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## FOOD COMPOSITION OF LONG-EARED OWL (*ASIO OTUS*) FROM POLAND AND UKRAINE DURING NON-BREEDING SEASON

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**Abstract.** The food of Long-eared Owls found in pellets collected from communal roosts in Poland and Ukraine was studied. Domination of voles *Microtus* sp. in the birds' diet was revealed. On three Transcarpathian roost sites voles were 77,7% of prey number and 89,0% of prey biomass. Results in Poland were similar, with the contribution of 76,5% and 87,8%, respectively. For places in Poland the Shannon-Wiener H' index values were 0,71 to 2,25 and it was higher than values from Ukraine: 0,29 to 1,88.

**Key words:** ecology, feeding, pellet, prey, rodent.

**Состав пищи ушастой совы (*Asio otus*) в Польше и Украине в негнездовой сезон. - К. Стасяк, И. Китовский, Р. Висьньовский, Г. Питуха, Р. Кравчик, Ш. Цьос, Г. Гживачевский, А.-Т. Башта. - Беркут. 21 (1-2). 2012. - Питание изучалось по погадкам, собранным на совместных ночевках на юго-востоке Польши и в Украинском Закарпатье. В пище преобладали полевки рода *Microtus*. Их доля составляла более трех четвертей по численности и почти 90% по биомассе. Питание сов в Польше было более разнообразным (индекс Шеннона-Винера колебался от 0,71 до 2,25), чем на Закарпатье (0,29–1,88).**

Owls, including Long-eared Owl (*Asio otus*) are less studied bird species due to their secretive way of life. The fact of forming communal roosts in non-breeding period, with many individuals together spending day gives possibility to analyze the processes of food determining in difficult for birds period.

### Material and methods

The pellets of Long-eared Owls were collected in south-eastern Poland (Lublin and Podkarpacie regions) and in Transcarpathian region (western Ukraine) in years 2007–2010. In Poland pellets were gathered from nine communal roosts of Long-eared Owl, located at: Dłużniów (50°28' N, 24°00' E), Kolonia Wola Wereszczyńska (51°26' N, 23°09' E), Łysołaje (51°11' N, 22°56' E), Pniówek (50°40' N, 23°17' E), Radawiec (51°12' N,

22°23' E), Siostrzytów (51°10' N, 22°58' E), Wólka Kałna (51°25' N, 22°16' E) and Zemborzyce (51°11' N, 22°26' E). In one case, pellets were collected in the suburbs of Rzeszów (50°02' N, 21°59' E). In Ukraine, the pellets were gathered from three different places located in the suburbs of Beregove (47°00' N, 35°31' E).

In all cases, communal roosts were located on coniferous trees and the pellets were collected from under those ones. The pellets were prepared for analysis by standard methods (Ruprecht et al., 1998). Following several authors (Arnold, Burton, 1980; Pucek, 1984; Cuisin, 1989), the number of vertebrate prey species was determined on the basis of skulls, mandibles, teeth, and other important bone remains. Some prey was grouped, for example Arvicolidae, *Sylvaemus*, Muridae, etc. (Table 1, 2), because sometimes a very high degree of



Table 1

Food composition of Long-eared Owls from Poland during non-breeding season  
 Состав пищи ушастой совы в Польше во внегнездовой сезон

Species	Mass, g	Siostrzytów 2007		Łysołaje 2007		Zemborzyce 2008		Dłużniów 2009		Radawiec 2009	
		%N	%B	%N	%B	%N	%B	%N	%B	%N	%B
<i>Sorex araneus</i>	8,0	–	–	–	–	–	–	0,66	0,22	–	–
<i>S. minutus</i>	3,5	–	–	–	–	–	–	0,66	0,10	–	–
<i>Micromys minutus</i>	4,0	–	–	0,91	0,12	–	–	1,97	0,34	1,82	0,23
<i>Mus musculus</i>	15,0	–	–	0,46	0,22	–	–	0,66	0,42	0,61	0,29
<i>Apodemus agrarius</i>	5,0	–	–	–	–	0,59	0,09	3,29	0,70	0,61	0,10
<i>Apodemus</i> sp.	19,0	0,76	0,43	3,65	2,19	4,71	2,83	9,21	7,47	9,09	5,42
<i>Sylvaemus</i> sp.	22,0	–	–	0,46	0,32	1,18	0,82	26,97	25,32	0,61	0,42
<i>Microtus glareolus</i>	23,0	1,53	1,04	–	–	–	–	15,79	15,50	–	–
<i>M. avellanarius</i>	16,0	–	–	–	–	–	–	3,95	2,70	–	–
<i>M. agrestis</i>	17,0	–	–	–	–	0,59	0,32	–	–	0,61	0,32
<i>M. oeconomus</i>	33,0	14,50	14,16	8,22	8,55	15,29	15,98	–	–	2,42	2,51
<i>M. arvalis</i>	35,0	79,39	82,22	73,52	81,10	65,29	72,36	8,55	12,77	81,81	87,88
<i>M. subterraneus</i>	19,0	0,76	0,43	2,28	1,37	1,18	0,71	1,97	1,60	1,21	0,72
Arvicolidae sp.	19,0	3,05	1,72	5,94	3,55	8,24	4,95	3,29	2,67	–	–
Muridae sp.	18,0	–	–	4,57	2,59	1,76	1,01	13,82	10,61	1,21	0,68
<i>Crociodura leucodon</i>	12,0	–	–	–	–	–	–	–	–	–	–
<i>Arvicola terrestris</i>	100,0	–	–	–	–	–	–	–	–	–	–
Reptilia sp.	12,0	–	–	–	–	–	–	–	–	–	–
<i>C. coccothraustes</i>	55,0	–	–	–	–	–	–	2,63	6,18	–	–
Aves sp.	25,0	–	–	–	–	1,18	0,93	5,92	6,32	1,82	1,43
Insecta sp.	0,5	–	–	–	–	–	–	0,66	0,01	–	–
Total prey number		131		219		170		152		165	
Total prey biomass, g			4427		6948		5369		3562		5257
Shannon–Wiener index		0,71		1,04		1,20		2,25		0,86	

**Note.** In Tables 1 and 2: N – number, B – biomass.

fragmentation did not allow to identify the prey in details. To estimate prey biomass, data for mammalian and avian prey biomass were used as in: Pucek (1984), Romanowski (1988), and Jedrzejewska, Jedrzejewski (2001). Shannon–Wiener diversity ( $H'$ ) indices were calculated for trophic diversity on species levels.

$$H' = -\sum P_i \log P_i \text{ (Krebs, 1994).}$$

## Results

In total, 4059 of prey individuals were isolated from the pellets (Tables 1, 2). Despite of some geographical differences, typical for

Long-eared Owls domination of voles *Microtus* sp. in the birds' diet was revealed. On three Transcarpathian roost sites voles were 77,7% of prey number and 89,0% of prey biomass. Results in Poland were similar, with the contribution of 76,5% and 87,8%, respectively. The share of Common Vole (*Microtus arvalis*) in Poland was lower than in Ukraine. The contribution of Tundra Vole (*M. oeconomus*) in Poland was 7,4%, this species was not found in Ukraine, because Transcarpathian region is out of this species' range (Bashta, Potish, 2007). Results of the survey strongly correspond with data of other studies of pellets collected from



End of the Table 1

Окончание таблицы 1

Species	Kol. Wola Wereszczyńska 2009		Pniówek 2009		Wólka Kątna 2010		Rzeszów 2010		Total	
	%N	%B	%N	%B	%N	%B	%N	%B	%N	%B
<i>Sorex araneus</i>	0,10	0,02	–	–	–	–	–	–	0,06	0,02
<i>S. minutus</i>	0,10	0,01	–	–	–	–	–	–	0,06	0,01
<i>Micromys minutus</i>	0,67	0,08	2,52	0,33	2,58	0,32	26,33	5,08	5,10	0,68
<i>Mus musculus</i>	0,29	0,13	6,37	3,14	0,43	0,20	0,61	0,44	1,62	0,81
<i>Apodemus agrarius</i>	0,19	0,03	2,67	0,44	–	–	9,80	2,36	2,29	0,40
<i>Apodemus</i> sp.	0,67	0,39	4,30	2,68	4,29	2,56	–	–	2,81	1,80
<i>Sylvaemus</i> sp.	–	–	–	–	3,00	2,07	8,98	9,52	2,93	2,17
<i>Microtus glareolus</i>	6,35	4,46	0,59	0,45	0,86	0,62	–	–	2,99	2,31
<i>M. avellanarius</i>	–	–	–	–	–	–	–	–	0,18	0,10
<i>M. agrestis</i>	3,75	1,95	–	–	–	–	0,20	0,17	1,28	0,73
<i>M. oeconomus</i>	11,83	11,92	4,89	5,30	8,15	8,45	–	–	7,39	8,20
<i>M. arvalis</i>	75,10	80,25	72,74	83,62	75,11	82,51	40,82	68,85	66,20	77,81
<i>M. subterraneus</i>	0,67	0,39	3,85	2,40	1,72	1,02	0,41	0,37	1,59	1,01
Arvicolidae sp.	–	–	–	–	1,72	1,02	1,84	1,68	1,50	1,00
Muridae sp.	–	–	–	–	2,15	1,21	9,18	7,97	2,63	1,59
<i>Crocidura leucodon</i>	–	–	–	–	–	–	0,20	0,12	0,03	0,01
<i>Arvicola terrestris</i>	0,10	0,29	–	–	–	–	0,41	1,97	0,09	0,31
Reptilia sp.	–	–	0,15	0,06	–	–	–	–	0,03	0,01
<i>C. coccothraustes</i>	–	–	–	–	–	–	–	–	0,12	0,23
Aves sp.	0,10	0,07	1,93	1,58	–	–	1,22	1,48	1,04	0,90
Insecta sp.	0,10	–	–	–	–	–	–	–	0,06	+
Total prey number	1040		675		233		490		3275	–
Total prey biomass, g		34061		20551		7423		10167	–	97513
Shannon–Wiener index	0,93		1,12		1,04		1,61		1,45	

communal roosts of Long-eared Owl in the northern part of their breeding range (Central and Northern Europe, North America: Marks et al., 1994; Tome, 1994; Holt, 1997; Young et al., 2005; Nisteanu, 2007; Romanowski, Żmihorski, 2008; Petrovici et al., in press), where the strong domination of local species of voles was shown in winter owls' diet.

Field Mice *Apodemus* sp. was a less important component of winter diet of the bird in Poland and Ukraine. In Poland it was 8,0% of total prey number and 4,3% of biomass. For locations in South-Western Ukraine it was 3,6% and 1,6%, respectively. Analysis from southern Europe show that the importance of those species can be reversed. Long-eared Owls' diet analysis from Northern Italy (Gal-

leotti, Canova, 1994) showed the contribution of mice *Apodemus* sp. reaching almost 43,0% of prey number and 50,0% biomass while the share of voles was 24,0% and 23,0%, respectively. The domination of other mice species of *Mus* genus is possible in Southern Europe and Africa (Birrer, 2009; Escala et al., 2009).

The important component of the birds' diet in Poland were Harvest Mice (*Micromys minutus*), which were found in pellets from seven out of nine places (Table 1). The contribution of Harvest Mice in total prey number from Poland was 5,1% and in prey biomass 0,7%. The highest number of this species was found in Rzeszów, where it was 5,0% of prey biomass and 26,3% of prey number, which is a high value in aspect of large sample size (N = 490).



Table 2

Food composition of Long-eared Owls from Ukraine (Transcarpathians) during non-breeding season

Состав пищи ушастой совы в Украине (Закарпатье) во внегнездовой сезон

Speciec	Mass, g	Beregove 2004		Beregove 2008		Beregove 2009		Total	
		%N	%B	%N	%B	%N	%B	%N	%B
<i>Sorex araneus</i>	8,0	19,47	6,88	–	–	–	–	5,61	1,48
<i>S. minutus</i>	3,5	7,96	1,23	–	–	–	–	2,30	0,27
Soricidae sp.	6,6	3,10	0,90	–	–	–	–	0,89	0,19
<i>Micromys minutus</i>	4,0	9,73	1,72	–	–	–	–	2,81	0,37
<i>Mus musculus</i>	15,0	1,33	0,88	–	–	0,70	0,33	0,51	0,25
<i>Apodemus agrarius</i>	5,0	3,98	0,88	–	–	3,50	0,55	1,79	0,29
<i>Apodemus</i> sp.	19,0	–	–	–	–	0,70	0,42	0,13	0,08
<i>Sylvaemus</i> sp.	22,0	3,98	3,87	–	–	2,80	1,93	1,66	1,20
Muridae sp.	18,0	0,44	0,35	–	–	2,10	1,18	0,51	0,30
<i>Microtus glareolus</i>	23,0	0,44	0,45	0,24	0,16	1,40	1,01	0,51	0,40
<i>M. agrestis</i>	17,0	–	–	–	–	0,70	0,37	0,13	0,07
<i>M. arvalis</i>	35,0	41,15	63,62	93,98	96,62	83,22	91,18	76,79	88,48
<i>M. subterraneus</i>	19,0	–	–	1,45	0,81	–	–	0,77	0,48
Arvicolidae sp.	19,0	5,75	4,83	3,86	2,15	4,20	2,50	4,46	2,79
<i>Crocidura leucodon</i>	12,0	0,88	0,47	0,24	0,08	–	–	0,38	0,15
<i>Rattus norvegicus</i>	310,0	0,88	12,12	–	–	–	–	0,26	2,60
<i>Mustela nivalis</i>	80,0	0,44	1,56	–	–	–	–	0,13	0,34
Reptilia sp.	12,0	0,44	0,23	–	–	–	–	0,13	0,05
Aves sp.	25,0	–	–	0,24	0,18	0,70	0,55	0,26	0,21
Total prey number		226		415		143		784	
Total prey biomass, g			5116,2		14128		4568		23812,2
Shannon-Wiener index		1,88		0,29		0,78		1,08	

In Ukraine Harvest Mice were found on one owls' communal roost only with a contribution of 9,7% of prey number and 1,7% of prey biomass (Table 2), which results in small participation in total Ukrainian Long-eared Owls' food composition. The share of this species in single places in Poland (Żmihorski, 2005; Romanowski, Żmihorski 2008) and other European countries (Laiu, Murariu, 1998; Bashta, Potish, 2007), where pellets were collected, was lower than in Rzeszów.

Synantropic mammals (*Rattus norvegicus*, *Mus musculus*) were not important compo-

nents of Long-eared Owls' diet, except one communal roost in the Beregovo suburbs (Table 2). In some publications the higher importance of those species is mentioned, especially when owls' wintering places were located in city centres (Corral et al. 1979; Laiu, Murariu, 1998; Bashta, Potish, 2007).

The biggest prey caught in Transcarpathian region was the Brown Rat (*Rattus norvegicus*) and the Least Weasel (*Mustela nivalis*), in Poland – juvenile of European Water Vole (*Arvicola terrestris*). The biggest caught birds were Hawfinches (*Coccothraustes coccothraustes*),



mentioned also in the literature as Long-eared Owls' prey (Laiu, Murariu, 1998). Some other small avian prey, as *Passer* sp., *Carduelis* sp., *Emberiza* sp., *Parus* sp. and birds of greater weight, as *Turdus* sp. were noted in owls' diet in Europe. According to Birrer (2009), Long-eared Owls can catch vertebrates of mass  $\geq 300$  g with the dominant prey consisting of species  $\leq 50$  g. It is worthwhile to mention that this owl species is able to capture the prey up to 500 g in weigh (Birrer 2009).

For places in Poland the Shannon-Wiener  $H'$  index values fluctuated from 0,71 to 2,25 (Table 1) and it was higher than values from Beregove (Transcarpathians, Ukraine), which was 0,29 to 1,88 (Table 2). The highest values of all roosts in both countries was that in Dłużniów (Poland), where prey dominants were mice (*Mus musculus*, *Apodemus arvalis*, *Apodemus* sp., *Sylvaemus* sp.) – 44,5% of all prey found at this roost.

The diet of Long-eared Owl in Poland and in Ukraine has small diversity of prey species, which is shown in low values of  $H'$  index, compared to other data from the area of distribution (Birrer, 2009). In case of using unpredictable food resources may cause problems for wintering owls. Due to frequent forming of communal roosts in autumn and winter and ease of collecting the pellets, the research over Long-eared Owls' diet should be continued.

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