Localities of three rare mammal species in central and northeastern Poland

Grzegorz Lesinski* 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 owl’s 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, Tiščekin 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 km²). Tawny owl’s pellets were collected from 1980 to 2007 at 69 sites, mostly (47) situated on the Mazovian Low-

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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 identi-
fication based on the skull characteristics presented by Pucek (1984). A bone material is usu-
ally 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. Brzeżce, 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. Dzianeków Leśny (Kampinos National Park), 52°20'N, 20°50'E: 20.06.2000 – 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 Czeranów, 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. Ponsruzyc (Mazowiecki Landscape Park), 52°00'N, 21°24'E: 17.02.2002 Ponsruzyc –
    3 M avellanarius; 26.06.2002 – 2 M. avellanarius
12. Sroczyn, 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
    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. Klembow “Dębina I” reserve, 52°24'N, 21°22'E (368)
19. Konstancin-Jeziorna, 52°03'N, 21°06'E (145)
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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)

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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.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Vertebrates total</th>
<th><em>Muscardinus avellanarius</em></th>
<th><em>Sicista betulina</em></th>
<th><em>Crocidura leucodon</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>1. Biłgoraj (Kamino National Park)</td>
<td>15</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. Bobrowa near Białystok</td>
<td>15</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3. Brzeźce</td>
<td>68</td>
<td>1</td>
<td>1.5</td>
<td>0</td>
</tr>
<tr>
<td>4. „Dęby Napiwodzkie” reserve</td>
<td>41</td>
<td>0</td>
<td>3</td>
<td>7.3</td>
</tr>
<tr>
<td>5. Dobary (Biebrza National Park)</td>
<td>61</td>
<td>1</td>
<td>1.6</td>
<td>0</td>
</tr>
<tr>
<td>6. Dziekanów Leśny (Kamino National Park)</td>
<td>281</td>
<td>1</td>
<td>0.4</td>
<td>0</td>
</tr>
<tr>
<td>7. Krzywa Góra (Kamino National Park)</td>
<td>47</td>
<td>1</td>
<td>2.1</td>
<td>0</td>
</tr>
<tr>
<td>8. NATolin near Nur</td>
<td>491</td>
<td>18</td>
<td>3.7</td>
<td>0</td>
</tr>
<tr>
<td>9. Noski near Nur</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10. Obzowa Droga (Biebrza National Park)</td>
<td>300</td>
<td>10</td>
<td>3.3</td>
<td>29</td>
</tr>
<tr>
<td>11. Pomyczyn (Mazowsze Landscape Park)</td>
<td>268</td>
<td>5</td>
<td>1.9</td>
<td>0</td>
</tr>
<tr>
<td>12. Sroczyn</td>
<td>610</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13. Sowa Wola Folwarcza (Kamino National Park)</td>
<td>903</td>
<td>35</td>
<td>3.9</td>
<td>0</td>
</tr>
<tr>
<td>14. Zameczysko (Kamino National Park)</td>
<td>118</td>
<td>5</td>
<td>4.2</td>
<td>0</td>
</tr>
</tbody>
</table>
**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 & Szwagrzyk 1987, Jędrzejewski et al. 1994). *M. avellanarius* was discovered in the Kamoppins Forest (Goszczyński et al. 1993), in the Romincka Forest (Zmihorski & 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 & Zmihorski 2004, Zmihorski & 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, Ruczyński et al. 1984, Andrzejewski 2003, Sterzyńska & Lesiński 2004). Forests near Nur appeared to be a new locality, as well as Brzeźce and Ponomrzyca. Localities from the western part of the Kamoppins 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 (Barauskas 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 Czame Lake, 53°32’ N, 20°38’ E – Pucek 1983a). The lack of this species in many samples from the Kamoppins 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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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 S感激etta 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 ostoję tych ssaków: Puszcza Kampinoska – orzesznicy, natomiast Dolina Biebrzy – zarówno orzesznicy, jak i smużki leśnej.

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