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# A DIET OF THE LONG-EARED OWL *ASIO OTUS* L. 1758 IN WEST BAČKA (VOJVODINA, YUGOSLAVIA)

J. J. PURGER, LJUBICA KRSMANOVIĆ

*Institute of Biology*, 21000 Novi Sad, Yugoslavia

*Abstract* — The analysis of 569 whole pellets of the long-eared owl, collected in the village Doroslovo (West Bačka) in the autum-winter period 1987/88 was performed. A considerable role of small mammales (98.48%), with the dominance of *Microtus arvalis* (70.67%) in the diet of the owl was established. The presence of a *Microtus agrestis* skull is another finding of this species in West Bačka. This result confirmed the value of pellet analysis, in the research of terriofauna.

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## INTRODUCTION

The diet of the birds and many other animal species, is rather well known at present. Numerous researches in our country and in the world, were directed towards examinations of the kind of prey or source of food, so that for many species the trophic niche is precisely known. Much less studies were devoted to the energetic requirements of particular species, or the energetic values of food. In this connection, the data on inter-relations of predator and prey, and especially on the energetic budget stages in the ecosystem are very scarce. The nutrient spectra for particular species represent an important part of the problem related to metabolism of an ecosystem. In this work the results of the long-eared owl pellets, analysis are reported with the hope that they might be used in a planned and general research of terriofauna and ecology of small mammals in ecosystems of West Bačka.

## MATERIAL AND METHODS

The trophic niche of the long-eared owl in the autumn-winter period was established through the pellets analysis. Pellets were collected in the center of Doroslovo village, where owls are gathering for more than twenty years. Their daily resting places were on birch

trees and different species of conifers planted around the church and in a nearby village yard. The long-eared owls find shelter in the branches and leaves of trees, and their permanent gathering each winter became a habit, so that the villagers do not distrub them. In such a situation it was easy to collect pellets discharged by the owls after the hunt. They were collected five times during autumn and winter of 1987 and 1988, dried and measured, and their content, was determined by dry technique (Schmidt 1967; Mikuska *et al.* 1977). Upon removal of hair, the determination of skeletal elements proceeded. The identification of prey, especially mammals, was performed on the basis of diagnostic characters of the skull and mandible using a binocular (Schmidt 1967; Niethammer and Krapp 1978, 1982). A part of the material related to subgenus *Sylvaemus* was determined on the basis of scatter diagram, constructed from the ratio of *formen incisivum* length (FI) and upper toothrow ($IM^3$) of undamaged skulls (Tvrtković 1979). This was confirmed by comparison with the trapped specimens. Some of the skulls of mammals and birds could not be determined due to serious damages and the lack of material for comparison. Such material was divided into several taxonomic categories *(Aves, Muridae, Apodemus* sp.).

## RESULTS

During the time period from September, 1987 — February, 1988, long-eared owl pellets were colected five times. Their number varied from case to case (Tab. 1), most probably due to different numbers and activities of the birds. During collection of the pellets number of the owls was approximately determined and it was increasing from September to January (from 20 to 105) while in February it

**Table 1. Data on collected material**

| Date of collection | Number of pellets | Pellets' weight X ± SE (g) | Number of prey | Number of prey per pellets |
|---|---|---|---|---|
| 27. 09. 1987. | 30 | 2.34 ± 0.10 | 64 | 2.13 |
| 17. 10. 1987. | 26 | 2.59 ± 0.14 | 56 | 2.15 |
| 7. 11. 1987. | 77 | 2.59 ± 0.07 | 172 | 2.23 |
| 2. 01. 1988. | 273 | 3.12 ± 0.05 | 613 | 2.24 |
| 14. 02. 1988. | 163 | 3.49 ± 0.07 | 411 | 2.52 |
| Total | 569 | 3.09 ± 0.03 | 1316 | 2.31 |

was reduced to 73, illustrating the formation and sustainance of the winter colony. A total of 579 whole pellets were investigated, the average weight being 3.09 *g* (Tab. 1). The number of registered skulls serving as an indicator for the prey number, varied from 1 to 7. The average number of skulls per pellet was 2.31, and it did not vary considerably in relation to the period of collecting. Somewhat larger weight of pellets in January and February, comparing to previous months, and the insignificantly larger number of skulls *per* pellet, could be explained by differences in weight of the osteologic material of different kinds of prey.

The analysis of pellet contents, based on the skulls present showed a heterogeneity in regard to both represented groups and the kind of prey. However, out of 1316 registered skulls, 1296 belonged to mammals, 19 to birds and residues of the jaw apparatus and chitin-of an insect. These data indicate that the quantitative participation of small mammals skulls in the total sample, is exceptionally high (98.48%), while the participation of birds and insects (1.44%, 0.08%) is almost negligable.

On the basis of differential characters, it was established that the skulls of *Arvicolidae* (70.74%) were dominant in the samples. A smaller number of *Muridae* skulls (27.66%) and only one skull of *Soricidae* (0.08%) were registered, as well.

Further analysis indicated that common vole skulls *Microtus arvalis* (Arvicolidae) were the most numerous in the pellets. Although the cranial part of the skull was damaged, the frontal part and the toothrow were well preserved. It was easy to notice that the pattern of $M^2$ is typical of *M. arvalis,* with an anterior loop and three alternating triangles. In one pellet, collected in February, a skull with the mandible was found. The upper toothrow, and especially the $M^2$ was analysed in detail (Fig. 1). An additional triangle T5 was developed in the lingual side of $M^2$. On the molars ($M^2$) of both side, the dentine field of T5 was perfectly closed, what is typical and diagnostic of *Microtus agrestis.*

The values of other characters of this skull were as it follows:

— length of upper molars ($M^{1-3}$)= 7.05 *mm*
— lenght of lower molars ($M_{1-3}$) = 6.15 *mm*
— diastema length = 7.50 *mm*
— length of foramen incisivum = 4.80 *mm*
— zygomatic width = 14.35 *mm*
— interorbital width = 3.70 *mm*

These characters also confirmed that the skull belonged to *Microtus agrestis.* So it was demonstrated again that the meadow vole is spread in West Bačka, and that the analysis of pellets represents a good additional method in the study of terriofauna. Parts of *Muridae* skulls were considerably damaged, so that determination

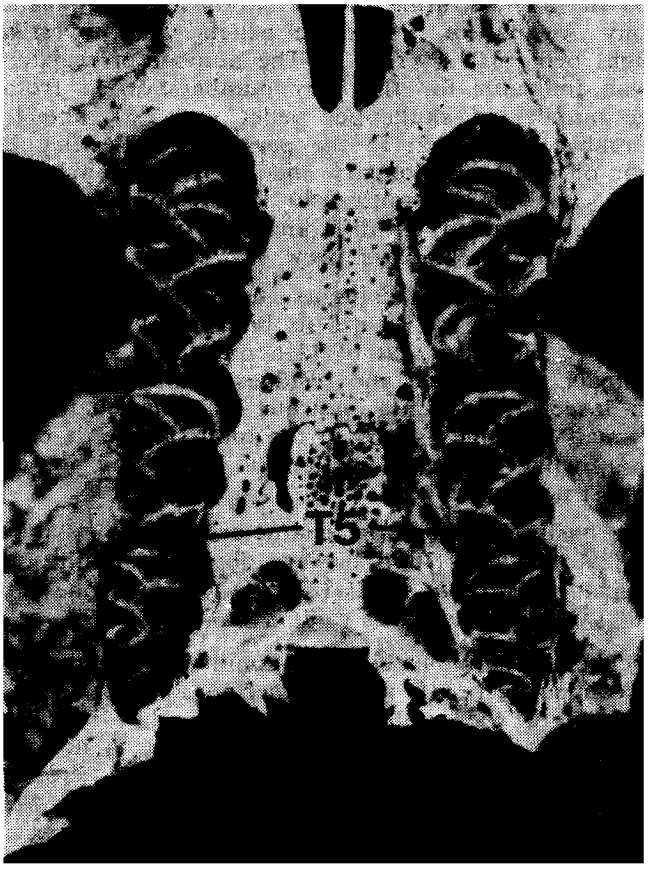


Fig. 1. Upper molars of *Microtus agrestis*.
Picture taken by J. J. Purger & B. Tallósi.

of either the species or the genus, was impossible to perform. These skulls made only 2.28% of the total sample. Some other skulls were well preserved enabling the length measurements (FI, $IM^3$). The values obtained were used to construct the scatter diagram and to separate species of the subgenus *Sylvaemus*. The diagram consisted of three groups of points, corresponding to those obtained on the basis of the trapped small mammals specimens (Krsmanović and Purger 1988). This was an evidence for the presence of *Apodemus sylvaticus*, *A. flavicollis* and *A. microps* skulls. The skulls of *A. sylvaticus* were more numerous (7.60%) in relation to the total sample, but also in relation to *A. flavicollis* and *A. microps*, whose participation in the content of the pellets was not considerable (1.30%, 0.30%, respectively). Somewhat higher number of skulls (6.15%), was impossible to determine due to the damage in the frontal part, so they

**Table 2. Number and percentual ratio of prey in pellets of the long-eared owl**

| Date of collection | Mammalia | | | | | | Total | | Aves | | Insecta | | Total number of prey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Soricidae* | | *Arvicolidae* | | *Muridae* | | | | | | | | |
| | n | % | n | % | n | % | n | % | n | % | n | % | |
| 27. 09. 1987. | — | — | 54 | 84.38 | 9 | 14.06 | 63 | 98.44 | 1 | 1.56 | — | — | 64 |
| 17. 10. 1987. | — | — | 48 | 85.71 | 7 | 12.50 | 55 | 98.21 | 1 | 1.79 | — | — | 56 |
| 7. 11. 1987. | — | — | 155 | 90.11 | 12 | 6.98 | 167 | 97.09 | 5 | 2.91 | — | — | 172 |
| 2. 01. 1988. | — | — | 403 | 65.74 | 203 | 33.12 | 606 | 98.86 | 6 | 0.98 | 1 | 0.16 | 613 |
| 14. 02. 1988. | 1 | 0.24 | 271 | 65.94 | 133 | 32.36 | 405 | 98.54 | 6 | 1.46 | — | — | 411 |
| Total | 1 | 0.08 | 931 | 70.74 | 364 | 27.66 | 1296 | 98.48 | 19 | 1.44 | 1 | 0.08 | 1316 |

n = Number of specimens

**Table 3. Qualitative and quantitative contents of the long-eared owl diet**

| Prey | Number | % |
|---|---|---|
| MAMMALIA | | |
| *Crocidura suaveolens* | 1 | 0.08 |
| *Microtus arvalis* | 930 | 70.67 |
| *Microtus agrestis* | 1 | 0.08 |
| *Apodemus flavicollis* | 17 | 1.30 |
| *Apodemus sylvaticus* | 100 | 7.60 |
| *Apodemus microps* | 4 | 0.30 |
| *Apodemus* sp. | 81 | 6.15 |
| *Apodemus agrarius* | 28 | 2.12 |
| *Rattus norvegicus* | 1 | 0.08 |
| *Mus* sp. | 103 | 7.82 |
| *Muridae* | 30 | 2.28 |
| AVES | | |
| *Passeriformes* (indet.) | 19 | 1.44 |
| INSECTA | | |
| *Coleoptera* (indet.) | 1 | 0.08 |
| Total | 1316 | 100.00 |

were classified into the group *Apodemus* sp. It is certain that these skulls belong to subgenus *Sylwaemus* thanks to well preserved molars, but the length $M^{1-3}$ was not sufficient to classify the mentioned species.

The skulls of *A. agrarius* were easy to differr from other species of the genus *Apodemus* by the level of molars and the skull roof, bu their participation in the total sample was unimportant (2.12%). Out of the total skull number, 7.82% belonged to the genus *Mus*. The determination up to the species was not made, due to certain taxonomic vagueness in the available literature. It should be pointed out that a smaller number of skulls (n = 5) did not have notched incisors, although other characters of the genus *Mus* were registered (arrowlike penetration of pariethal bones into frontal bones, characteristic foramen incisivum etc.). One skull of *Rattus norvegicus* (Muridae), and one of *Crocidura suaveolens* (Soricidae) were recorded in the total sample, indicating that these representatives of small mammals are not important for the diet of long-eared owl (Tab. 3).

## DISCUSSION

On the basis of pellet contents analysis, it was ascertained that small mammals dominate in the diet of long-eared owl. The participation of birds in the autumn-winter diet was somewhat lower comparing to the data mentioned in the literature (Schmidt 1975; Mikuska 1979). This is probably a consequence of high numerical value of available small mammals, that is, sufficient quantity of prey of primary importance. A higher importance of insects in the diet could not be expected, since insects rest during the winter although some other authors reported a low affinity, of the long-eared owl for this kind of prey during the year. The long-eared owl in its winter diet, most frequently uses common vole *(Microtus arvalis, Arvicolidae)*, while other species of *Muridae* represent a compensatory or additional prey. The participation of compensatory food sources, increasing in January and February was also recorded by Simeonov and Petrov (1986) in the winter diet of the long-eared owl in Bulgaria. According to these authors, the increased number of *Muridae* and *Aves* remnants in pellets, is the consequence of reduced activity of voles, in the period of high snow. This statement is acceptable, but it is also logical to beleive that this phenomenon is the consequence of changed inter-relations between the predator and the prey. Namely, during winter, according to our data, the reproduction in the population of voles ceases, so that their number remains about unchanged. On the other hand, the colony of long-eared owls increases continually, so that it could be concluded that the relative number of voles decreases (having in mind the participation of voles in the diet, in September, October, and November, Tab. 2). Limited in their movements, the long-eared owls are, compelled to hunt other kinds of prey in January and February, such as different species of *Muridae*. The confirmation for such an assumption could be obtained by following the dynamics of number of small mammals. It is difficult to reply to the question why do owls prefer the commen vole. Whether the taste of the prey or a selective catch is in question, or the secret is in simpler, easier and faster catch of prey. The fact is that voles are less aggressive and slower than different *Muridae* species. They live on open surfaces, mostly in agroecosystems and are especially numerous in alfalfa. All this could be the cause for a massive participation of the voles in the diet of owls. We are not sure that the hunt of long-eared owl is selective, so that we are inclined to say that the owl is satisfied and adjusts itself to the prey accessible in an easier and faster way (confirmed by the list of prey in January and February). In this work we did not mention the results of they prey's biomass, although these data are important within the frame of ecosystem energetics. We think that we still do not know enough about the way of the long-eared owl life, especially in regard to its rhythm of food consumption and pellet discharge, so that the review of realistic results requires further

examinations of its behaviour. Besides particulars about owl's diet, the analysis of pellets enables and contributes to the better knowledge on terriofauna (Mikuska 1977; Mikuska *et al.* 1977; Tvrtković and Džukić 1977; Ham *et al.* 1980/81). The finding of *Microtus agrestis* skull is of importance for the terriofauna of West Bačka. During our researches, this species was not registered by the trapping technique, and was not in the list of small mammals of this region. By this finding, we are correcting and supplementing the list of small mammals for the first time (Krsmanović and Purger 1988). The presence of the meadow vole at Bezdan was registered by Mirić (1980) who applied the trapping and Mikuska (1977) by analysis of *Asio otus* pellets. Mikuska (1979, 1981) registered this vole in the area of a special zoologic reservation „Kopački Rit", confirming that *Microtus agrestis* is present on both banks of the Danube.

In the skull samples, three species of the subgenus *Sylvaemus: Apodemus sylvaticus, A. flavicollis* and *A. microps* were registered. These findings of skulls also confirm that the long-eared owl hunts in open habitats, especially in agroecosystems, marshes and bushes, near village roads. This holds true also for *A. flavicollis,* which was recorded by trapping in open surfaces of former complexes in different degradation stages.

## CONCLUSION

In this work, the results of pellet analysis of the long-eared owl *(Asio otus)* are reported. They indicate that in the autumn-winter diet of this owl, small mammals are dominant (98.48%). The participation of birds and insects in neglectable (1.44% and 0.08%, respectively). Common vole — *Microtus arvalis, Arvicolidae* is the most frequent prey of this owl (70.67%). Other *Muridae* species represent a compensatory or additional kind of prey (27.66%), while *Soricidae* have no importance in the diet of this owl (0.08%).

The pellet analysis, has once again been proved as a reliable additional method for the research of terriofauna. The finding of a skull of *Microtus agrestis,* confirms that this species is present in West Bačka. The presence of *Apodemus sylvaticus, A. flavicollis* and *A. microps* in this region is confirmed by skulls in the pellets and trapped samples.

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# О ИСХРАНИ СОВЕ УТИНЕ, *ASIO OTUS L.* 1758 У ЗАПАДНОЈ БАЧКОЈ (ВОЈВОДИНА, ЈУГОСЛАВИЈА)

Ј. Ј. ПУРГЕР, ЉУБИЦА КРСМАНОВИЋ

*Институт за биологију*, 21000 Нови Сад, Југославија

У раду је дата анализа садржаја 569 целих свалица сове утине које су прикупљене у селу Дорослово (западна Бачка) у јесење-зимском периоду 1987/88.

Утврђено је да у овом периоду у исхрани сове значајну улогу имају ситни сисари (98,48%), док је учешће птица и инсеката занемарљиво (1,44% и 0,08%).

Најчешћа врста плена је пољска волухарица, *Microtus arvalis, Arvicolidae* (70,67%). Остаје отворено да ли је ова специјализација резултат селективног улова или лакшег, бржег и једноставнијег доласка до плена.

Остале врсте *Muridae* представљају компензаторну или допунску врсту плена (27,66%) док *Soricidae* немају значаја у исхрани сове (0,08%).

Анализа гвалица се још једанпут показала као добра допунска метода за проучавање териофауне једног подручја. У садржају гвалица пронађена је лобања *Microtus agrestis* што потврђује да је ова врста присутна у западној Бачкој (Војводина, Југославија). Лобање *Apodemus sylvaticus, Apodemus flavicollis* и *Apodemus microps* су доказ о распрострањењу ових врста који је потврђен и изловљеним примерцима.