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DISTRIBUTION ECOLOGY OF THE HUNGARIAN DORMOUSE SPECIES, BASED ON THE NATIONAL BIODIVERSITY MONITORING SYSTEM

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Distribution data are presented on the three dormouse species found in Hungary – hazel dormouse (*Muscardinus avellanarius*), fat dormouse (*Glis glis*) and forest dormouse (*Dryomys nitedula*). Data were collected, partly within the framework of the National Biodiversity Monitoring System. Data sources included several natural history museums, faunal publications, monitoring of bird nest boxes and our own field work. Records were obtained for 554 hazel dormice, 239 fat dormice and for 64 forest dormice. These represent 212 of the 10 ×10 km grid UTM-squares of Hungary, covering 23.7% of the squares with arboreal vegetation. The distribution maps were compared to the vegetation map of Hungary showing the different forest types. The results showed that dormice occurred mostly in sessile oak (*Quercus petraea*) dominated forests, but all three dormouse species were also found in woods dominated by introduced tree species, mostly black-locust/false acacia (*Robinia pseudo-acacia*). The hazel dormouse occupies a very wide spectrum of habitable forest types, but the fat dormouse occurs in fewer forest types. The forest dormouse appeared in drier forests. The difference between the occurrence in native and introduced forest types is least in the case of the forest dormouse.

Key words: dormouse, distribution, UTM-map, forest type

INTRODUCTION

Three dormouse species have been described from Hungary: hazel dormouse (*Muscardinus avellanarius*), fat dormouse (*Glis glis*) and forest dormouse (*Dryomys nitedula*). Dormice have been protected in Hungary since 1974 and they are included in the Hungarian Red Data Book (BANKOVICS & NECHAY 1989). The distribution of these species was first described by SCHMIDT (1974) based on owl-pellet analyses, then by BAKÓ (1996) with data from publications by Hungarian natural history museums, and live-trapping.

Populations of dormice in Hungary require different species composition and vegetation structure of the forests in which they live (BAKÓ 1996), but in diverse habitats they can be coexistent (GÁL 1999). Due to de-afforestation, the natural habitat of dormice has shrunk and forest management practices force them out to the edges of the remaining forests. At the same time, forests of new, introduced tree species have appeared (particularly *Robinia* and *Pinus*) offering new potential habitats, if dormice can adapt to these vegetation types.

The aim of our research was to collect new data and to study the occurrence of dormice in different vegetation types on a national scale. Research on local vegetation preference was carried out by GÁL (1999).

MATERIAL AND METHODS

Museum collections: catalogue data of the mammal collection of the Hungarian Natural History Museum (Budapest), the Bakony Natural History Museum (Zirc) and the Mátra Museum (Gyöngyös) were processed.

Faunal publications: results of faunistic research, often owl-pellet analyses and live-trapping.

Artificial nest boxes: dormice often occupy nest boxes of hole-breeding birds (ROBEL & LEITENBACHER 1993, SORACE *et al*. 1999, JUŠKAITIS 1995*b*), therefore it was possible to collect information from the managers of such nest box schemes. In Lithuania, JUŠKAITIS (1995*a*) also used this method in his research.

Field work: A smaller but not negligible part of the data originate from our own field work, using live-trapping and monitoring of nest boxes placed for dormice.

DATA PROCESSING

The 10 × 10 km UTM (Universal Transfer Mercator) grid has been used for mapping distribution (DÉVAI *et al.* 2000), and for further analysis the software ArcView 3.1. To compare dormouse distribution and forest types the database of the "Corine Land Cover – Layer for Forestry" have been used (CZIMBER 1999).

As dormice live exclusively in arboreal plant associations (e.g. BRIGHT & MORRIS 1993, KRYŠTUFEK & VOHRALÍK 1994), we ignored the UTM-squares without any arboreal vegetation, that means we used 894 squares out of 1052. We examined the occurrence in each forest type. The layer defines the forest types based on the dominant tree species. We counted those squares, where the given forest type covered more than 25%. In the majority of dormouse records the habitat type is not mentioned or it is not possible to define it correctly, so this coverage value makes it likely that the given dormouse species really can be found in that forest type.

We compared the actual vegetation map with the distribution of all three dormouse species. However, due to the large variability of the forest types, those maps (Figs 1–3) are clearer to see where native and introduced forest types are grouped. Those forest types were taken as introduced, which were defined in the layer as woods dominated by black-locust/false acacia (*Robinia pseudoacacia*), poplar (*Populus deltoides*), Scots pine (*Pinus silvestris*) and black pine (*P. nigra*).

The frequency of occurrence in each forest type of each dormouse species was calculated using the software Microsoft Excel 97. After grouping the forest types into native and introduced categories, we examined how often dormice appeared in these two groups.

RESULTS

Dormice occurred in 212 UTM-squares, which is 23.7% of the squares with arboreal vegetation (Table 1). The maps (Figs 1–3) show the distribution of the dormice among the grouped forest types.

There were many UTM-squares where dormice coexisted (Table 2).

Comparison of the distribution and vegetation maps shows that dormice occure mostly in areas dominated by sessile oak (*Quercus petraea*) among natural forest types.

Table 1. Occurrence in the UTM-squares and the number of all records

	Muscardinus avellanarius	*Glis glis*	*Dryomys nitedula*
Occurrence	170 (59%)	89 (31%)	28 (10%)
All data	554 (65%)	239 (28%)	64 (7%)

Table 2. Rate of coexistence of the three dormouse species in Hungary

Muscardinus avellanarius	*Glis glis*	*Dryomys nitedula*	*Muscardinus + Glis*	*Muscardinus + Dryomys*	*Muscardinus + Glis + Dryomys*
48%	19%	4%	20%	4%	5%

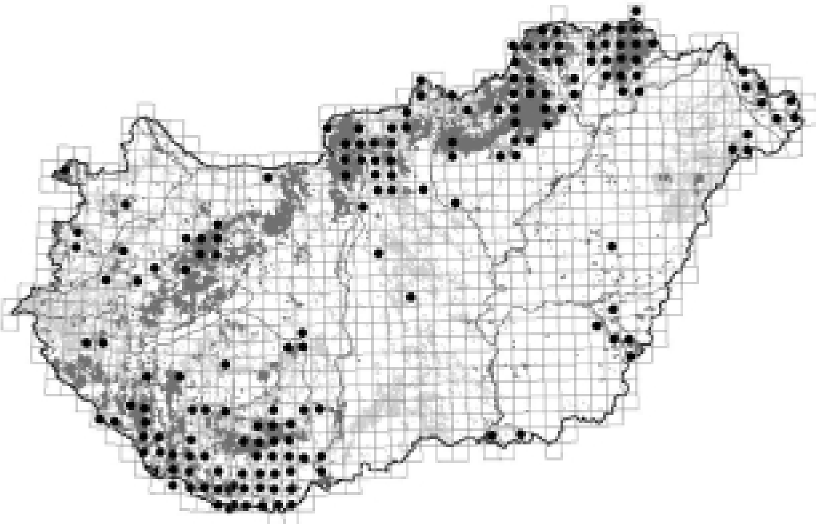

Fig. 1. Distribution map of the hazel dormouse with the grouped forest types. Legend: black dot = occurrence, gray shading = forests dominated by native tree species, pale gray shading = forests dominated by introduced tree species

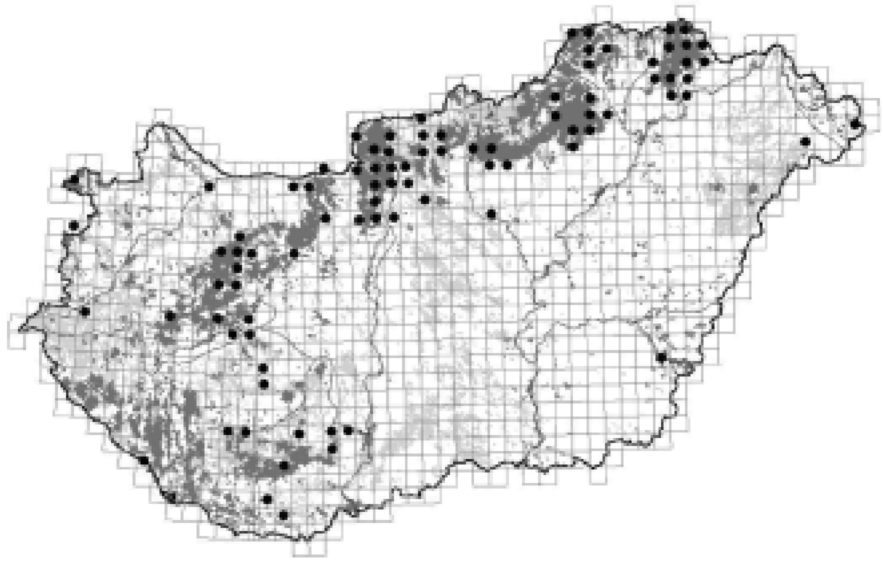

Fig. 2. Distribution map of the fat dormouse with the grouped forest types. Legend: black dot = occurrence, gray shading = forests dominated by native tree species, pale gray shading = forests dominated by introduced tree species

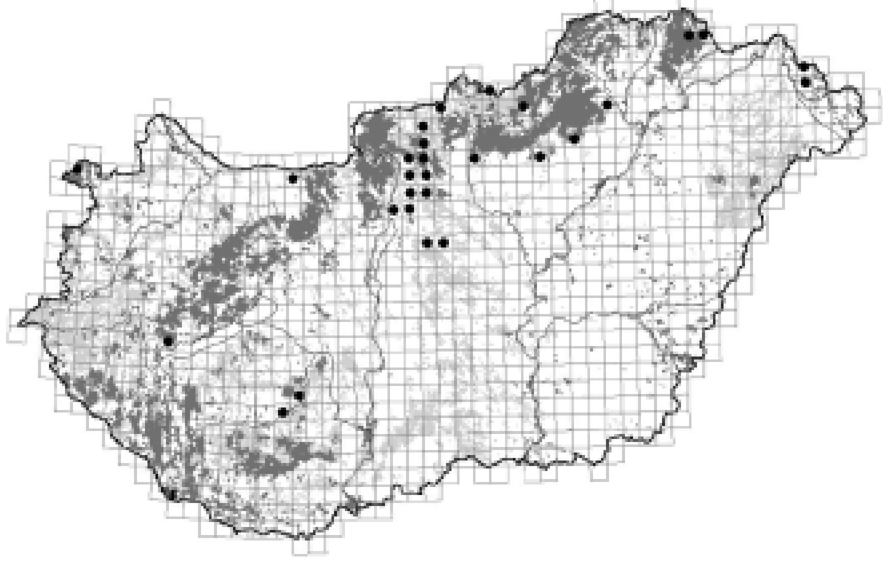

Fig. 3. Distribution map of the forest dormouse with the grouped forest types. Legend: black dot = occurrence, gray shading = forests dominated by native tree species, pale gray shading = forests dominated by introduced tree species

The hazel dormouse (Fig. 4) appears in almost every natural forest type, but mainly in robur (*Q. robur*) and sessile oak, also quite often in hornbeam (*Carpinus betulus*) and beech (*Fagus sylvatica*). More remarkable is its occurrence among turkey oak (*Q. cerris*), willow (*Salix spp.*), as well as in the tree species group containing alder (*Alnus spp.*), birch (*Betula pendula*) and horse chestnut (*Aesculus hippocastaneum*). Within woods of introduced tree species, the hazel dormouse was almost only found in black-locust, with a few in Scots pine and none at all in black pine and poplar woods.

The fat dormouse also occurred in those UTM-squares where sessile oak was dominant (Fig. 5). We also found it in robur-dominated forests, however in a lower percentage of squares. The fat dormouse was also present in all four types of introduced forest, predominantly in black-locust.

The forest dormouse appeared very often in the vegetation types of arid character (Fig. 6), like sessile and turkey oak. In other native forests it appeared only in robur. Like the fat dormouse, the forest dormouse is probably present in all forests dominated by introduced trees, but the preference of black-locust seems greater.

The groups of native and introduced forest types were compared and Fig. 7 shows the habitat selection of the Hungarian dormouse species. Hazel and fat dormice appeared mainly in native forest types, while the forest dormouse showed no clear difference between the two categories.

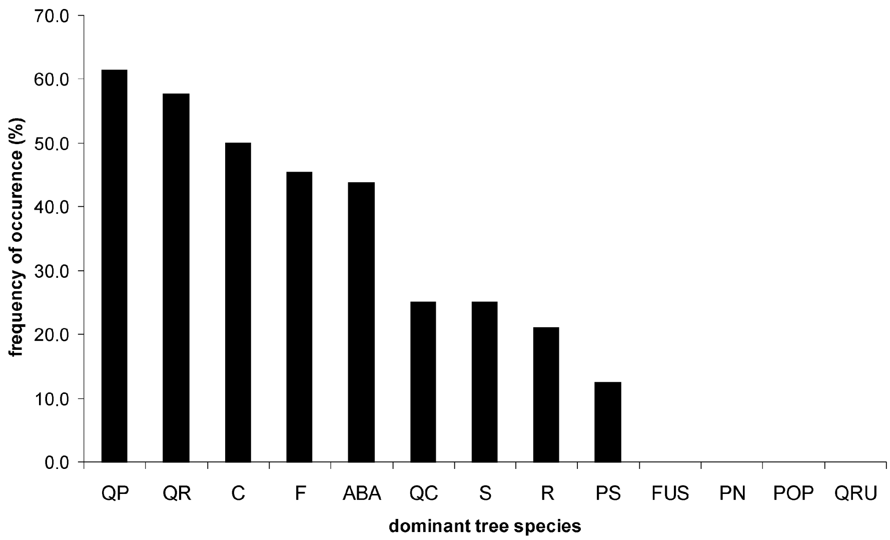

Fig. 4. Frequency of occurence of hazel dormouse in different forest types. Legends: ABA = *Alnus*, *Betula*, *Aesculus* etc., C = *Carpinus*, F = *Fagus,* FUS = *Fraxinus*, *Ulmus, Sorbus* etc., PN = *Pinus nigra*, POP = *Populus*, PS = *P. sylvestris,* QC = *Q. cerris*, QP = *Q. petraea*, QR = *Q. robur*, QRU = *Q. rubra*, R = *Robinia*, S = *Salix*, T = *Tilia*

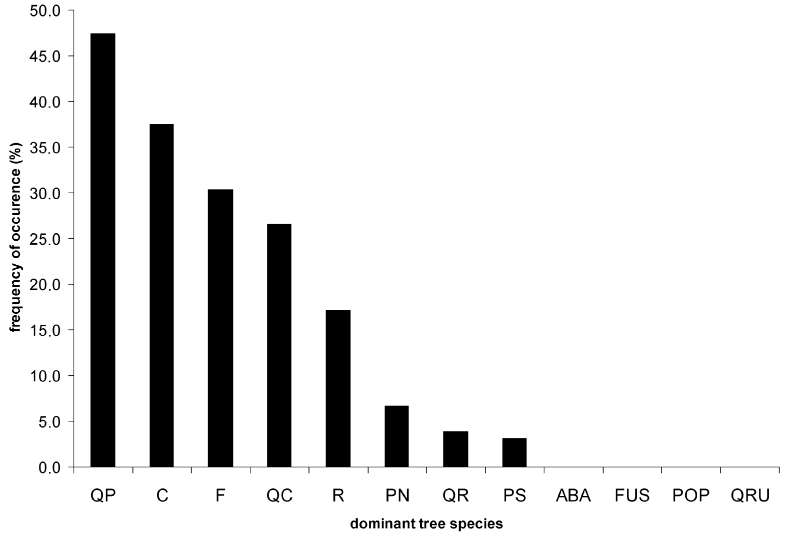

Fig. 5. Frequency of occurence of fat dormouse in different forest types. Legends: ABA = *Alnus*, *Betula*, *Aesculus* etc., C = *Carpinus*, F = *Fagus*, FUS = *Fraxinus*, *Ulmus*, *Sorbus* etc., PN = *Pinus nigra*, POP = *Populus*, PS = *P. sylvestris,* QC = *Q. cerris*, QP = *Q. petraea*, QR = *Q. robur*, QRU = *Q. rubra*, R = *Robinia*, S = *Salix*, T = *Tilia*

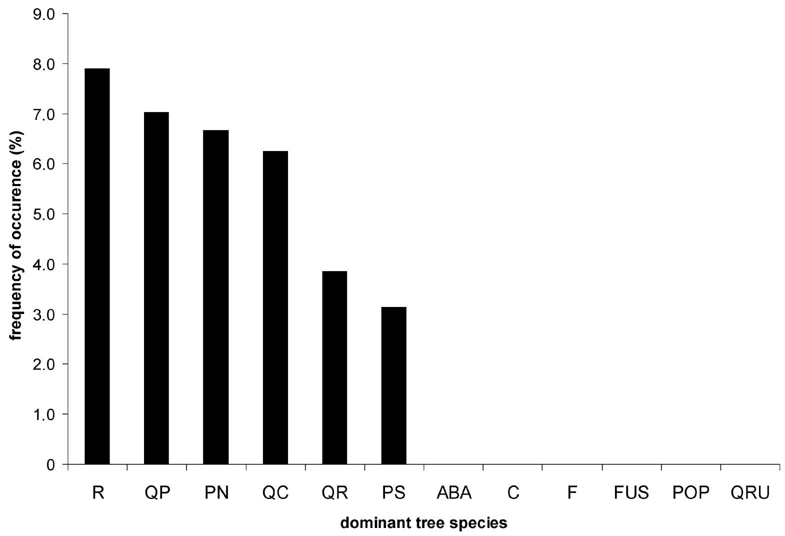

Fig. 6. Frequency of occurence of forest dormouse in different forest types. Legends: ABA = *Alnus*, *Betula*, *Aesculus* etc., C = *Carpinus*, F = *Fagus*, FUS = *Fraxinus*, *Ulmus*, *Sorbus etc.,* PN = *Pinus nigra*, POP = *Populus*, PS = *P. sylvestris,* QC = *Q. cerris*, QP = *Q. petraea*, QR = *Q. robur*, QRU = *Q. rubra*, R = *Robinia*, S = *Salix*, T = *Tilia*

DISCUSSION

The distribution of Hungarian dormice occupies 23.7% of the forested area of Hungary. This value is more than double that reported in our earlier study (BAKÓ 1996). This can be attributed to more intensive data collection and the longer-term aspect of our study. Dormice in Hungary seem to be rare in the Transdanubian Mountains and in the northwest of Hungary, although vegetation types should be suitable for them there. The reason for the few records may be the low level of research activity in these regions.

It is clear that among natural forest types all three species are most often found in the sessile oak dominated forests. In the woods dominated by introduced trees, all three dormouse species were observed mostly in black-locust forest, but only in hilly areas. The black-locust stands in the plain are not connected to natural forests and moreover they have a poorly developed understorey, so they do not offer suitable habitats for dormice. We have only a very limited amount of data from poplar and pine dominated woods.

On the distribution map of hazel dormouse, the hilly and mountainous regions are clearly outlined. Most data were collected from the Northern Mountains and from the south-west of Hungary, probably due to the more intensive research conducted there. If in these two regions the hazel dormouse is very common, they are probably widely spread in other comparable parts of the country as well. Since the last comprehensive survey (BAKÓ 1996), new data have become available from the Great Hungarian Plain, particularly from the Körös–Maros region and the

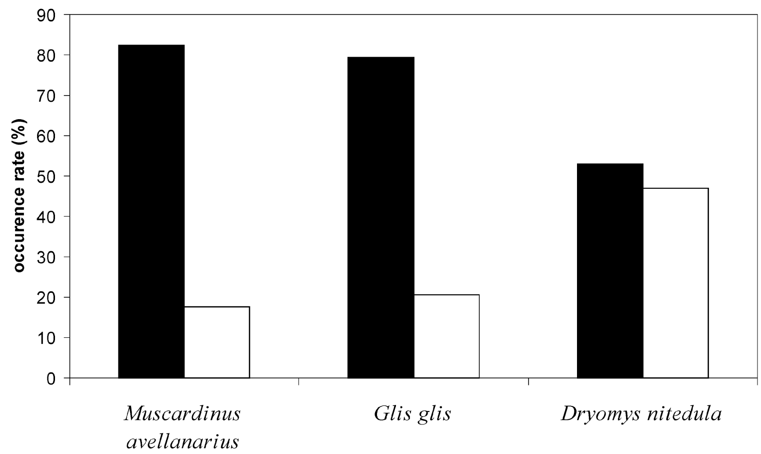

Fig. 7. Occurrence rate of the dormice for the grouped forest types. ■ = forests dominated by native tree species, □ = forests dominated by introduced tree species

Nyírség. However in the national parks of this region *Muscardinus* has not been found (PALOTÁS & DEMETER 1983, DEMETER & TOPÁL 1987). Compared to other dormouse species it is clearly the most common dormouse in Hungary (BAKÓ 1996). We found it in almost every forest type, and it confirms the observation of GÁL (1999) stating that the hazel dormouse has a wide vegetation spectrum. Earlier observations showed already that this species also often occurs in willow (DOBOS & TÓTH 1993, GÁL 1999). The low value in this case could be explained by the narrow distribution of willow stands, which are restricted to river sides in Hungary. In the Great Plain such woods can be found along the rivers Körös, Maros and Tisza, and we have data as well from forests in the flood area near the Dráva. Populations of hazel dormouse should also occur in similar habitats near other rivers, e.g. the Danube.

Among the introduced woods hazel dormouse mostly appeared in black-locust. PAPP (1971) also observed it in this vegetation type, although GÁL (1999) did not find it there. It is absent from black pine stands, but present in woods dominated by Scots pine. GÁL (1999) found his specimens always in the shrubby parts of the pine stand. We can expect new observations in introduced forest types in the future.

Our research suggests the preference for forests dominated by native tree species is similar in hazel and fat dormice, although the distribution of the fat dormouse indicates a clear preference for hilly areas and fewer data are available from flat regions. The observations from the Great Plain are new for Hungary. The overall distribution area is similar to that of hazel dormouse, but the populations are more isolated. Our results confirm that the fat dormouse is less frequently found than hazel dormouse. This observation contradicts the work of BÁLDI *et al.* (1995), in which the mammals of Hungary are classified according to their conservation status. They concluded that the hazel dormouse is more endangered than the fat dormouse. Among our dormice this species is attached most strongly to the three most common forest tree species of Hungary (sessile oak, turkey oak and beech). This confirms the observations of BAKÓ and GÁL (1999). Most data are from oak forests, while *Glis* is less common in the closed beech stands with a sparse understorey. According to SCHOPPE (1975) it even avoids this vegetation type. The populations in the flat areas could be relic. According to the vegetation maps, they might live in the flood area, although they were never described in this region or from this vegetation type.

We have few data on the distribution of the forest dormouse in Hungary, probably because it is a genuinely rare species. The populations are isolated as confirmed by cranial examinations (BAKÓ 1996). In the Cserhát mountains and in the Gödöllő hills they may be found in every forest and the majority of the Hungarian population probably occurs there (BERTY 1995, BAKÓ 1996). The forest dormouse appears more often in dry forests, but is absent from the Great Plain. The black-locust monocultures have a poorly developed understorey and are isolated from extensive natural forests. The plantations were often set up in sandy areas, formerly without any forest, where dormice had been absent and colonization by *Dryomys* is only recent. We have only one observation from the northern shore of Lake Balaton, although the submediterranean forests there could be suitable for the forest dormouse. The same is true of the Mecsek Mountains in the south-west of Hungary. Probably they are present in these regions, but we have no data. Suitable habitats are also available in the Baranya hills, in the Transdanubian and Northern mountains. As in previous studies (NOWAKOWSKI & BORATIŃSKI 1997, BAKÓ & GÁL 1999), we did not find evidence of the forest dormouse in either willow stands or in the alder-birch-horse chestnut forests. Our results suggest that the forest dormouse prefers black-locust and pine woods, so new data could be expected from these habitat types.

From the data it can be concluded that all three species can probably adapt themselves to the woods formed by introduced tree species, or they can at least tolerate these historically new vegetation types.

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