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AN ATTEMPT TO ESTIMATE THE SIZE AND DENSITY OF *Dryomys nitedula* POPULATION IN THE BIAŁOWIEŻA FOREST

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ABSTRACT. On the basis of available literature data an attempt was made to estimate size and density of the Forest Dormouse population in the Polish part of the Białowieża Forest, covering ca 58 000 ha. The estimate of the population size falls between 7750 and 40 170 individuals. The number of 18 856 individuals is probably the closest to the real state. Considering the above calculations as reliable, the density ofpopulation in this area is ca 3.3 indiv./10 ha (the extreme results are: 1.3 and 6.9 indiv./10 ha). Such densities correspond to those given by other authors for other areas.

Key words: Forest Dormouse, *Dryomys nitedula*, population size, density, Białowieża Forest

BIALOWIEZA ORMANI *Dryomys nitedula* POPULASYONUN YOĞUNLUK VE BÜYÜKLÜĞÜNÜN HESAPLANMASINA AIT BIR DENEME

ÖZET: Bialowieza Ormanı'nın yaklaşık 58 000 hektarlık Polonya kısmındaki ağaç faresi populasyonunun büyüklük ve yoğunluğu hakkında mevcut kaynaklara dayanılarak bir hesaplama yapılmıştır. Hesaplanan populasyon büyüklüğü 7750 ile 40 170 birey arasında çıkmıştır. 18 856 adetlik birey sayısı büyük olasılıkla gercek duruma en yakın olanıdır. Yukarıdaki hesapların güvenilir olduğu kabul edilirse bu bölgedeki populasyon yoğunluğu yaklaşık 3,3 birey/10 ha'dır (ekstrem değerler: 1,3 ve 6,9/10 ha'dır). Bu yoğunluk değerleri diğer araştırıcıların diğer bögelerden verdikleri değerler ile uyuşmaktadır.

Anahtar sözcükler: Ağaç faresi, *Dryomys nitedula*, populasyon büyüklüğü, Bialowieza Ormanı

INTRODUCTION

The Forest Dormouse (*Dryomys nitedula* Pallas, 1778) is a small tree-dwelling rodent of a nocturnal activity. The length of the animal's body varies from 72 to 113 mm, of the tail – from 60 to 92 mm. It weights 15-47 g (Pucek 1984). In Poland, the Forest Dormouse is a rare animal. It is thought to occur in small isolated subpopulations (Jurczyszyn & Wołk 1998, Pucek & Raczyński 1983). The species is included into the Polish Red Data Book and covered by the species protection (Głowaciński 1992). The fact that that the northwestern boundary of the species geographical range crosses Poland (Jurczyszyn & Wołk 1998, Mitchell-Jones *et al.* 1999, Pucek & Raczyński 1983, Storch 1978) is considered as the reason of its low number. The other reason of a rare occurrence of the Forest Dormouse in this area can be habitat degradation and cutting old broadleaved tree stands suitable for the species (Głowaciński 1992).

So far the question what densities and population size can the Forest Dormouse reach in inhabited forest complexes has remained with no answer. A somewhat more detailed data on the spatial organisation in *Gliridae* were given only for the Edible Dormouse by Lozan *et al.* (1990) and Gaisler *et al.* (1977). Information on densities and numbers of individuals in a population is of a basic importance in order to define its role in an ecosystem and its conservation status. The conservation of species that forms low-size populations should be based first of all on the theory of low-size populations. Constructing such a theory requires a basic knowledge on the biology and ecology of such a species

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(Andrzejewski 1995). Thus, we faced the need to estimate the number and densities of the Forest Dormouse population in the Białowieża Forest.

The Forest Dormouse, similarly as other species from the *Gliridae* family, is a poorly known animal. Studies on this animal, especially in field, abound with methodical difficulties. For these reasons, our estimations are only rough approximations, aimed to give the general idea of a real range of numbers.

METHODS, RESULTS AND DISCUSSION

To calculate densities and sizes of populations of small rodents, methods based on trapping, marking and releasing animals in a rather large area (CMR) are usually used. In the case of Dormice, in particular – of the Forest Dormouse in the Białowieża Forest, this method is highly inefficient. Besides technical difficulties with catching these animals in traps (Bezrodnyj 1990), this method brings questions into interpretations, even in much better known animals (e.g. Andrzejewski & Babińska-Werka 1986, Andrzejewski & Babińska-Werka 1988, Bujalska 1988, Bujalska 1990, Grüm 1988). However, due to the absence of even this kind of data, we decided to base the estimations on other facts and approximations.

Assumptions

The calculations below were done on the basis of our own studies, taking into account the available literature data and information obtained from the forest service.

The studies have been conducted since 1993 in the Polish (western) part of the Białowieża Forest. The surveyed transect of a 12.8 km length, with ca 190 bird nestboxes hanged along it, crossed different typological classes of stands (according to the forest classification – Zaręba 1988). We found stands which belonged to six classes (their percent share in the transect length is given): coniferous forests constituted 37.6% of the stands, mixed-coniferous forests – 19.4%, mixed forest – 15.2%, and two classes of swampy broadleaved stands treated jointly – alder carr/swamp woodland – 13.9%. Generally the age of stands in this area did not exceed 100 years – this age class occurred along 62.4% of the transect, and stands over 100 years old – along 37.6%. The measure of the density of a stand is crown closure, which was over 50% along 67.5% of the transect, while the closure of understorey exceeding 50% was noted along 58.3% of the transect.

Results of the studies allowed for defining habitat preferences of the Forest Dormouse and the approximate size of its territories (Nowakowski & Boratyński 1996, Nowakowski 1999). Moreover, the degree of occupancy of habitats used by the Forest Dormouse was defined (Nowakowski 1999). The results cited below were presented at the III International Conference on Dormice in Croatia (1996) and at the IV International Conference on Dormice in Turkey (Nowakowski 1999).

1. The Forest Dormouse prefers broadleaved stands with a remarkable admixture of spruce and pine (mixed forests). It also willingly uses coniferous stands with considerable share of broadleaved trees (mixed-coniferous forests) as well as exclusively broadleaved stands or broadleaved with minor admixture of coniferous trees (forests). The animal avoids entirely coniferous stands (coniferous forests) and broadleaved swampy stands (alder carr/swamp woodland).
2. In the post-hibernation and breeding periods and during raising youngs the Forest Dormouse lives solitary.
3. We estimated that the home range of the Forest Dormouse is a circle of a diameter from 65 to 100 m, and its area is from 0.44 to 0.79 ha. If we assume that the home range is elliptic and the given values are the shortest and the longest diameters of the ellipsis, the home range of the animal has ca 0.59 ha.
4. The space occupied by a Forest Dormouse every year does not include the entire area of the forest types suitable for the species. On average, ca 35.2% (SD = 11.9%) of this area is covered by Forest Dormice home ranges.

Moreover, we defined the share of habitats used by the Forest Dormouse within the whole Polish part of the Białowieża Forest. We used here three sources of data: 1. we defined the area of habitats (percentage) used by the Forest Dormouse within our research transect and the area where the Forest Dormouse does not occur as a representative sample for the Białowieża Forest - we obtained the value

54.4%; 2. from the forest management maps we calculated areas of stands preferred by the Forest Dormouse - the resulted value was ca 65%; 3. we summed up the share of stands (after Łonkiewicz 1995) considered by us as suitable for the Forest Dormouse (Nowakowski & Boratyński 1996) - with the result of ca 45%.

In the following part of the paper we regard our result (the main sequence - see below) to be the most appropriate. We base further calculations on this result not only because it is almost a mean value from the two others given, but also, first of all, because it is based on the field sample. The result read form the forest management maps (see below – the second side sequence) is biased by reading inaccuracies, however it approximately reflects the status of stands "declared" by the forest service. Unfortunately, the forest maps not exactly correspond to the real situation in the field. The result obtained from the interpretation of the paper by Łonkiewicz (1995) (see point 3.) is biased by more rough division of habitats used by the author than that used by us to define Forest Dormouse habitat preferences. In addition, apart from the typological classification, the author uses also rather detailed phytosociological one. This classification reflects the potential quality of habitats, thus cannot be literally interpreted in terms of habitat preferences of the Forest Dormouse described in our paper (Nowakowski & Boratyński 1996).

Calculations of the Forest Dormouse numbers

Remarks

1. In the presented paper we calculate, according to the accepted assumptions, the most probable number of Forest Dormice and the extreme values - the highest and the lowest possible ones.
2. Despite the fact that the results are only approximate, they cannot be extrapolated to the Belorussian part of the Białowieża Forest because of a different type of management.

The Polish part of the Białowieża Forest has the area of ca 58 000 ha and this rounded value was taken to further calculations.

The main sequence - the most probable value in our opinion

1. Accepting the above estimates of the share of habitats used by the Forest Dormouse at the level 54.4%, we obtain the area of 31 552 ha of habitats occupied by the animal.
2. This area is not entirely inhabited by the Forest Dormouse every year (Nowakowski 1999), thus we obtain the mean result of 11 106 ha (35.2 % of the 31 552 ha).
3. Assuming that the home range does not differ significantly from the territory, and regarding the diameters of the home range given above, with the elliptic home ranges of the 0.59 ha area (the diameters 65 m and 100 m) - the area of 11 106 ha can hold 18 856 individuals.

Side sequence - the minimal number:

1. Accepting the estimated share of habitats used by the Forest Dormouse as a level of 45% (by the interpretation of Łonkiewicz 1995), the result is 26 100 ha of stands inhabited by the species.
2. Not whole this area is inhabited by the Forest Dormouse every year (Nowakowski 1999), thus we obtain the minimal result of 6 081 ha (23.3% (mean-SD) from 26 100 ha).
3. Assuming that the home range does not differ significantly from the territory and regarding the cited diameters of the home range, with the circular home ranges of the 0.79 ha area (the diameter 100 m) - the area of 6081 ha supports 7750 indiv.

Side sequence - the maximal number

1. Taking the estimates of the share of habitats used by the Forest Dormouse at the level of 65% (after forest service maps), the result is 37 700 ha of stands inhabited by the species.
2. As not the whole this area is inhabited by the Forest Dormouse every year (Nowakowski 1999), we acquire the maximal result of 17 757 ha (47.1% (mean +SD) from 37 700 ha).

3. Assuming that the home range does not differ significantly from the territory and regarding the cited diameters of the home range, with the circular home ranges of the 0.44 ha area (the diameter 65 m) - the area of 17 757 ha can hold 40 170 indiv.

Calculation of densities

If we assume the above sequence of calculations are correct, the density of the Forest Dormouse in our sample plot is ca 3.3 indiv./10 ha (extreme results are: 1.3 and 6.9 indiv./10 ha). Taking into consideration only the stands inhabited by the Forest Dormouse we obtain the result ca 6.0 indiv./10 ha (extreme results are: 3.0 and 10.7 indiv./10 ha). These results should be regarded as representative for the whole Polish part of the Białowieża Forest.

REFERENCES

Andrzejewski R. Ekologiczne problemy ochrony różnorodności biologicznej. Materiały konferencji "Nauka na rzecz różnorodności biologicznej". [Ecological problems of conservation of the biodiversity. Materials of the conference "Science for Biodiversity"]. Pp. 50-70. Oficyna Wydawnicza IE PAN, 1995.

Andrzejewski R., Babińska-Werka J. Bank vole populations: are their densities really high and individual home range small? Acta theriol., 31: 409-422, 1986.

Andrzejewski R., Babińska-Werka J. Czy nie lepiej zajrzeć do lasu? [Is not it better to visit the forest?]. Wiad. ekol., 34: 78-84. 1988.

Bezrodnyj S. V. O Sposobakh otlova son'. Vestn. zoologii 4: 84-85, 1990.

Bujalska G. Populacje nornicy rudej: czy rzeczywiście ich zagęszczenie jest małe a areały osobnicze duże? [Populations of the bank vole: is really their density low and home ranges small?]. Wiad. ekol. 34: 73-78, 1988.

Bujalska G. O zagęszczeniu populacji i areałach osobniczych nornicy rudej. [On populations and home ranges of the bank vole]. Wiad. ekol., 36: 213-218, 1990.

Gaisler J., Holas V., Homolka M. Ecology and reproduction of Gliridae (Mammalia) in Northern Moravia. Folia zool., 26: 213-228, 1977.

Głowaciński Z. (Ed). Polska czerwona księga zwierząt. [Polish Red Data Book of Animals]. PWRiL, Warszawa, 1992.

Grüm L. W sprawie pojęcia "areał osobniczy" i zasad porównywania jego charakterystyki. . [On the idea the "home range" and rules of camparing its characteristics]. Wiad. ekol., 34: 61-71, 1988.

Jurczyszyn M., Wołk K. The present of dormice (*Myoxidae*) in Poland. Nat. Croat. 7: 11-18, 1998.

Lozan M., Belik L., Samarskij S. Soni (*Gliridae*) yugo-zapada SSSR. Shtiintsa. Kishinev. Pp. 1-146, 1990.

Łonkiewicz B. A study on delimitation and management of the Białowieża Forest as a biosphere reserve - a synthesis of study results. In: P. Paschalis, K. Rykowski, S. Zajączkowski, (Eds). Protection of Forest Ecosystems Biodiversity of Białowieża Primeval Forest. Warsaw. Pp: 193-234. 1995.

Mitchell-Jones A., Amori G., Bogdanowicz W., Kryštufek B., Reijnders P. J. D., Spitzenberger F., Stubbe M., Thissen J. B. M., Vorhalík V., Zima J. The atlas of European mammals. Academic Press, T&A D Poyser for the *Societas Europaea Mammalogica*, Pp. 300-301, 1999.

Nowakowski W. K. The system of spatial distribution of *Dryomys nitedula* in the Białowieza Forest (Eastern Poland). IV Int. Conf. on Dormice, Turkey, Book of Abstracts. P. 32, 1999.

Nowakowski W. K., Boratyński P. Habitat Preferences of the forest dormouse (*Dryomys nitedula*) in lowland forests. III Int. Conf. on Dormice, Croatia, Book of Abstracts. P. 18, 1996.

Pucek Z. (Ed.). [Key to identification of Polish mammals]. Klucz do oznaczania ssaków Polski. PWN, Warszawa, 1984.

Pucek Z., Raczyński J. (Eds) Atlas rozmieszczenia ssaków w Polsce. [The atlas of distribution of mammals in Poland]. PWN, Warszawa, 1983.

Storch von G. Familie *Gliridae* Thomas, 1897 – Schläfer. In: Niethammer J., Krapp F. (Eds) Handbuch der Säugetiere Europas. Akademi Verlagsgesellschaft. Wiesbaden, vol. 1, Pp. 202-280, 1978.