Camera-trap assisted monitoring of presence and ecology of the hazel dormouse

Kamerabasiertes Monitoring der Präsenz und Ökologie der Haselmaus

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1. Introduction

The most commonly used methods to detect hazel dormice (Muscardinus avellanarius) are nest boxes/tubes (Bright & MacPherson 2002), searching for natural nests (Foppen et al. 2002) or for gnawed hazelnuts (Bright, Mitchell & Morris 1994), as well as live-trapping (Berg & Berg 1999) and track tunnels (Mills et al. 2016). Most of these survey techniques by themselves do not give insight into correlation of habitat parameters or occupation of other species on dormice or their temporal patterns. On behalf of the Stiftung Naturschutz Schleswig-Holstein and the Department of Environment and Energy Hamburg, these factors of interest for effective implementation of future conservation efforts for the declining population numbers (Bright et al. 2006; Büchner et al. 2010), were therefore investigated with the use of camera traps.

2. Methods

Within three zones of interest, two in Schleswig-Holstein along the motorway A24 and one in Hamburg, 85 camera sites were surveyed gradually for 14 nights each from the 7th of August 2017 until the 23rd of
October 2017. The first 36 sites were surveyed a second time during the month of September to eliminate concerns of no detected dormouse presence being the result of a start too early in the season. Camera traps modified for documentation of small animals over a short distance (20 – 70 cm) and equipped with infrared flash were set to take a burst of 3 photos per detection and a delay of 30 seconds. The cameras faced a wooden board baited with peanut butter and strawberry jam, around which a selection of 12 habitat parameters (Bright & Morris 1990; Bright et al. 2006) were assessed in a 20 m radius.

3. Results

In total, 349,920 photos were taken, of which the data from the 17 sites with hazel dormouse detection were processed further. Ultimately 1.5 % of the original total and 9.9 % of the pictures processed recorded hazel dormice. Hazel dormouse presence was detected to the north and south along an approximately 2.68 km stretch of the A24 motorway (Unit A), and findings of previous years further to the east along the A24 (Unit C), around the crossing with the federal highway B404, were reconfirmed (Schulz et al. 2012; see fig. 1). No occurrences were documented in Hamburg.

The most frequently recorded species, appearing on 77.8 % of the pictures on hazel dormouse sites, were the on visual records indistinguishable species of wood mice (Apodemus sylvaticus) and yellow-necked mice (A. flavicollis), collectively named Apodemus sp. (see tab. 1). At 11 out of the 17 successful sites, hazel dormice were only recorded during one of the 14 sampling nights. At two of the successful sites, both within the same area (ca. 200 m apart), dormice were continu-
ously recorded on 13 nights. The same two sites were also responsible for 95% of the total of all hazel dormouse pictures.

The mean number of trapping nights to first detection of a hazel dormouse was 5.88 (± 4.55). The earliest first detection took place on the first night after installation, the latest during the 13th night.

The occurrence of *Apodemus* species (see fig. 2) was found to have a slightly negative effect on hazel dormouse presence, with the chance of hazel dormouse occupancy at sites where *Apodemus* sp. were not present being 1.28 times higher than at sites where they were found.

4. Discussion

The temporal pattern of three activity peaks during the night suggests a similar pattern as is known in other mouse species (Hoogenboom et al. 1984). Hazel dormice returning very few times or even not at all after their first visit emphasises the profound effect a single moment of camera malfunction could have on accurate detection rates. Anomalies such as the far above average of records and returns within one area suggest possible variables and influences of important for the species that were not taken into account and need to be investigated further. It is uncertain whether the negative influence of *Apodemus* species was due to interspecies competition for resources in the area or merely increased depletion of the bait due to sheer numbers of *Apodemus*. Especially of interest is the one occasion where the species were documented on the board simultaneously, which occurred at one of the anomalous two sites with the overwhelming majority of dormouse records.

The importance of presence of hazel (*Corylus avellana*) and larger forested areas for habitat preference was reaffirmed (Juškaitis & Šiožinytė 2008; Bright et al. 2006). The possible link of camera-/bait-placement

| Species                  | Period 1 (N = 85) | Period 2 (N = 36) |
|-------------------------|------------------|------------------|
| *Muscardinus avellanarius* | 17               | 0                |
| *Apodemus sp.*          | 76               | 34               |
| *Apodemus agrarius*     | 2                | 0                |
| *Myodes glareolus*      | 30               | 13               |
| *Micromys minutus*      | 0                | 2                |
| *Sciurus vulgaris*      | 33               | 15               |
| *Rattus norvegicus*     | 28               | 6                |
| *Soricidae sp.*         | 1                | 0                |
| *Oryctolagus cuniculus* | 1                | 0                |
| *Lepus europaeus*       | 1                | 0                |
| *Martes foina*          | 2                | 0                |
| *Mustela putorius*      | 0                | 1                |
| *Mustela erminea*       | 1                | 0                |
| *Felis catus*           | 3                | 1                |
| *Procyon lotor*         | 1                | 0                |
| *Capreolus capreolus*   | 3                | 2                |

Correlation between hazel dormouse detection and habitat parameters shows that presence of hazel within 20 m of the camera site (Cramer’s $V = 0.366$; $p = 0.012$), placement of the baited board directly in hazel (Cramer’s $V = 0.587$; $p < 0.001$) and a larger size of surrounding forested area (Cramer’s $V = 0.562$; $p = 0.002$) were heavily associated with hazel dormouse detection. Temporal activity of the hazel dormouse shows three clear peaks: the first after dawn, the second around midnight and the third before dusk (see fig. 3).
within the hazel tree itself in order to in-crease de-
tection rates is critical for further research using the
same method. For presence determination on a larger
scale, the commonly applied practices of using nest
boxes and tubes as well as searching for nests and
gnawed nuts may be more feasible and less likely to
return false negatives. This is especially true when fi-
ancial budget, investment of time and susceptibility
to malfunction are of concern. However, camera traps
have certainly proven themselves useful when more
in depth analysis of ecology than mere detection of
hazel dormouse presence is of interest and are inva-
uable for observations of interspecies interactions.

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