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Localities of three rare mammal species in central and northeastern Poland

Grzegorz LESIŃSKI* and Jakub GRYZ**

*Department of Functional Food and Commodity, Warsaw University of Life Sciences – SGGW, Nowoursynowska 159 C, 02-787 Warsaw, Poland; e-mail: glesinski@wp.pl
**Division of Forest Zoology and Wildlife Management, Warsaw University of Life Sciences – SGGW, Nowoursynowska 159 C, 02-776 Warsaw, Poland; e-mail: Jakub.Gryz@wl.sggw.waw.pl

Abstract: Analyses of 69 collections of the tawny owls' pellets (28 containing over 100 prey items) revealed the presence of three rare mammal species on several localities in central and northeastern Poland: *Muscardinus avellanarius* (11 localities), *Sicista betulina* (3), and *Crocidura leucodon* (2). The obtained results supplemented data on their distribution close to the borders of continuous ranges. The Kampinos Forest was confirmed as important refuge of *M. avellanarius*, and the lower basin of the Biebrza Valley for both *M. avellanarius* and *S. betulina*.

Key words: *Crocidura leucodon*, *Muscardinus avellanarius*, *Sicista betulina*, distribution, tawny owl's pellets, Mazovia, Podlasie

INTRODUCTION

Studies of owls' diet give an information about the distribution of many species of small mammals (Pucek & Raczyński 1983). In central and northeastern Poland some species attain borders of their continuous range, including: northern birch mouse *Sicista betulina* (Pallas, 1778), common dormouse *Muscardinus avellanarius* (Linnaeus, 1758), and bicoloured white-toothed shrew *Crocidura leucodon* (Hermann, 1780). As the specific faunistic studies focused on their distribution in this part of Poland were not conducted, many localities have been discovered during other studies.

For the three mentioned species the Mazovia is a region where the limits of their ranges occur: the south-western or north-western (*S. betulina*, *M. avellanarius* – Pucek 1983a, b), and the northern (*C. leucodon* – Pucek & Michalak 1983). They reach the vicinity of the Warsaw city: *S. betulina* was recorded near its eastern borders (Lesiński et al. 1998), *M. avellanarius* slightly exceeds the city from the western side (Pucek 1983b), and *C. leucodon* was reported from the city at one isolated site (Luniak & Nowicki 1990). In the countries bordering on the north-eastern Poland, *M. avellanarius* and *S. betulina* are relatively common, while *C. leucodon* occurs only in Belarus (Krapp 1999, Morris 1999, Pucek 1999, Grišanov & Beljakov 2000). The presence of these species were often confirmed based on analyses of owl pellets (Dzjamjančyk 1988, Tišečkin 1997, Balčiauskienė 2005, Balčiauskienė et al. 2005).

The aim of this paper is to supplement data on the distribution of the above mentioned species of small mammals using the material of bone remains from the tawny owl's food.

MATERIAL AND METHODS

Study area mostly covered the Mazovia and Podlasie regions, and included a part of the Mazurian Lake District (central and north-eastern Poland, ca. 60,000 km^2). Tawny owl's pellets were collected from 1980 to 2007 at 69 sites, mostly (47) situated on the Mazovian Low-

land. Samples' collection was not specially aimed at finding the three analysed species, and took place in various habitats and regions. Samples with the presence of analysed species (14), and additionally those containing more than 100 vertebrate prey items (21), were taken into consideration. For each site the name and geographical coordinates were given. Species identification based on the skull characteristics presented by Pucek (1984). A bone material is usually damaged by tawny owls, and in some cases only mandibles were found.

Results

Distribution of localities

The presence of the mammal species under study was confirmed on the following localities (geographical coordinates, date of pellets' collection and number of individuals of each species were given – Fig. 1):

1. Biały Grąd (Kampinos National Park), 52°20'N, 20°48'E: 12.05.1983 – 1 *M. avellanarius*
2. Bobrowa near Białystok, 53°06'N, 23°21'E: 07.08.2007 – 4 *S. betulina*
3. Brzeźce, 51°39'N, 21°00'E: 18.07.2006 – 1 *M. avellanarius*
4. „Dęby Napiwodzkie" reserve, 53°31'N, 20°41'E: 22.05.2007 – 3 *S. betulina*
5. Dobarz (Biebrza National Park), 53°21'N, 22°36'E: 19.04.1987 – 1 *M. avellanarius*
6. Dziekanów Leśny (Kampinos National Park), 52°20'N, 20°50'E: 20.06.2000 – 1 *M. avellanarius*
7. Krzywa Góra (Kampinos National Park), 52°20'N, 20°25'E: 12.10.1995 – 1 *M. avellanarius*
8. Natolin near Nur, 52°38'N, 22°18'E: 28.07.2002 – 1 *C. leucodon*, 1 *M. avellanarius*; 31.05.2003 – 2 *C. leucodon*, 4 *M. avellanarius*; 03.07.2003 – 1 *M. avellanarius*; 30.04.2005 – 1 *M. avellanarius*; 17.06.2006 – 2 *M. avellanarius*; 08.06.2007 – 2 *M avellanarius*; 17.08.2007 – 1 *M. avellanarius*; 22.09.2007 – 1 *M. avellanarius*
9. Noski near Ceranów, 52°39'N, 22°12'E: 25.09.1999 – 1 *M. avellanarius*
10. Olszowa Droga (Biebrza National Park), 53°25'N, 22°35'E: 01.05.2005 – 2 *M. avellanarius*; 01.07 2005 – 1 *M. avellanarius*, 6 *S. betulina*; 24.06.2006 – 4 *S. betulina*; 09.07.2006 – 2 *M. avellanarius*, 6 *S. betulina*; 29.07.2006 – 2 *M. avellanarius*, 2 *S. betulina*; 08.06.2007 – 3 *M. avellanarius*, 9 *S. betulina*; 14.07.2007 – 2 *S. betulina*
11. Ponurzyca (Mazowiecki Landscape Park), 52°00'N, 21°24'E: 17.02.2002 Ponurzyca – 3 *M avellanarius*; 26.06.2002 – 2 *M. avellanarius*
12. Seroczyn, 52°34'N, 22°21'E: 08.07.1994 – 1 *C. leucodon*; 03.07.1996 – 5 *C. leucodon*; 03.07.1999 – 1 *C. leucodon*
13. Sowia Wola Folwarczna (Kampinos National Park), 52°21'N, 20°37'E: 09.09.2004 – 3 *M. avellanarius*; 30.05.2005 – 19 *M. avellanarius*; 10.10.2005 – 5 *M. avellanarius*; 01.10.2006 – 8 *M. avellanarius*
14. Zamczysko (Kampinos National Park), 52°18'N, 20°30'E: 04.2003 – 2 *M. avellanarius*; 11.2004 – 1 *M. avellanarius*; 27.10.2006 – 2 *M. avellanarius*

M. avellanarius was recorded on 11 localities, *S. betulina* on 3 localities, and *C. leucodon* on 2 localities (Fig. 1). The samples with more than 100 prey items, in which the three species were absent (sample size in brackets):

15. Białowieża park, 52°42'N, 23°50'E (246)
16. Buchnik Forest, 52°21'N, 20°55'E (305)
17. Jegiel, 52°35'N, 21°37'E (109)
18. Klembów "Dębina I" reserve, 52°24'N, 21°22'E (368)
19. Konstancin-Jeziorna, 52°03'N, 21°06'E (145)

20. Lipków, 52°16'N, 20°48'E (229)
21. Pniewo Wielkie, 52°56'N, 20°29'E (808)
22. Rogów, 51°49'N, 19°54'E (691)
23. Szpakowo Kolonia, 53°26'N, 22°51'E (116)
24. Szymaki, 53°26'N, 23°41'E (124)
25. Trzyrzeczki Forest, 53°41'N, 23°12'E (905)
26. Tustań, 52°30'N, 20°22'E (458)
27. Warsaw, Arkadia Park, 52°11'N, 21°01'E (186)

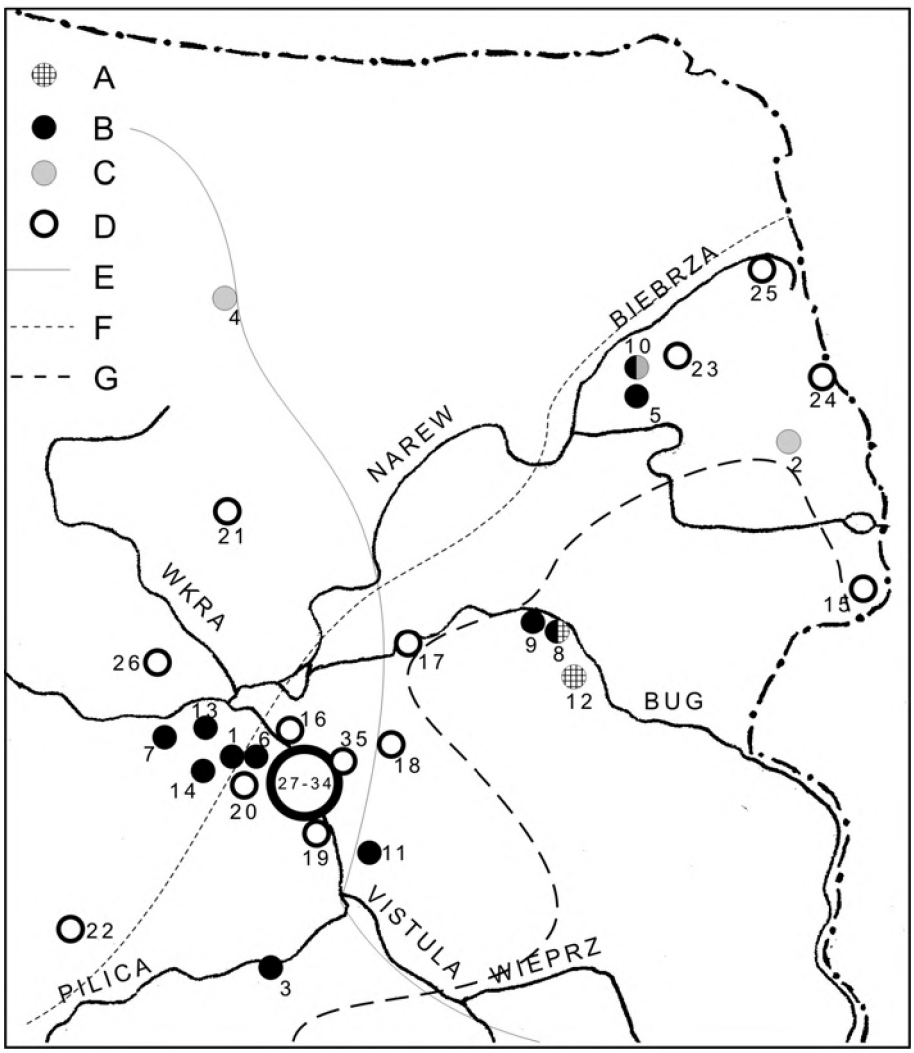

Fig. 1. Distribution of localities of the three analysed species and sites without them in central and northeastern Poland (numbered as in the text). Previously known geographic ranges of the three species (after Pucek 1984), as well as main rivers and the borders of Poland, are shown; A – *Crocidura leucodon*, B – *Muscardinus avellanarius*, C – *Sicista betulina*, D – sites without these 3 species; Limits of ranges: E – *Sicista betulina* (south-western), F – *Muscardinus avellanarius* (north-western), G – *Crocidura leucodon* (northern)

28. Warsaw, Bielany Park, 52°17'N, 20°57'E (262)
29. Warsaw, Kabacki Forest, 52°07'N, 21°03'E (386)
30. Warsaw, Łazienki Park, 52°12'N, 21°01'E (315)
31. Warsaw, Młociny Park, 52°18'N, 20°55'E (267)
32. Warsaw, Natolin Forest, 52°08'N, 21°04'E (173)
33. Warsaw, Sobieski Forest, 52°13'N, 21°09'E (281)
34. Warsaw, Wilanów Park, 52°09'N, 21°05'E (384)
35. Zielonka, 52°17'N, 21°10'E (1073).

Percent of the vertebrate prey

Among localities of *M. avellanarius*, relatively high percent of this species in the vertebrate prey was noted in the Biebrza and Kampinos National Parks and forests near Nur (3.3–3.9%). At one site the share of *S. betulina* was near 10%. Remarkable is also the presence of four individuals of the latter species in a small sample from Bobrowa. *C. leucodon* belongs to the least frequently caught by tawny owls in the study area with a relatively low proportion to other prey items (Table 1).

Table 1. The share of three mammal species among vertebrate prey in the tawny owl's diet at the study sites; for small samples (<40 ind.) the percent was not calculated.

Locality	Vertebrates total	*Muscardinus avellanarius*		*Sicista betulina*		*Crocidura leucodon*	
		N	%	N	%	N	%
1. Biały Grąd (Kampinos National Park)	15	1	–	0	0	0	0
2. Bobrowa near Białystok	15	0	0	4	–	0	0
3. Brzeźce	68	1	1.5	0	0	0	0
4. „Dęby Napiwodzkie" reserve	41	0	0	3	7.3	0	0
5. Dobarz (Biebrza National Park)	61	1	1.6	0	0	0	0
6. Dziekanów Leśny (Kampinos National Park)	281	1	0.4	0	0	0	0
7. Krzywa Góra (Kampinos National Park)	47	1	2.1	0	0	0	0
8. Natolin near Nur	491	18	3.7	0	0	3	0.6
9. Noski near Nur	8	1	–	0	0	0	0
10. Olszowa Droga (Biebrza National Park)	300	10	3.3	29	9.7	0	0
11. Ponurzyca (Mazowsze Landscape Park)	268	5	1.9	0	0	0	0
12. Seroczyn	610	0	0	0	0	7	1.1
13. Sowia Wola Folwarczna (Kampinos National Park)	903	35	3.9	0	0	0	0
14. Zamczysko (Kampinos National Park)	118	5	4.2	0	0	0	0

Discussion

The results of studies on the tawny owl's diet published to date revealed several localities of rare mammal species in the study area. Large samples from the Białowieża Forest contained such species as: *Sorex caecutiens*, *Neomys anomalus*, *Dryomys nitedula*, *Glis glis*, *S. betulina* (Ruprecht & Szwagrzak 1987, Jędrzejewski et al. 1994). *M. avellanarius* was discovered in the Kampinos Forest (Goszczyński et al. 1993), in the Romincka Forest (Żmihorski & Osojca 2006), and *S. betulina* in the Pisz Forest (Kowalski 1961), near the Łuknajno Lake (Kowalski & Lesiński 1988), close to the eastern borders of Warsaw (Lesiński et al. 1998), and in the Romincka Forest (Osojca & Żmihorski 2004, Żmihorski & Osojca 2006).

The material presented in this paper supplemented data on the distribution of *M. avellanarius*. The Kampinos and Biebrza National Parks were confirmed as important refuges of this species (Pucek 1983b, Raczyński et al. 1984, Andrzejewski 2003, Sterzyńska & Lesiński 2004). Forests near Nur appeared to be a new locality, as well as Brzeźce and Ponurzyca. Localities from the western part of the Kampinos Forest slightly correct previously known limit of its range. The absence of this species in large samples collected on the Płońsk and Ciechanów Plains (Tustań, Pniewo Wlk.) suggests that these areas lie out of its range, and confirms earlier opinions (Pucek 1983b).

M. avellanarius is relatively easily captured by tawny owls. Its absence in a sample of 368 vertebrates from the Klembów "Dębina I" reserve, that is characterized by a presence of suitable habitats (tree stands dominated by *Quercus robur* and *Carpinus betulus*), could suggest that this forest area is too small and isolated from other localities. Remarkable is also the absence of *M. avellanarius* in parks of Warsaw and suburban forests (see also Goszczyński et al. 1993, Gryz et al. in press), which indicates its sensitivity to a high level of urbanization. However, in the regions with more abundant populations, it was recorded in the peripheral zone of a large city, e.g. in Vilnius (Baranauskas 2005). It seems probable that in central and eastern Mazovia this species prefers wet forests. Many of its localities were situated at sites with a presence of such habitats.

Two new localities of *S. betulina* (Olszowa Droga, Bobrowa) are situated inside a known range, and the third one on its limit, just a few kilometers from the previously discovered locality (the Czarne Lake, 53°32'N, 20°38'E – Pucek 1983a). The lack of this species in many samples from the Kampinos National Park indicates that this wooded area, rich in wetlands, lies out of its range. In the vicinity of Warsaw it probably does not exceed the Vistula river, though the closest locality is known only 10 km apart (Lesiński at al. 1998).

C. leucodon is a synanthropic species connected with the vicinity of human settlements (Krapp 1999), and consequently rarely caught by a tawny owl. Only some individuals of this owl living in habitats situated out of forests have an opportunity to find that prey. The range of *C. leucodon* mostly covers the eastern part of the Mazovia (Pucek 1983b), which reflects its presence in the material under study only from that area. The occurrence of this species in Warsaw (Luniak & Nowicki 1990) was not confirmed in many large samples of the tawny owl's prey from that area (sites 27–34, Fig. 1), which could suggest even extinction of that probably small and isolating population.

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STRESZCZENIE

[Stanowiska trzech rzadkich gatunków ssaków w środkowej i północno-wschodniej Polsce]

Analiza 69 zbiorów zrzutek puszczyka *Strix aluco* (w tym 28 zawierających powyżej 100 ofiar) wykazała obecność trzech rzadkich gatunków ssaków na Mazowszu i Podlasiu: orzesznicy *Muscardinus avellanarius* (11 stanowisk), smużki leśnej *Sicista betulina* (3) i zębiełka białawego *Crocidura leucodon* (2). Stwierdzone stanowiska uzupełniają dane na temat ich występowania w pobliżu granicy zasięgu i pozwalają na korektę przebiegu tej granicy w przypadku orzesznicy w okolicach Warszawy. Stwierdzono, że niektóre obszary stanowią ważne ostoje tych ssaków: Puszcza Kampinoska – orzesznicy, natomiast Dolina Biebrzy – zarówno orzesznicy, jak i smużki leśnej.

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