in their original site. Our animals were not translocated, nor dispersers, in that 100 % subsequently returned to their regular nestboxes.

More data are required to confirm statistically whether females travelled further to the hibernation site relative to the normal range area than males in all years and whether they return each year to the same hibernaculum. Breeding females may need to travel further to get more food to supply the extra energy expenditure required for breeding and lactation (Gittleman & Thompson 1988) so males may become fat enough to hibernate earlier than females (in breeding years). If they claim (and seal up) all the best hibernation sites, that may force females to travel further to find an adequate hibernaculum. It is very likely that the used nestboxes do not accurately describe the home range and that radiotracking to determine the extent of ranging should be undertaken as well as locating the hibernacula.

Whilst there was some evidence of communal hibernation in this study, this was not to the same level as previously found in the UK. Morris & Hoodless (1992) found two radiotracked dormice each hibernated with others (2 more animals in the same hibernaculum or nearby), whilst 2/13 animals in our study did so. Our result is more comparable to the results by Jurczyszyn (2007) who showed 6 out of 83 wild *Glis* hibernated communally. We found that a single dormouse in a cavity may be extremely close to other cavities with several hibernating dormice using the same surface entrance hole. This network of cavities around old tree stumps may represent a form of communal hibernation but it is possible that cases were missed during our excavations due to our precise digging down to where the radio collar was located c. 40 cm below the soil surface. There are no caves on our site as described in Slovenia (Polak 1997, Kryštufek 2007).

On three occasions, food stores (acorns or beech seeds) comprising over 100 seeds were found in or near the hibernation cavity. In one instance, acorns had also been used to fill in the entrance tunnel of the hibernation cavity with a dormouse inside. It is entirely possible the *Glis* made the food stores. However, other rodents, such as wood mice, have been shown to make food stores (Vander Wall 1990) and it is possible that the food stores found in this study were gathered by another animal and the burrow subsequently taken over by Glis. As with some of the radiocollared *Glis* in this study, Morris & Morris (2010) showed that some previously marked individuals are not found in nestboxes at all during non-breeding year but then ‘re-appear’ in a subsequent breeding year. Theories to explain this could include the continued hibernation (or summer torpor as shown by Bieber & Ruf (2009) for well fed caged animals) of animals during these non-breeding years when it is wasteful to waken and expend energy when there is almost no food. An underground burrow in soil is buffered from extreme temperature and moisture changes and may also reduce predation (Reichman & Smith 1990) and thus storage of food would be an obvious extra adaption to facilitate continued underground ‘hibernation’ during non-breeding years. Alternatively, they may come above ground but not visit any boxes or move away entirely from study woodland and find alternative food and shelter elsewhere before returning. Long term radio collar studies could clarify the alternative options.

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6. References

Bieber, C. & Ruf, T. (2009): Summer dormancy in edible dormice (*Glis glis*) without energetic constraints. – Naturwissenschaften **96**: 165–171.

Brooks, S. (2008): Dormice: friend or foe? The spread and movement of the edible dormouse and the hazel dormouse in relation to woodland management. – Unpublished MSc thesis, Imperial College: 48 pp.

Gittleman, J. & Thompson, S. (1988): Energy allocation in mammalian reproduction. – Integrative and Comparative Biology **28**: 863–875.

Jurczyszyn, M. (2006): The use of space by translocated edible dormice, *Glis glis*, at the site of their original capture and the site of their release: radio tracking method applied in a reintroduction experiment. – Polish Journal of Ecology **54**: 345–350.

Jurczyszyn, M. (2007): Hibernation cavities used by the edible dormouse, *Glis glis* (Gliridae: Rodentia). – Folia Zoologica: **56**: 162–168.

Jurczyszyn, M. & Zgrabczyńska, E. (2007): Influence of population density and reproduction on space use and spatial relations in the edible dormouse. – Acta Theriologica **52**: 181–188.

Kryštufek, B. (2007): Edible dormouse—characteristics and life. – In: Kryštufek, B. & Flajsman, B. (eds): Dormouse and man. – Ekoloski forum LDS, Ljubljana, Slovenia: 43–89. (in Slovene)

Morris, P. (2004): Dormice. – Whittet Books Ltd., Suffolk, United Kingdom.

Morris, P. & Hoodless, A. (1992) Movements and hibernaculum site in the fat dormouse (*Glis glis*). – Journal of Zoology **228**: 685–687.

Morris, P. & Morris, M. (2010): A 13-year population study of the edible dormouse *Glis glis* in Britain. – Acta Theriologica **55**: 279–288.

Platt, F. B. & Rowe, J. J. (1964): Damage by the edible dormouse (*Glis glis*) at Wendover forest (Chilterns). – Quarterly Journal of Forestry **57**: 228–233.

Polak, S. (1997): The use of caves by the edible dormouse (*Myoxus glis*) in the Slovenian karst. – Hrvatski prirodoslovni muzej: 9 pp.

Properzi, S., Antonelli, D., Capizzi, G., Carpanetto, M. & Riga, F. (2003): Home range and activity pattern of the edible dormouse (*Glis glis*) in central Italy. – Acta Zoologica **49**: 166.

Reichman, O. J. & Smith, S. C. (1990): Burrows and burrowing behaviour by mammals. – In Genoways, H. H. (eds): Current Mammalogy **2**. – Plenum Press, New York: 197–224 pp.

Ściński, M. & Borowski, Z. (2008): Spatial organization of the fat dormouse (*Glis glis*) in an oak-hornbeam forest during the mating and post-mating season. – Mammalian Biology **73**:119–127

Thompson, H. (1953): The edible dormouse (*Glis glis*) in England, 1902–1951. – Proceedings of the Zoological Society of London **122**: 1017–1024.

Vander Wall, S. B. (1990): Food hoarding in animals. – University Chicago Press, Ltd, London: 445 pp.

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