STUDIA UNIVERSITATIS BABEŞ-BOLYAI BIOLOGIA, 66, 2, 2021 (p. 85-92)
doi:10.24193/subbbiol.2021.2.05

=== SHORT COMMUNICATION ===

What is for dinner? Qualitative and quantitative data regarding small mammal species identified in pellets of long-eared owl (*Asio otus*) from Cluj-Napoca

Ana-Maria Neacă[1]✉, Anca-Ioana Margea[2] and Alexandru N. Stermin[1]

[1]Babeş-Bolyai University, Faculty of Biology and Geology, Department of Taxonomy and Ecology, Cluj-Napoca, Romania; [2]Iuliu Haţieganu University of Medicine and Pharmacy, Faculty of Medicine, Department of Clinical Laboratory, Cluj-Napoca, Romania;
✉***Corresponding author, E-mail: neaca.anamaria@gmail.com***

Article history: Received 19 October 2020; Revised 23 November 2020; Accepted 5 November 2021; Available online 30 December 2021.

Abstract. Analysis of pellets provides information on the prey distribution, abundance, behavior and trophic relationships between Strigiformes and small mammals. By analyzing the skulls from long-eared owl (*Asio otus*) pellets, collected from a colony located in the Mercur Park, in Cluj- Napoca, Romania, we aimed to identify the small mammal species and to compare the results with available ones from another study conducted 2 years ago in the same area. During 7 collecting campaigns (November 2018 to March 2019) in 538 pellets a total of 1290 skulls were identified. Over the study period, the colony increased from 10 to 40 birds. Six species of small mammals were identified: the field striped mouse (*Apodemus agrarius*), the yellow-necked mouse (*Apodemus flavicollis*), the wood mouse (*Apodemus sylvaticus*), the European water vole (*Arvicola terrestris*), the field vole (*Microtus agrestis*) and the common vole (*Microtus arvalis*). Compared with the previously study, a new species was identified: the yellow-necked mouse and another one was missing: the bank vole (*Myodes glareolus*).

Keywords: Strigiformes, diet, rodents, anthropogenic impact

Introduction

Pellet analysis is a valid method used in the field of owl ecology to obtain data on the small mammals' species. The pellets provide information of the prey distribution, abundance or behavior. Moreover, the trophic relationships between Strigiformes and small mammals can be assessed, as the diet composition of these birds have geographical and climatic variations (Selçuk *et al.,* 2017).

Long-eared owl (*Asio otus* Linnaeus, 1758) is spread throughout Europe, North-West Africa, Asia and North America. In Romania, long-eared owl is one of the most wide-spread strigiform species (Marks *et al.,* 1994; Halici and Stermin, 2020). The populations from the northern parts of its range are migratory and those from the southern and western are sedentary (Cramp and Simmons, 1985). Typical of the long-eared owl is that they form large wintering colonies, in urban and suburban areas, where they can find a stable source of food, protecting themselves more easily against weather conditions and potential predators (Cramp and Simmons, 1985; Galli *et al.,* 2015; Lövy and Riegert, 2013, Moga *et al.,* 2005; Halici and Stermin, 2020).

Long-eared owl diet is made up of 90% of voles, but they can eat sparrows or other birds when the preferential small mammals are low in numbers (Iozon *et al.,* 2002).

Undigested food is relapsed in the form of pellets that contain mostly rodent residues. The pellets have round margins as well as a round surface. Their dimensions can reach 4.8 cm in length and 2.5 cm in thickness at most. Pellets are found in large numbers during winter when the owls gather in groups (Olsen, 2019).

Comparative analysis of the data obtained on long term studies can provide new insights into the structure of animal communities and the changes that occur in population features in relation to bioclimate (Tores and Yom-Tov, 2003). Therefore, understanding the diet of these birds, as well as the dynamics of the predated species are key elements in conservation efforts (Iozon *et al.,* 2002; Birrer, 2009).

In this context, the aims of our study were: (i) to evaluate the number of pellets and the skulls collected from the colony over the wintering periods (ii) to identify the small mammal species by skull analysis and (iii) to compare the results with data collected from another study conducted 2 years ago in the same area (Margea, 2018).

Study area

The colony was located in the Mercur Park, from Gheorgheni district in Cluj-Napoca on Detunata alley at 46° 76' N, 23° 62' E, behind the Mercur Complex, but also next to it at 46° 46' N and 23° 37' E. This whole area is

considered „an urban forest", frequented daily by the elderly who walk their pets. The identification of the colonies was performed with the help of the locals who are familiar with the presence of owls in the area as the colony gathers there every year.

The vegetation in that area is dominated by pines (*Pinus*). This is one of the long-eared owls preferred species, thus becoming a place frequented annually by them.

Materials and methods

Field data were collected from November 2018 to March 2019. At each campain the long-eared owls located on the study area were counted and all the pellets collected. Observations were made during the day light to increase the possibility of locating birds in the resting site.

The collected pellets were dried in paper-covered trays. The pellets were measured in length and width using a ruler and a bow compass.

Each bone from the pellets was separated and cleaned with tweezers. The skulls and the mandibles found were also separated according to the date and location for further examination.

The skeleton parts from samples were analyzed using a binocular magnifier (Optika) and a rodent determinator, based on the dentition, using the book Mammals of Poland (Pucek, 1981).

The distinction between the species: the field striped mouse (*Apodemus agrarius*), the yellow-necked mouse (*Apodemus flavicollis*), the wood mouse (*Apodemus sylvaticus*) was based on the differences in their dentition according to Pucek, 1981.

Results and Discussions

A total of seven collecting campaigns were carried out in the Mercur Park area from November 2018 to March 2019. Over the study period, the colony increased from 10 to 40 individuals.

During the five months, a total number of 538 pellets were collected. The maximum number of pellets (n= 222) was recorded in January 2019, with a strong increase from November (n = 9) followed by a slow decline in February (n = 180) and March 2019 (n = 127) (Fig. 1). The small number of pellets collected in December can be explained by the fact that the samples were collected in early December (09 December 2019) when the birds had not yet settled in the area.

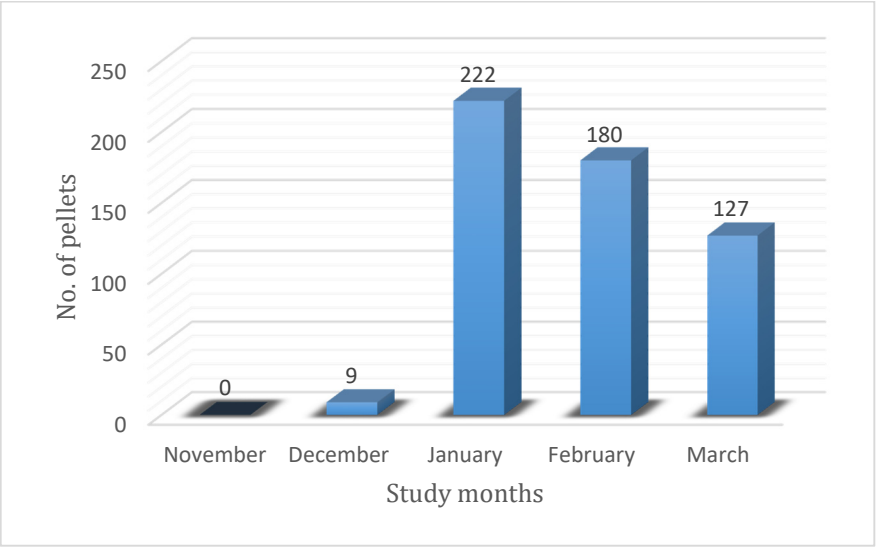

Figure 1. The monthly dynamics of the number of colected pellets.

A total of 1290 skulls were identified in the pellets during our study, with a minimum of 14 (December) and a maximum of 576 (February) (Tab. 1, Fig. 2).

Table 1. The minimum, maximum and standard deviation (S.D.) of the number of collected pellets and skulls during the months when the samples were identified on the field (December, January, February, March)

	Pellets	**Skulls**
min.	9	14
max.	222	576
med.	115.5	295
S.D.	100.01	247.29

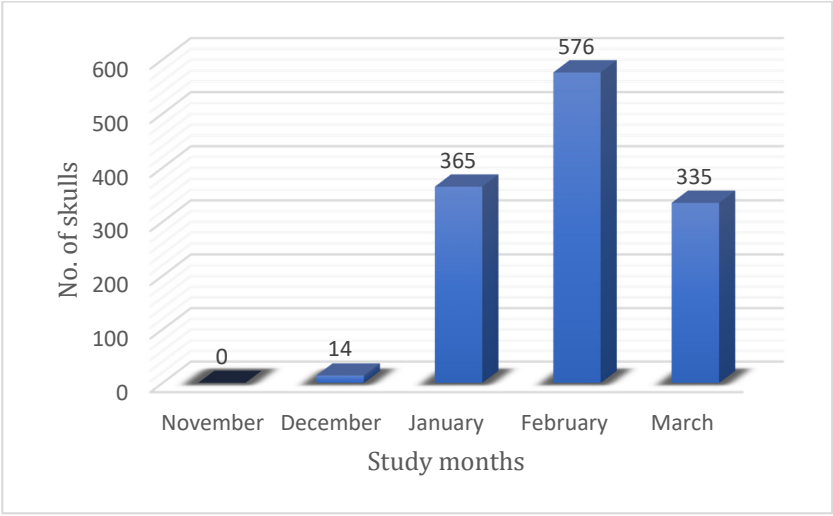

Figure 2. The monthly dynamics of the number of skulls

Six species of small mammals were identified: the field striped mouse (*Apodemus agrarius*), the yellow-necked mouse (*Apodemus flavicollis*), the wood mouse (*Apodemus sylvaticus*), the European water vole (*Arvicola terrestris*), the field vole (*Microtus agrestis*) and the common vole (*Microtus arvalis*). The common vole (82.96%) was predominant, followed by the yellow-necked mouse (10.32%) (Tab. 2). The previously recorded data (Margea, 2018) showed similar number of taxa but with differences in species: the field striped mouse, the wood mouse, the European water vole, the bank vole (*Myodes glareolus*), the field vole and the common vole, mainly the common vole and the field vole.

Table 2. The number of individuals from each species identified in the months when the samples were identified on the field

	December	January	February	March
Apodemus agrarius	0	21	20	2
Apodemus flavicollis	4	40	45	17
Apodemus sylvaticus	0	4	6	0
Arvicola terrestris	0	0	6	1
Microtus agrestis	0	12	3	1
Microtus arvalis	5	221	437	195

Comparing our results with the previously one, in our study a new species was identified: the yellow-necked mouse and another one was missing: the bank vole (Tab. 3).

Table 3. The precence (+) and absence (-) of small mamal species determined in the two studies

Species	2016 – 2017 (Margea, 2018)	2019 - 2020
Apodemus agrarius	+	+
Apodemus flavicollis	-	+
Apodemus sylvaticus	+	+
Arvicola terrestris	+	+
Microtus agrestis	+	+
Microtus arvalis	+	+
Clethrionomys glareolus	+	-

Analyzing the number of species related to the time periods, in November, there were no pellets recorded and after the birds began to gather in the colony, the low number of small mammal species was identified in December (n = 2) and the maximum number in February and March (n = 6) (Tab. 2).

The most predominant species was the common vole (n = 858) followed by the yellow-necked mouse (n = 106) and the least common was the European water vole (n = 7). The minimum number of individuals was found in December and March, indicating the periods when the owls returned to, respectivly left Cluj-Napoca.

With a percentage of about 82.96%, the predominant species in the diet of long eared-owls is the common vole, similar with the previous study – 91.19% (Margea, 2018). Another numerous species between November 2018 and March 2019 was the yellow-necked mouse (10.32%), unlike the previous study (Margea, 2018) where during the winter of 2016 - 2017 the field vole (6.22%) was the second species encountered. The species with the lowest percentages are represented by the wood mouse (0.97%) and the European water vole (0.10%) in the current study while in the previous one, the field striped mouse (0.26%), the European water vole (0%) and the bank vole (0.52%).

A major difference between the two studies is the presence of the bank vole in the previous one. The bank vole prefers forest habitats and coastal areas, being a rare presence near the cities (Benedek, 2014). A possible explanation for their observation near the city is the increase in the density of the area or the need for food in the conditions of a harsh winter. Also, the bank vole may be present in the pellets in 2017 and absent in 2020 because of a sampling error given the low number of pellets collected. To observe if it is a real change in the small mammal community further research is needed.

Following the analysis of the pellets, three skulls of shrews and a beak of a common chaffinch (*Fringilla coelebs*) were discovered, along with some remains of plastic bags and cigarette filters. Birds are an alternative source of food for the long-eared owls and the remains of materials (plastic and cigarette filters) indficate that the urban environment in which the long-eared owls settled shows signs of pollution.

The factors that influence the presence or absence of some species in the diet of long-eared owls be a long and harsh winter and the anthropogenic impact on the wintering habitats. Moreover, climate influences the availability of food. To survive, long eared-owls adapt by changing their diet or extending their hunt ground. The plastic found in the pellets present an alarm sign as the polluting behaviour of humans affect the quality of food ingested by the long-eared owl.

Conclusions

The qualitative analysis of pellets, revelead that the diet of long-eared owl from the colony in Cluj-Napoca was composed of six species: the field striped mouse, the yellow-necked mouse, the wood mouse, the European water vole, the field vole and the common vole. The yellow-neck mouse is a species in addition to the previous study.

The diversity of the owl's diet is indicated by the presence of shrews skulls and the beak of a common chaffinch. Also, the impact of human activity is observed through the plastic remains found in the pellets.

Taking into account our results and the previous study (Margea, 2018), the presence or absence of some species in the diet of long-eared owls present in the Mercury Park area depends on a variety of factors. Those factors could be the climate - a long and harsh winter and the anthropogenic impact on the wintering habitats.

References

Benedek, A. M. (2014). Comunităţi de mamifere mici (ordinele *Soricomorpha* şi *Rodentia*) din Transilvania. *Ed. Universităţii "Lucian Blaga"*, Sibiu, pp. 284

Birrer, S. (2009). Synthesis of 312 studies on the diet of the long-eared owl (*Asio otus*), *Ardea*, *97*, 4, 615.

Cramp, S., & Simmons, K. (Eds.) (1985). The Birds of the Western Palearctic, volume 4. *Oxford University Press*, Oxford, pp. 97.

Galli, L., Baroni, D., Gelli, I., Launo, S., Puppo, C., & Rossi, R. (2015). Data about Long-eared owl *Asio otus* diet in a winter roost in Imperia (Western Liguria, North Italy) and notes on their daily activity cycle. *Boll. Mus. Ist. Biol. Univ. Genova*. *77*, 72-83.

Halici, M., & Stermin, A. N. (2020). Colonial wintering of Long - eared owl (*Asio otus*) in Botoşani County (N-E, Romania). *Studia Biologia* UBB, *65*, 1, 83 – 92.

Iozon, D., Dinea M., Georgescu, B., Helgiu, A., & Câmpean, D. (2002). Sistematica şi ecologia păsărilor, *Risoprint*, Cluj-Napoca, pp. 279.

Lövy, M., & Riegert, J. (2013). Home Range and Land Use of Urban Long-eared Owls. *The Condor*. *115*, 3, 551-557.

Margea, A. I. (2018). Studii calitative şi cantitative privind speciile de micromamifere identificate pe baza craniilor în ingluviile de ciuf de pădure (*Asio otus*) colectate în municipiul Cluj-Napoca. Bachelor thesis, Babeş – Bolyai University.

Marks, J. S., Evans, D. L. & Holt, D. W. (1994). Long-eared Owl (*Asio otus*). In *The Birds of North America*, Poole, A. F., Gill. F. B. (Eds). Cornell Lab of Ornithology, Ithaca, NY, USA.

Moga, C. I., David, A., Harteli, T., & Coroiu, I. (2005). Trophic spectrum of long-eared owl *Asio otus* during a winter lacking significant snow cover. *Biota*. *6,* 1-2, 43-48.

Olsen, L. -H. (2012). Animale şi urmele lor, *Mast*, Bucureşti, pp. 273.

Pucek, Z. (1981). Mammals of Poland. *Ed. Polish Scientific Publishers*, Warsaw, pp. 367.

Selçuk, A., Bankoğlu, K., & Kefelioğlu, H. (2017). Comparison of winter diet of Long-eared owls *Asio otus* (L., 1758) and Short-eared owls *Asio flammeus* (Pontoppidan, 1763) (Aves: Strigidae) in Northern Turkey. *Acta Zoologica Bulgarica*, *69*, 345-348.

Tores, M., Yom-Tov, Y. (2003). The diet of the Barn owl *Tyto alba* in the Negev Desret. *Israel Journal of Zoology*, *49*, 223-236.