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Monitoring dormice (Gliridae) populations as a method of evaluating the efficiency of biodiversity management tools in Grădiştea Muncelului – Cioclovina Nature Park

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Abstract

Dormouse (Gliridae) populations in Romania are so far insufficiently studied, with very little data available. Four types of forest habitat were selected in Grădiştea Muncelului – Cioclovina Nature Park for the instalment of nest boxes in 2010, mostly in areas covered by virgin and cvasivirgin forests. During the following period, more nest boxes were installed in rural areas, in habitats with high human interaction. *Muscardinus avellanarius* and *Glis glis* were the most common species found and their population density is proven higher in areas with sustainable forest management.

Keywords

Dormice, monitoring, biodiversity, forest management, stakeholders, local communities

Introduction

Grădiştea Muncelului – Cioclovina Nature Park is located within the Southern Carpathians (Şureanu Mountains) and represents a protected landscape (category V IUCN). More than half of its 38.184 ha are covered in forest vegetation, thus creating the premises for high biodiversity, especially in the less accessible virgin and cvasivirgin forests.

Grădiştea Muncelului-Cioclovina Nature Park includes large forested areas as well as pastures, cultivated land, carstic areas, historic monuments, archaeological sites and villages. The landscape is characterised by hills and mountains with steep slopes, ranging between 600-1700 m.

Dormice are a peculiar group among mammals, set aside by the fact that their population densities are smaller compared to that of other rodents of same size and their reproductive success is considerably lower. Dormice are sensitive to climate change or any disturbances of their natural habitat, which makes them excellent bio-indicators for forested or shrubby areas.

In the context of recent financial difficulties, we decided to test a method of evaluating the efficiency of biodiversity management tools by monitoring dormice (Gliridae), which implies low costs and minimal equipment. The method consists of installing nestboxes and live-traps in a few key areas, covering an array of different forest types, including those with high naturality as well as areas with high human interaction.

At certain steps of the monitoring process, stakeholders (reticent at first towards the concept of forest management) have been involved in installing the nestboxes and monitoring their status (reporting missing or damaged ones). Meetings have been organized in order to explain the importance of forest habitats, of dead and decaying wood, and of maintaining ecological corridors open. A better collaboration with the park administration has been achieved.

Methods

In order to make any determinations regarding the biology and ecology of dormouse species, nest boxes were installed in several areas in Grădiştea Muncelului-Cioclovina Nature Park. These nest boxes are made of wood, shaped like a cube with a 15 cm side. The top of the boxes can be removed to allow the investigation of its contents. Each box has an entrance on the side, no more than 5 cm in diameter. The boxes are always installed with the entrance facing the trunk of the tree as to avoid being used by birds. Above and beneath the entrance, wooden elements allow enough space between the trunk of the trees and the box to facilitate access of the individuals.

Nest boxes were placed in trees in linear transects about 15 m apart from each other, with 10 boxes for each transect. The height at which the boxes were places varies between 1,5 m and 2,5 m (JUSKAITIS 2006).

In addition to these boxes, artificial shelters were made from plastic bottles in order to supplement possible nesting sites. The plastic bottles were cut at both ends resulting in a tube which is then painted black. Plywood is then used to make a small platform on which the nests will be installed. Another piece of plywood is used to seal

off one end of the tube. The platform is always a bit longer than the tube, to allow easier access. These structures were also placed in linear transects, in the same manner as the nest boxes.

The nest boxes and shelters were first installed in April 2010, just before the active season and were checked once every two weeks to avoid disturbing the nests. A total of 80 nest boxes and plastic tubes were installed by 2012. Captured individuals were marked by tattooing the ear and released. During the study, the degree of occupancy for the nest boxes was noted as well as the degree of capture and recapture. For each captured individual biometrical data was recorded (body length, tail length, weight).

In addition to these, live-traps were used for the capture of dormice. At every given location, twice a year, 10 live-traps were used for 3 nights in a row, baited with apple, peanut butter and sunflower seeds. This led to a better understanding of dormice dynamics in the study area.

The study began in areas with high degrees of naturality and was later extended to include areas with high human interaction. The virgin and cvasi-virgin forests that we first studied became the control group. Low reproductive success or other significant changes that would occur in both groups at the same time would be considered natural and thus not an influence of management. The habitats included in the study consists only of beech forests (pure or mixed with hornbeam) with *Corylus avellana* or *Crataegus monogyna*.

A very important aspect of management in protected areas is insuring a good communication with the local communities and stakeholders. In order to guarantee that biodiversity management tools have a lasting effect, the local communities have to understand the importance of sustainability and support the endeavours of the park administration. Meetings were organised in order to explain the importance of dead wood, of keeping ecological corridors open and of sustainable forest management. Denizens were also involved in the research as they were asked to participate during the instalment of the nest boxes and throughout the monitoring period.

A first meeting in 2010, brought together local communities and stakeholders. The importance of dead wood was underline, practices that encourage natural forest regeneration were promoted and the importance of preserving the understorey and shrubs was explained. Presentations and films were made and shared at this meeting as well as during events that involved local schools. Some solutions were suggested as an alternative to removing dead wood or cutting down shrubs from private property land.

In 2011, more meetings were organized. Besides explaining the concepts and the need of sustainable forest management, dormice were introduced to the locals. Volunteers were recruited for the instalment of nest-boxes, and the monitoring method was explained. Volunteers were asked to check the nest-boxes for damage at least once a week. During 2011 5 meeting were organised with members of the local communities, as well as schools in the park's surrounding area.

In 2012 other areas were included. Besides the usual talks regarding forest management, results from the previous years were presented, demonstrating the potential for a sustainable use of forest resources.

Results

Three species of dormouse were found using the nest boxes:

Muscardinus avellanarius (hazel dormouse), the smallest dormouse species in Romania, forms round nests made of branches, leaves and grasses (ZAYTSEVA 2006).

Glis glis (edible dormouse) usually builds nests from leaves and mosses (GRZIMEK 2003). Nests are usually found higher in the trees, in hollows of at the bifurcation of branches. This species sometimes uses deserted birds' nests (JUSKAITIS 2006).

Dryomys nitedula forms round nests, about 15 – 25 cm across, with the entry on the side or at the top. Rough materials are used at the outside, such as branches, and the interior is padded with grasses, moss, feathers or hair. It sometimes uses empty bird nests that it modifies to fit its needs (ADAMIK & KRAL 2008). Several nests can be found on a single tree, yet only one is functional (MURARIU & POPESCU 2001).

All the nest boxes were installed during April, at the start of the active season for dormice. However, during the first two months there was very little evidence that the boxes were being used. This situation was common throughout the study. In any given location, about one month after the instalment of the shelters, hardly any results were recorded. After the first month, droppings, leaves and nests began to gradually appear in the nest boxes.

In the first season, in 2010, when only virgin and cvasi-virgin forests were considered for the study, 53.8% of the nest boxes were occupied. The following year the rate of occupancy rose to 71.3%, and remained relatively stable throughout the study period (70-80%). The other nest boxes, not inhabited by dormice, also recorded signs of activity (dormouse droppings, leaves fragments) and in several cases, *Apodemus sylvaticus* and *Apodemus flavicollis* individuals as well as birds' nests were found in the boxes.

During the three years, 144 *Muscardinus avellanarius*, 89 *Glis glis* and 23 *Dryomys nitedula* were captured.

Most *Muscardinus avellanarius* (96 individuals) individuals were captured in areas with dense understorey or shrubs, rich in *Coryllus avellana* or *Crataegus monogyna* (JUSKAITIS 2008). In contrast, most *Glis glis* (61 individuals) were found in forests with tall trees (MILAZZO et al. 2003) and little understorey. The species is known to prefer such habitats (JURCZYSZYN 1995) and its presence in the area has been confirmed for many years, since it began nesting in cabins and other buildings nearby.

Dryomys nitedula was proven the most elusive, with a scarce 27 individuals over a 3 year period.

The rate of recapture is relatively high, with 65% of individuals being recaptured at least once. This is a result of the nest-box method we used, since dormice build their nests during the first year and for the most part will return the following spring. Some individuals we captured and marked were not found during subsequent verifications. They were most likely killed by predators.

The number of captured individuals varies from month to month, reaching a maximum in August, after weaning. Starting with October, the average number of captures begins to decline until the second half of November, when all activity stops in the nest-boxes. Not a single artificial shelter was used during winter. Dormice prefer hibernating in nests built on the ground.

The average number of captured individuals for all three years is presented below.

Table 1: Average captures for every month of the active season

Species	April	May	June	July	August	September	October	November
Muscardinus	2	4	10	19	29	32	19	6
Glis	0	1	4	9	13	14	7	2
Dryomys	0	1	1	4	3	3	2	0

Each year, in every new location, given the novelty of the shelters, very little activity was recorded in the nest-boxes during April. For the second season, however, activity begins about 3 weeks sooner.

Though the number of dormice using the nest-boxes remained relatively stable in the virgin and cvasi-virgin forests, a rise in numbers was recorded in forests with high human interaction after 2011. If the populations in the virgin forests rose by only 2-3 dormice, in the other areas, 7-9 more individuals were recorded during 2012. Since the rise in number was one-sided, we correlate this population growth to the success of management measures and effective implementation.

Local communities, though reticent at first towards dormice, considering them to be pests, finally came to understand the importance of these species. Once confused with mice and rats or considered pests because of their resemblance to other rodents, are now viewed as charismatic species, with children being most involved in the monitoring process. However, there are still areas where the task of implementing this monitoring scheme is just beginning. Of course, the purpose of the meetings we organized is not to change the attitude towards these species, but rather to raise awareness to the fragility of the ecosystems and the need to protect all species.

Weight was recorded for every captured individual (g). The results are shown in the figure below.

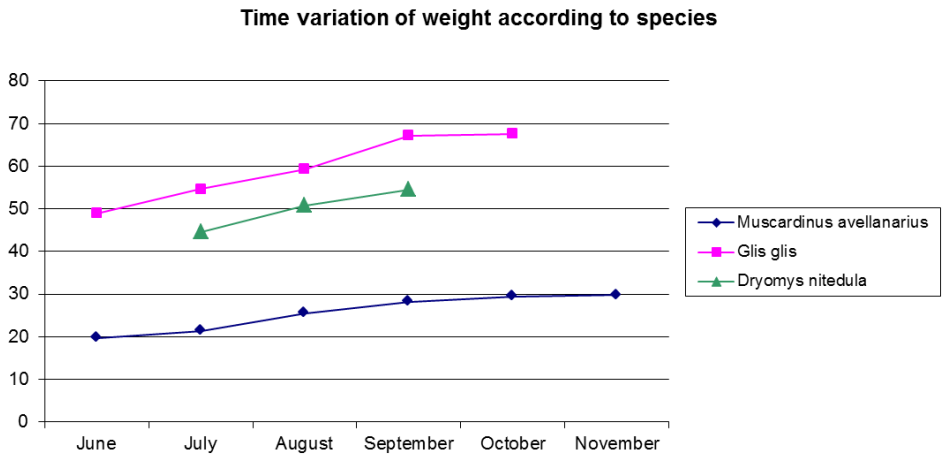

Figure 1: Time variation of weight according to species

The average value for the biometrical data recorded is listed in table 2. There are no notable differences when compared to other European populations (PUCEK 1981).

Table 2: Average values for biometrical data for each species

Species	*Muscardinus avellanarius*	*Glis glis*	*Dryomys nitedula*
Body length	73.3	165.4	97.7
Tail length	69.4	127.5	84.5
Weight	25.6	59.2	50.0

Discussion

Dormice monitoring schemes have been implemented before in Romania, but this was never used in Romania as a means of monitoring the effectiveness of forest management. We chose this novel method because dormice are good bioindicators, very sensitive to changes in their habitat.

However, this is merely being tested. Given the short period of time for the study, it is possible that in time, this method will be proven unsuccessful. Further data and a comparison with other methods of evaluating forest management are required.

On the other hand, low costs of implementation, and the accessibility of it (dormice are easily handled), make this method ideal for biologists or other protected area specialists who do not specialize in small mammal biology.

Conclusion

As a conclusion to our study, we could notice positive correlation between dormice population growth and stakeholders' understanding of forest management needs, with the trend being maintained to this day. Even so, some areas with a long history of human interaction, still need to be closely observed and the management tools, proven successful so far, widely accepted by all stakeholders.

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