PECKIANA • Volume 8 (2012) • pp. 167–172

ISSN 1618-1735

Comparison of two nestbox types and their suitability for the common dormouse *Muscardinus avellanarius*

CARINA SCHERBAUM-HEBERER, BETTINA KOPPMANN-RUMPF, SEMELA DUKOVA & KARL-HEINZ SCHMIDT

Abstract

Throughout its distributional range the common dormouse *Muscardinus avellanarius* uses nestboxes intended for birds and dormice, but there have been no investigations of preferences for either nestbox type yet. In a three-year-study carried out in a low mountain range near the town of Schlüchtern, Germany from 2009 until 2011 a total of 23 nestboxes of two different types of construction and size were set up at intervals of 20 m along a hedgerow. The nestboxes comprised a total of 12 wood-concrete 1B SCHWEGLER™ nestboxes for birds with an entrance hole measuring 26 mm (abbr.: BIRD-boxes) as well as 11 wooden nestboxes made by a local manufacturer with an entrance hole measuring 21 mm (abbr.: MUS-boxes). The aim of the study was to find out if the MUS-boxes would be accepted by the common dormouse, whether preferences for either nestbox type could be detected and if the small nestboxes could help minimize competition with other nestbox users such as tits, mice (*Apodemus* sp.) and insects. The results showed that the common dormouse accepted the MUS-boxes and used them more intensively than the BIRD-boxes, the intensity being relatively stable over the years whereas it showed significant differences in the use of BIRD-boxes. MUS-boxes also helped to eliminate use by tits, edible dormouse *Glis glis* and partially also hornet *Vespa crabro.*

Keywords: preferences, entrance hole, competition, *Apodemus* sp.

1. Introduction

The common dormouse *Muscardinus avellanarius* is known to accept nestboxes for birds as well as specially designed dormouse nestboxes throughout its distributional range (Vaughan 2001, Juškaitis 2008).

Generally nestboxes are also occupied by other mammals such as edible dormouse *Glis glis*, yellow-necked mouse *Apodemus flavicollis*, woodmouse *Apodemus sylvaticus*, hole-nesting birds like blue tit *Parus caeruleus* and insects, e. g. Saxon wasp *Dolichovespula saxonica* and hornet *Vespa crabro*. All these nestbox users have been observed to be potential competitors for the common dormouse. Tit nests are being avoided possibly due to aggressive behaviour by the birds (Gatter & Schütt 1999) or the danger of parasites originating from hair used by tits for nest construction. Juškaitis (1998) states that several torpid dormice were pecked to death presumably by the great tit *Parus major*. However observations on the impact of the common dormouse on birds is quite controversial ranging from destruction of birds' broods (Adamík & Král 2008) to peaceful co-existence in the same nestbox (Juškaitis 1995). Insects, once they have established a colony keep the common dormouse from using the nestbox.

No studies have yet been conducted focusing on which of the two nestbox types the common dormouse prefers. Therefore we had a comparatively small nestbox constructed in order to check whether it would be accepted by this species. Furthermore we asked whether we might detect preferences over nestboxes for birds and if the small nestbox might help minimize competition with other nestbox users.

2. Material and methods

The dormouse nestboxes were made of wood by a local manufacturer, according to the preference of dormice for that material (Juškaitis 1997). As the minimum diameter of dormouse nests is known to be 4.5 cm (Vilhemsen 1996) the measurements chosen for the nestbox chamber were 6 × 6 × 27 cm. This relatively small chamber was also chosen to possibly keep insects from building nests inside the nestbox as the size of Saxon wasp nests varies between 10–20 cm (Hintermeier & Hintermeier 1994) while that of hornets may reach a diameter of up to 70 cm (Lohmann 2004).

A relatively small entrance hole of only 21 mm was created following the suggestion by Gatter & Schütt (1999) to use entrance holes measuring less than 27 mm to keep edible dormice from using the boxes. The entrance hole faced outwards to check whether small hole-breeding birds would still be able to enter. In addition a metal plate known to be no obstacle for common dormouse (Vaughan 2001) was put around the entrance hole to avoid gnawing and therefore keep its size stable. A lid on top was chosen to minimize disturbance while checking the nestboxes. The abbreviation used for this type of nestboxes will be 'MUS-boxes'.

A total of 11 dormouse nestboxes were set up alternating with 12 cylindrical wood-concrete 1B SCHWEGLER™ nestboxes for birds with a removable front panel, an entrance hole measuring 26 mm, an internal diameter measuring 12 cm, the front side measuring 24 cm, the back side measuring 27 cm. The abbreviation used for this type of nestboxes will be 'BIRD-boxes'.

The nestboxes were erected at intervals of 20 m in a linear array along a hedgerow in a low mountain range at approximately 3.5 km north of the town of Schlüchtern (50° 19' N, 9° 28' E), Germany. All nestboxes were set up at a height of approximately 1.6 m (Bright et al. 2006) on thick branches or stems and in one case on a fence post always assuring connectivity with the surrounding vegetation. The hedgerow consisted mainly of blackthorn *Prunus spinosa*, hawthorn *Crataegus laevigata,* privet *Ligustrum vulgare* and dog rose *Rosa canina.*

Nestbox checks were carried out from spring , i. e. March/April until autumn, i. e. October/November at least monthly from 2009 until 2011. Especially in spring, checks were conducted more frequently in order to gather data for a long-term monitoring project focusing mainly on hole-nesting passerines. Tit nests were removed from the nestboxes after the breeding season. Nestbox users were neither captured nor tagged to minimise disturbance. In some cases it was therefore impossible to count the exact number of animals in the nestbox. Thus for dormouse findings we distinguished between the presence of an individual or an empty dormouse nest. The name of the species or, if impossible to determine, the genus of nestbox users was registered when finding individuals and/or typical nests. Over each year the same nestbox can be occupied successively by several species. For the analysis a species was counted once per year even if it occurred in one nestbox several times.

The total number of nestboxes used by a species/genus were compared by applying the Chi^2-test, in cases of a simple contingency table with one degree of freedom the continuity correction was applied.

3. Results

Evidence of common dormice in the study area was found as dormouse nests, individuals and in two years even litters (2009: one in a BIRD-box, three in MUS-boxes; 2011: six in BIRD-, seven in MUS-boxes) were found in both nestbox types. Tits, mainly blue tit, and in one case great tit were found mainly in the BIRD-boxes. Only once an unfinished and empty tit nest, presumably blue tit was registered in a MUS-box.

Saxon wasp and hornets were found in both nestbox types. While Saxon wasp succeeded in establishing a colony in MUS-boxes in four cases (two in 2009, one in 2010 and one in 2011) findings of hornets were restricted to queens and building activities. *Apodemus* sp. occurred in dormouse nests as well as in its own nests and often with juveniles in both nestbox types. Edible dormouse appeared in one BIRD-box and even gave birth there.

Nestbox users appearing exclusively in MUS-boxes were bank vole *Myodes glareolus* in two cases and a solitary bee species, presumably *Osmia bicornis* (Scholz, A., personal communication).

Common dormice used more BIRD- than MUS-boxes in 2009, then occupied more MUS- than BIRD-boxes in 2010 and 2011, but the differences were not significant (2009: $Chi^2 = 0.000$; $df = 1$; $p > 0.05$; 2010: $Chi^2 = 2.091$; $df = 1$; $p > 0.05$; 2011: $Chi^2 = 0.457$; $df = 1$; $p > 0.05$). The numbers of used BIRD-boxes showed significant differences between the years ($Chi^2 = 8.914$; $df = 2$; $p < 0.05$) whereas for MUS-boxes no significant result, but a trend could be observed ($Chi^2 = 5.280$; $df = 2$; $p < 0.1$).

Apodemus sp. appeared in both nestbox types in 2009 and 2010 and could be detected in BIRD-boxes exclusively in 2011. Comparing the number of nestboxes used each year no significant difference between the two nestbox types could be found (2009: $Chi^2 = 1.166$; $df = 1$; $p > 0.05$; 2010: $Chi^2 = 0.000$; $df = 1$; $p > 0.05$). The use of BIRD-boxes showed no significant differences between the years whereas the use of MUS-boxes did ($Chi^2 = 13.364$; $df = 2$; $p \leq 0.001$).

Blue tits revealed significant differences in the use of BIRD-boxes between the years reaching its maximum count of 11 occupied BIRD-boxes in 2010 ($Chi^2 = 6.742$; $df = 2$; $p < 0.05$). Including nests of undetermined tits' species (= 'tits' in Fig. 1A) no such difference appeared ($Chi^2 = 2.182$; $df = 2$; $p > 0.05$).

Only in 2009 Saxon wasp could be detected in both nestbox types showing no relevant difference in the number of nestboxes used ($Chi^2 = 0.007$; $df = 1$; $p > 0.05$). Also the number of occupied MUS-boxes showed no significant difference between the years ($Chi^2 = 0.569$; $df = 2$; $p > 0.05$).

For hornets no significant difference in the use of MUS- and BIRD-boxes in 2009 could be found ($Chi^2 = 0.365$; $df = 1$; $p > 0.05$), in both nestbox types the intensity of use varied between the years (BIRD: $Chi^2 = 6.039$; $df = 2$; $p < 0.05$; MUS: $Chi^2 = 11.242$; $df = 2$; $p < 0.01$).

The solitary bee species appeared in the MUS-boxes in all three years but the comparison between the years revealed no significant difference ($Chi^2 = 4.290$; $df = 2$; $p > 0.05$).

Focusing on the total number of animal sightings (= number of encounters of at least one individual in the nestbox) the MUS-boxes revealed higher counts for common dormice than the BIRD-boxes for all years. For 2010 and 2011 the counts were significantly higher than in the BIRD-boxes. As the probability of animal encounters rises with the number of nestbox checks in contrast to findings of dormouse nests which remain in the nestbox no comparison between the years was carried out (2009: 35, 2010: 21, 2011: 41 checks).

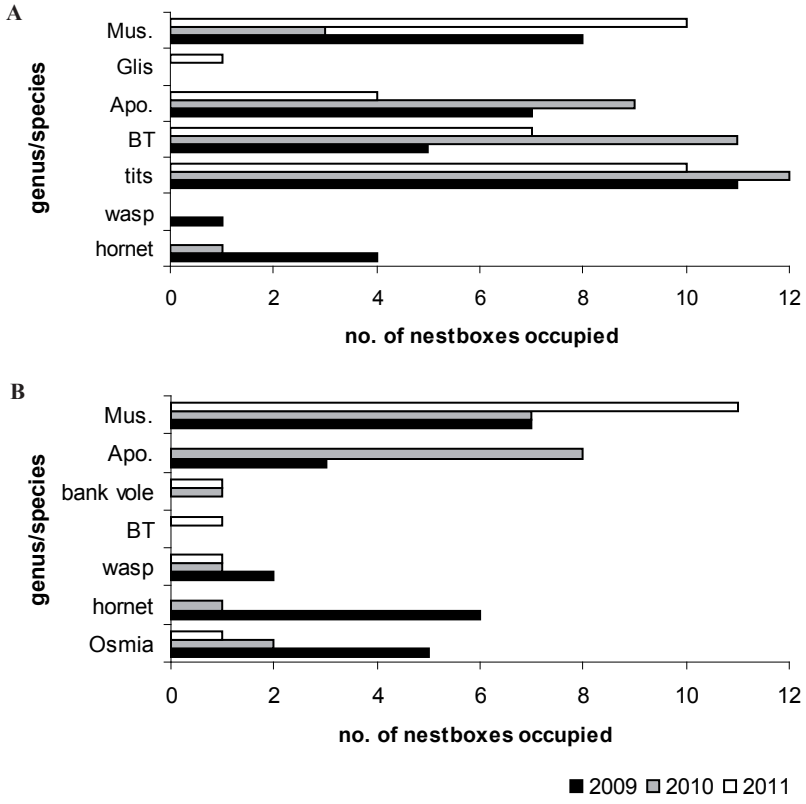

Fig. 1 **A**, **B**:Total number of nestboxes used by genera/species in BIRD-(above) and MUS-boxes (below); abbreviations: Mus. = *Muscardinus;* Apo. =*Apodemus* spec.; BT = Blue Tit.

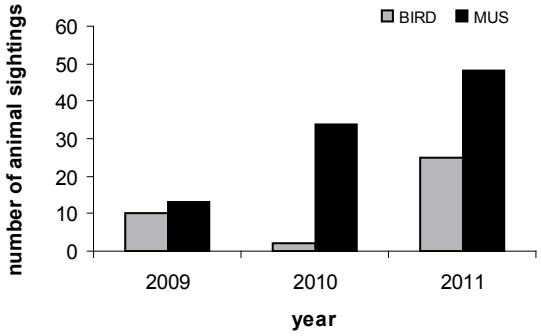

Fig. 2 Total number of animal sightings of the common dormouse (= encounters of at least one individual) in both nestbox types.

The chronological order of nestbox use by several species showed that once *Apodemus* sp. occupied a nestbox of either type, no more individuals of the common dormouse would be encountered afterwards. Although the cells built by the solitary bee species covered up to three corners of the MUS-boxes they did not keep common dormice from occupying a nestbox.

4. Discussion

The use of MUS-boxes may be advantageous for the common dormouse as it allows the total elimination of two potential competitors for nestboxes, i. e. tits and edible dormouse, and a partial elimination of hornets as these occurred in the nestboxes but did not manage to establish colonies. The presence of the edible dormouse in the study area was proven by a finding in a BIRD-box which is generally considered to be too small for this species. Unexpectedly Saxon wasp managed to establish colonies in the MUS-boxes in spite of the relatively small measurements. Furthermore, the MUS-boxes cannot help to exclude *Apodemus* sp. whose appearance seems to be crucial for it terminates the use of a nestbox by common dormice. This confirms the observation that dormice confronted with the smell of urine of the yellow-necked mouse immediately avoid the source of odour (Zaytseva & Nowakowski 2011).

Except for the first year, the common dormouse was found more often in MUS-boxes and its strong presence there does not show significant differences between the years indicating a preference for this nestbox type. In addition, the observation that more animal sighting were registered in the MUS-boxes indicates a more intensive use of this nestbox type. Several studies on suitable nestbox sizes have been carried out and showed different results. Common dormice were observed to select smaller nestboxes (15 × 15 × 20 cm) and smaller entrance holes (32 mm) in a study conducted in Sicily (Sarà et al. 2005), the measurements of the small nestboxes being bigger than those of the BIRD-boxes in the present study. In contrast, a study carried out in Britain showed preferences for larger nestboxes (Eden & Eden 2001) while a Lithuanian study (Juškaitis 2008) showed no preferences for neither large nor small nestboxes. Possibly the presence of potential competitors, as well as the accessibility of nestboxes for such species, might be important in the common dormouse's choice of whether to use a nestbox or not. The fact that BIRD-boxes were used by more species of potential competitors might explain the varying intensity of use by common dormice over the years.

In this context it is remarkable that although nests used for reproduction tend to be bigger in diameter, i. e. 10–15 cm (Juškaitis & Büchner 2010) than the chamber size of the MUS-boxes, reproduction nevertheless occurred in them. Possibly the presence of competitors in the study area caused common dormice to accept less favourable places, i. e. extremely small sites to raise juveniles. The absence of dormouse litters in the nestboxes in 2010 might be explained by the fact that *Apodemus* sp. reached its highest count of occupied nestboxes in this year. Eden & Eden (2003) state that high abundance of *Apodemus* sp. causes a decrease in nestbox use by the common dormouse. As seen in 2011 with only few competitors present, common dormice used both nestbox types intensively.

The present study was conducted as a pilot test for a future project comprising a larger number of both BIRD- and MUS-nestboxes with different combinations of internal dimensions and sizes of entrance holes to find out about ideal nestbox parameters for the common dormouse.

5. References

Adamík, P. & Král, M. (2008): Nest losses of cavity nesting birds caused by dormice (Gliridae, Rodentia). – Acta Theriologica, **53**:185–192.

Bright, P., Morris, P. & Mitchell-Jones, T. (2006): The Dormouse Conservation Handbook. 2nd ed. – English Nature, Peterborough: 73 pp.

Eden, S. M & Eden, R. M. G. (2001): The dormouse in Dorset: a reappraisal of dormouse ecology. – Dorset Natural History and Archaeological Society Proceedings **123**: 75–94.

Eden, S. M & Eden, R. M. G. (2003): Further observations on dormice in Dorset. – Dorset Natural History and Archaeological Society Proceedings **125**: 125–129.

Gatter, W. & Schütt, R. (1999): Langzeitentwicklung der Höhlenkonkurrenz zwischen Vögeln (Aves) und Säugetieren (Bilche Gliridae, Mäuse Muridae) in den Wäldern Baden-Württembergs. Ornithologischer Anzeiger **38**:107–130.

Hintermeier, H. & Hintermeier, M. (1994): Bienen, Hummeln, Wespen im Garten und in der Landschaft. – Obst- und Gartenbauverlag, München: 116 pp.

Juškaitis, R. (1995): Relations between common dormice (*Muscardinus avellanarius* L.) and other occupants of bird nest-boxes in Lithuania. – Folia Zoologica **44**: 289–296.

Juškaitis, R. (1997): Use of nestboxes by the common dormouse (*Muscardinus avellanarius* L.) in Lithuania. – Natura Croatica **6**: 177–188.

Juškaitis, R. (1998): Hollow birds breeding and roosting in nestboxes in mixed forests of Lithuania. – Acta Zoologica Lituanica Ornithologia **8**: 134–140.

Juškaitis, R. (2008): The common dormouse *Muscardinus avellanarius*: Ecology, population structure and dynamics. – Institute of Ecology of Vilnius University Publishers, Vilnius: 163 pp.

Juškaitis, R. & Büchner, S. (2010): Die Haselmaus *Muscardinus avellanarius*. 1st ed. – Die Neue Brehm-Bücherei Band **670**, Westarp Wissenschaften, Hohenwarsleben: 181 pp.

Lohmann, M. (2004): Tierparadies Garten. – BLV Verlagsgesellschaft München: 127 pp.

Sarà, M., Milazzo, A., Falletta, W. & Bellia, A. (2005): Exploitation competition between hole-nesters (*Muscardinus avellanarius*, Mammalia and *Parus caeruleus*, Aves) in Mediterranean woodlands. – Journal of Zoology (London) **265**: 347–357.

Vaughan, G. (2001): 'Dormousitis' - the sequel or should tit boxes be erected for birds or mammals? – Devon Birds **54**: 4–17.

Vilhemsen, H. (1996): The distribution, habitat requirements and nest sites of the common dormouse in Denmark. – In: Müller-Stieß, H. (ed.): Schläfer und Bilche. Tagungsbericht 1. Internationales Bilchkolloquium, St. Oswald 1990. – Verein der Freunde des Ersten Deutschen Nationalparks Bayerischer Wald e. V., Neuschönau: 49–55.

Zaytseva, H. & Nowakowski, W. (2011): The reactions of *Muscardinus avellanarius* and *Apodemus flavicollis* to the 'odor of nest'. – 8th International Dormouse Conference Abstract Book, Görlitz: 53.

Accepted 29 May 2012

Authors' address:

Carina Scherbaum-Heberer*, Bettina Koppmann-Rumpf, Semela Dukova & Karl-Heinz Schmidt
Ecological Research Centre Schlüchtern
Georg-Flemmig-Str. 5
36381 Schlüchtern, Germany

*Corresponding author: Carina Scherbaum-Heberer (e-mail: cheberer@gmx.de)