

POPULATION DYNAMICS OF THE EDIBLE DORMOUSE (*GLIS GLIS*) IN ENGLAND

BURGESS, M., MORRIS, P. and BRIGHT, P.

*School of Biological Sciences, Royal Holloway University of London
Egham, Surrey, England, e-mail: malcburgess@hotmail.com*

In a study of the introduced population of the Edible dormouse *Glis glis* 130 nest boxes and 50 'nest tubes' were checked annually once a month from May to November. Between 1996 and 2001 a total of 465 edible dormice were captured, of which 392 have been marked with PIT tags. Reproductive failure was observed in 1996, 1998 and 2001 when no males developed conspicuous testes nor were females found lactating. Reproduction occurred in 1997, 1999 and 2000. Using the minimum number of animals alive method we determined that population density shows high inter-annual variability with between 0.6–4.1 per hectare but is lower than in continental Europe. In contrast average litter size was 6.8, higher than in their native range. Survivorship did not differ between years or between sexes.

Key words: *Glis glis*, population dynamics, introduced species, reproductive failure

INTRODUCTION

The edible dormouse is not native to England, where it was introduced in 1902 (JONES-WALTERS 1991). The current British distribution is restricted to a small part of the Chiltern Hills, in central England, where there are extensive areas of beech *Fagus sylvatica* woodland. The introduction of species outside their native range can have significant ecological implications and poses the second greatest threat to global diversity (MCNEELY *et al.* 2001). Understanding the population dynamics of the English population of the edible dormouse is an important first step to discovering their ecological impact, and to aid any future management of the species.

Studies of the edible dormouse have so far been primarily conducted in the species' native range of central and southern Europe. It has been found that population densities show high inter-annual variability (JURCZYSZYN 1995) and reproductive failure has been observed in Germany (SCHLUND *et al.* 1997) and Italy (PILASTRO 1992). This has been attributed to a lack of food availability, particularly tree fruits.

In the present paper we report on basic population dynamics of the edible dormouse in England and discuss differences between the species here and in its native range.

METHODS

The study was conducted in a 58 hectare mixed woodland near Berkhamstead, Hertfordshire, located 5 km from the original release site of 1902. In 1995, 130 wooden nest boxes (30 × 10 × 15 cm with an entrance hole enlarged to 50–55 mm by the animals) were positioned about 3 m high on trees, in lines throughout the wood. Animals were also captured in an additional 50 plastic nest tubes put up in May 1997 (MORRIS & TEMPLE 1998) and are included here. Nest boxes and nest-tubes were monitored once a month from May until November between 1996 and 2001 inclusive.

Passive integrated transponder (PIT) tags (Labtrac, Sussex, UK) were used to mark animals individually. Captured dormice were weighed to the nearest gram, sexed and their reproductive condition recorded. A female was considered to have had a litter if she was lactating or if young were present in the nest box or nest tube. Enlarged scrotal testes indicated sexual activity in males. The number of young in a nest box or nest tube was taken to be the litter size, provided all young were of a weight prior to dispersal (< 41 g). Estimates of date of birth for all young weighing < 51 g were back calculated from date of capture, based on the average growth rate of young (1.9 g per day) and the assumption that young weighed 1.5 g at birth (LANGER 2002). Annual population size was the total number of individual adults and young captured once during the year, or the minimum number of animals known to be alive (MNA). For life histories and MNA calculations a dormouse recaptured in 2 or more years after its last year of capture was assumed to be alive during the intervening years. Minimum number alive calculation included dormice not tagged in October and November 1997 and 2000 due to a shortage of tags.

A birth year was assigned to young based on weight when first captured. If body mass fell within an expected weight category for that capture date a birth year was assigned. The expected weight category, for each capture date, was calculated from the earliest estimated date of birth (21 July) and the average daily growth rate of 1.9 g per day.

RESULTS

A total of 392 edible dormice were PIT tagged during the study period. A number of young were not tagged in 1997 and 2000 due to a shortage of tags.

Reproduction

No reproduction was observed in 1996, 1998 or 2001. In these years male testes did not become scrotal and no female was found to be lactating. Reproduction occurred in 1997, 1999 and 2000. Average litter size (Fig. 1) over all years was 6.8 (± 2.16 , $n = 49$) ranging from 1–11. Based on an average young growth rate of 1.9 g per day (± 0.35 , $n = 47$) between the first weeks in September and October, the date of birth was estimated for 361 individuals. Estimated mean birth dates were; 19 August in 1997 (± 12.1 , $n = 102$), 19 August in 1999 (± 8.4 , $n = 101$) and 17 August in 2000 (± 11.1 , $n = 168$). 93% of births occurred during August.

Population size and sex ratio

Annual population size, estimated as minimum number known to be alive, ranged from 35 to 240, equivalent to 0.6–4.1 per hectare. A total of 179 males and 180 females were tagged, a sex ratio of 1:1.

Survivorship

Life histories of 216 animals assigned a birth year revealed a mean reappearance rate of 21% surviving the first hibernation (juveniles) and an average of 27% reappearing in subsequent years (adults). No difference was found between sexes of juveniles ($khi^2 = 3.03$, d.f. = 1, $n = 40$, $P > 0.05$), between sexes of adults ($khi^2 = 2.71$, d.f. = 1, $n = 9$, $P > 0.05$), or of sexes between years ($khi^2 = 1.23$, d.f. = 2, $n = 44$, $P > 0.05$).

DISCUSSION

A total lack of breeding was observed in three of the six study years, and these coincided with the lack of development in spring of the male testes. Reproductive failure has been found to occur in the edible dormouse in continental Europe (e.g. KONIG 1960, SCHLUND *et al.* 1997, BIEBER 1998), and this has been attributed to a lack of tree fruits in autumn. BIEBER (1998) found an absence of

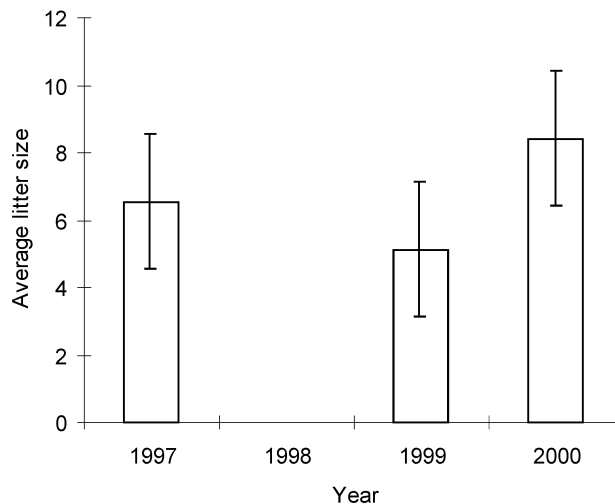


Fig. 1. Average litter size (1997, $n = 13$; 1999, $n = 17$; 2000, $n = 19$) of edible dormice during the study period. There were no litters born in 1996, 1998 or 2001

testicular growth in males during a non-breeding year and it has also been shown that only large testes of the edible dormouse actually contain sperm (JOY *et al.* 1980). It is suspected that local failure of the beech *Fagus sylvatica* crop (HILTON & PACKHAM 1997) that dominates the study site was a primary factor causing the observed breeding failure, although the mechanism of this effect remains unclear.

With the absence of new recruits in some years there is considerable inter-annual variability in population density. The density we found of 0.6–4.1 per hectare compares with a previous English estimate of 0.6–1.8 per hectare (HOODLESS & MORRIS 1993), conducted over one year only, but obtained by a different method (line transect counts). This population density appears low compared to continental Europe, even in years of breeding. Densities of 1–11 per hectare have been found in Poland (JURCZYSZYN 1995), 2.3–6 per hectare in Germany (SCHLUND *et al.* 1997) and up to 30 per hectare in the northern Caucasus (NOWAK 1994).

The average litter size of 6.8 was higher than found in studies in continental Europe. In Moravia average litter size was 4.5 (GAISLER *et al.* 1977), in Italy 4.7 and 5.3 (PILASTRO 1992, 1994) and in Slovenia 5.8 (KRYSTUFEK 2001). A difference of food availability may be the cause of this, and a higher litter size might partially compensate for non-breeding years.

Survivorship does not appear to be affected by population density or food availability, as there was no difference between years, ages or sexes in reappearance rates. It is likely that the flowering and fruiting cycle of beech is influencing the population dynamics of the edible dormouse in England. The lack of beech fruits in some years may be associated with reproductive failure and consequent lower population density. Litter size could also be influenced by the fruiting cycle of the beech crop. Further study is currently being conducted on relationships between the edible dormouse and beech.

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