

## RADA REDAKCYJNA – EDITORIAL BOARD

Przewodniczący – President: Prof. dr Kazimierz KOWALSKI  
Zast. Przewodniczącego – Vice-President: Prof. dr Andrzej SZEPTYCKI

Członkowie – Members: Prof. dr C. BŁASZAK, Prof. dr Z. BOCHEŃSKI,  
Prof. dr J. PAWŁOWSKI, Prof. dr Z. PUCEK, Prof. dr J. RAZOWSKI,  
Prof. dr A. RIEDEL, Dr Z. STEBNICKA, Prof. dr A. SZEPTYCKI  
Prof. dr Z. SZYNDLAR

## REDAKCJA – EDITORIAL STAFF

Redaktor naczelny – Editor-in-chief: Prof. dr Z. BOCHEŃSKI  
Zast. redaktora naczelnego – Subeditor (Vertebrata): Prof. dr Z. SZYNDLAR  
Zast. redaktora naczelnego – Subeditor (Invertebrata): Dr Z. STEBNICKA

Adres redakcji: Instytut Systematyki i Ewolucji Zwierząt Polskiej Akademii Nauk,  
ul. Sławkowska 17, 31-016 Kraków

Address of the Editor: Institute of Systematics and Evolution of Animals,  
Polish Academy of Sciences, Sławkowska 17, 31-016 Kraków, Poland

©Copyright by Instytut Systematyki i Ewolucji Zwierząt Polskiej Akademii Nauk,  
Kraków, 1997

ISBN 83-907187-2-3

ISSN 0065-1710

Cover Design  
Jerzy ŚWIECIMSKI

The rhinoceros on the cover presents a nearly complete specimen of the Pleistocene *Coelodonta antiquitatis*, excavated in the layers of ozocerite in Starunia (Eastern Carpathians), 1929. This unique exhibit is shown in the Natural History Museum (Institute of Systematics and Evolution of Animals), Cracow.

Druk i oprawa: Drukarnia Kolejowa  
ul. Bosacka 6, Kraków  
nakład 500 egz. + 25

## Weasel and stoat (Mustelidae; Mammalia) in the food of birds of prey from Poland

Andrzej Lech RUPRECHT

Received: 20 May, 1996

Accepted for publication: 20 Sep., 1996

RUPRECHT A. L. 1997. Weasel and stoat (Mustelidae; Mammalia) in the food of birds of prey from Poland. Acta zool. cracov. 39(2): 165-171.

**Abstract.** Weasel and stoat remains were identified in 34 (2.6%) out of 1300 pellet collections of birds of prey from Poland. Weasels were found in 32 collections and their percentage in all vertebrates found in the particular collection was according to the raptor species, as follows: Barn Owl ( $n = 15$ ,  $\bar{x} = 0.66\%$ , range = 0.01-3.40%), Long-eared Owl ( $n = 3$ ,  $\bar{x} = 0.77\%$ , range = 0.31-1.64%), Tawny Owl ( $n = 12$ ,  $\bar{x} = 0.56\%$ , range = 0.03-2.38%), and Buzzard ( $n = 1$ ,  $\bar{x} = 0.62\%$ ). No significant relationship was found between the frequency of consumption of weasels and stoats by birds of prey and (1) the density of weasel and stoat populations and (2) the density of rodents, which are the primary food of owls and Mustelidae.

**Key words:** taphonomy, Mustelidae, Poland.

Andrzej Lech RUPRECHT, ul. Polna 12a/27, 87-720 Ciechocinek, Poland.

### I. INTRODUCTION

Small Mustelidae, i.e. weasels *Mustela nivalis* LINNAEUS, 1766 and stoats *Mustela erminea* LINNAEUS, 1758, occasionally fall prey to owls, which has already been described in literature even as curious events (e.g. DAVID 1988). The works devoted to an analysis of the diet of owls in Poland report the presence of weasels twice in the diet of the Long-eared Owl (UTTENDÖRFER 1939) and six times in that of the Tawny Owl (UTTENDÖRFER 1939, 1952). Besides, bony remains of a stoat were detected only once in the Tawny Owl's pellet (UTTENDÖRFER 1952) and also once in a pellet of some undefined owl (BUCHALCZYK 1983). Regional studies of the diet composition of the Barn Owl from western Poland revealed six cases of the presence of bony remains of weasels in pellets (ŚWIERKOWSKA-GRUSZCZYŃSKA 1952, KRZEPTOWSKI 1962, KOZŁOWSKA 1964, DOLEŻAŁ 1971, PARADOWSKA 1978) and two cases in eastern Poland (Lublin region – NIKODEM 1974). In the Tawny Owl's pellets from the south-east of Poland the remains of the weasels were observed only twice (CAIS 1963, KULCZYCKI 1964). The frequency of weasel remains has been estimated for Poland on the basis of 13 habitation areas, from which the pellets of the Barn Owl, Tawny Owl, Long-eared Owl and Buzzard were analysed (BUCHALCZYK 1983). Other owl species hunt Mustelidae less frequently. The remains of an adult individual of *Mustela rixosa* SVIHILA & SVIHILA, 1932 were found in a pellet of a Barn Owl in Virginia, USA (HANDLEY 1949), whereas some weasel

remains were spotted in a Hawk Owl at Näätamo in Finland (NIETHAMMER 1983). Stoat remains were found in a pellet of the Short-eared Owl in Manitoba, Canada (WALLEY 1982) and in a pellet of the Great Grey Owl in Canada (BRUNTON & REYNOLDS 1984). MIKKOLA's (1983) compilatory work shows the occurrence of both stoats and weasels in the diet of Eagle Owls from Estonia, Finland, Norway and Sweden, more weasels being present in the diets of the Snowy Owl from Fenno-Scandia and the Pygmy Owl from Finland.

**A c k n o w l e d g m e n t s.** I am very thankful to Dr. Henryk OKARMA (Mammal Research Institute Polish Academy of Sciences at Bałowieża) for his reviewing the English text.

## II. MATERIAL AND METHODS

The remains of small mustelids were found only in 34 collections of pellets of the birds of prey from Poland collected from 1905 to 1983. The pellets contained bony remains of 35 weasels and 2 stoats (Table I). The data came from the literature on the subject (UTTENDÖRFER 1939, 1952, CAIS 1963, KULCZYCKI 1964, BUCHALCZYK 1983) and, additionally, from the collection stored at the Mammal Research Institute of Polish Academy of Sciences at Białowieża, and from unpublished theses for master's degree from the Department of Systematic Zoology of the A. Mickiewicz University in Poznań. The localities of small Mustelidae and the data concerning them are given in Table I and marked on a map of Poland in the UTM (Universal Transverse Mercator). The sequence of the localities and their reading goes northwards and then eastwards – in accordance with the reading of the UTM.

The data were analyzed from the following points of view:

- (1) The species of predator whose pellets contained mustelid remains;
- (2) The relative population density of small Mustelidae in Poland (BUCHALCZYK, in manuscript);
- (3) The data concerning weasel reproduction in natural conditions (JĘDRZEJEWSKA 1987) including the dates of consecutive collections of the pellets containing the bony remains of Mustelidae;
- (4) The relative density of the population of two basic rodent species which make up the weasels diet, i.e. the common vole (CABOŃ-RACZYŃSKA & RUPRECHT 1977) and the house mouse (RUPRECHT 1986).

## III. RESULTS

Mustelid remains were found present in 34 (2.6%) out of approximately 1,300 collections of owl pellets from all over Poland. The percentage of weasels in these 32 collections of pellets relative to bird species was as follows: Barn Owl *Tyto alba* ( $n = 15$ ,  $\bar{x} = 0.66\%$ , range = 0.01-3.40%); Long-eared Owl *Asio otus* ( $n = 3$ ,  $\bar{x} = 0.77\%$ , range = 0.31-1.64%); Tawny Owl *Strix aluco* ( $n = 12$ ,  $\bar{x} = 0.56\%$ , range = 0.03-2.38%); and Buzzard *Buteo* sp. ( $n = 1$ ) with 0.62% of small vertebrates estimated in the given collection. The percentage of stoats in the total of small vertebrates which come from the pellets of the Barn Owl, constitutes 0.15%, whilst in the case of the Tawny Owl it is 0.31% (Table I).

It is worth while to analyse the remains of a male weasel from the Tawny Owl's pellet found near a tree in the 396 "A" Section of the Białowieża Primeval Forest (UTM: FD 84) on April 5th, 1978. Although it is known that the Tawny Owl tears its prey to pieces before consumption (BOCHENSKI et al. 1993, RUPRECHT 1995), the above-mentioned pellet contained a nearly complete weasel skeleton, including the baculum. This proves that the animal was consumed as a whole.

Table I

The occurrence of weasels and stoats in the birds of prey diet within the borders of Poland; n – number of mustelid individuals in a given pellet collection; % – percentage of weasel or stoat individuals in a given pellet collection, estimated on the basis of the total number of vertebrates (found in the collection)

UTM	Locality	Date	n	%	Birds of prey	Author
<i>Weasels Mustela nivalis</i>						
VV 91	Grzędzice	1961	1	0.11	Tawny Owl	(KRZEPTOWSKI 1962)
VV 91	Pocernino	1961	1	0.11	Barn Owl	(KRZEPTOWSKI 1962)
WS 94	Strzegom	V-XI 1932	2	2.38	Tawny Owl	(UTTENDÖRFER 1939)
WT 06	Gnilec	XI-XII 1934	1	0.36	Long-eared Owl	(UTTENDÖRFER 1939)
WT 53	Siedlisko	VII 1961	1	0.78	Tawny Owl*	(BUCHALCZYK 1983)
WU 65	Rzeczyn	1976/1977	1	0.10	Barn Owl	(PARADOWSKA 1978)
XS 12	Uciechów	III 1931	1	0.49	Tawny Owl	(UTTENDÖRFER 1939)
XS 37	Pęgów	II-XII 1941	1	1.08	Tawny Owl	(UTTENDÖRFER 1952)
XS 46	Wrocław-Osobowice	VI-XII 1932	2	0.61	Tawny Owl	(UTTENDÖRFER 1939)
XS 54	Lizawiec	1905-1910	1	0.31	Long-eared Owl	(UTTENDÖRFER 1939)
XT 18	Głuchowo	IX 1969/1970	1	0.78	Barn Owl	(DOLEŻAL 1971)
XT 83	Raszków	1950/1951	1	0.01	Barn Owl	(ŚWIERKOWSKA-GRUSZCZYŃSKA 1952)
XT 88	Samarzewo	1962-1964	1	0.12	Barn Owl	(KOZŁOWSKA 1964)
CC 74	Dalików	7 XI 1969	1	0.13	Barn Owl*	(BUCHALCZYK 1983)
CE 98	Kwietniewo	24 VII 1983	1	0.26	Tawny Owl	(K. BIELECKA in litt.)
CF 40	Żeliszewki	1 V 1972	1	1.64	Long-eared Owl	(BUCHALCZYK 1983)
DV 98	Łabowa	VIII 1961	1	0.03	Tawny Owl	(KULCZYCKI 1964)
EB 89	Markuszów	25 IX 1964	1	0.33	Barn Owl*	(NIKODEM 1974)
EB 95	Wilkołaz	3 X 1960	1	0.22	Barn Owl*	(BUCHALCZYK 1983)
ED 75	Jasienica	8 VIII 1956	1	3.12	Barn Owl*	(BUCHALCZYK 1983)
EE 08	Reszel	30 VIII 1961	1	0.30	Barn Owl	(BUCHALCZYK 1983)
EE 76	Klusy	28 VIII 1961	1	0.10	Tawny Owl	(BUCHALCZYK 1983)
EE 77	Zelki	28 VIII 1961	1	0.20	Tawny Owl	(BUCHALCZYK 1983)
EF 10	Parys	11 VIII 1961	2	0.58	Barn Owl*	(BUCHALCZYK 1983)
EF 92 FF 02	Romincka Forest	1943	1	0.36	Tawny Owl	(UTTENDÖRFER 1952)
FA 01	Babice	1958-1962	1	0.30	Tawny Owl	(CAIS 1963)
FB 28	Łuszczów	20 XII 1964	1	0.55	Barn Owl*	(NIKODEM 1974)
FD 84	Białowieża Forest Sector 396 "A"	5 IV 1978	1	–	Tawny Owl	(W. BAJKO in litt.)
FD 94	Białowieża	1 III 1975	1	0.62	Buzzard	(BUCHALCZYK 1983)
FE 49	Pogorzelec	26 VIII 1961	1	3.40	Barn Owl*	(BUCHALCZYK 1983)
GA 09	Rzeplin	20 X 1964	1	0.18	Barn Owl	(BUCHALCZYK 1983)
KS 90	Dołhobyczów	20 X 1964	1	0.06	Barn Owl*	(BUCHALCZYK 1983)
<i>Stoats Mustela erminea</i>						
XA 13	Chełmki	IV-VIII 1939	1	0.31	Tawny Owl	(UTTENDÖRFER 1952)
EV 58	Trzciana	31 X 1964	1	0.15	Barn Owl*	(BUCHALCZYK 1983)

\*Identification of the owl species by the author (ALR)

#### IV. DISCUSSION

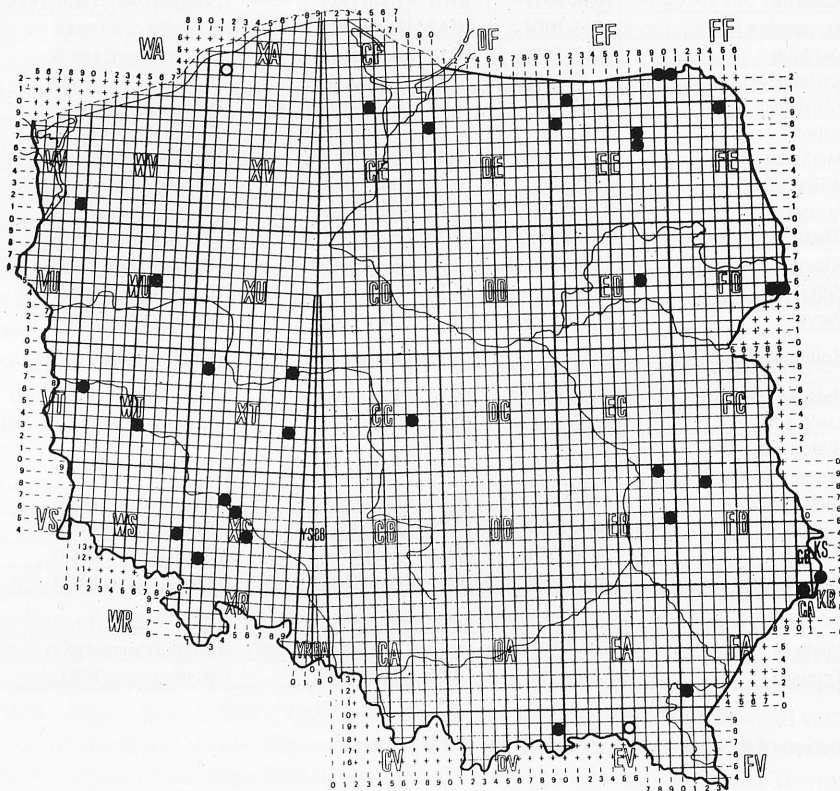
(1) None of the three owl species, i.e. Barn Owl, Long-eared Owl, and Tawny Owl, has been found to hunt more small mustelids than the other two. Nevertheless, weasel skulls were frequently found in the Tawny Owl pellets, collected by K. KASPRZYK near Lidzbark Warmiński (UTM: DE



79), Mazurian Lake District in 1995. Pellets of the Barn Owl and Tawny Owl predominate in the material studied; it results chiefly from an easy access to church towers and attics, where these owls often settle. It may suggest that small mustelids constitute their prey more often than in the case of other owls. In fact small Mustelidae constitute random prey to the owls. The owls, however, play a certain role in their natural mortality, and, in this way, contribute to the accumulation of bony remains of both weasels and stoats.

(2) An interesting relationship was found between the distribution of the localities of birds of prey in Poland, where the bony remains of weasels and stoats were collected, and the numbers of weasels and stoats in forests in 1961-1965, calculated on the basis of snow-tracking and estimations of forest inspectorates (Figs 1 and 2).

There was no distinct relationship between the frequency of small mustelids consumed by owls and the density of their prey. Although the Kielce region has the highest density of the weasel and stoat population (over 35 individuals/forestry) their remains were not found in the pellets of local owls. The lowest density of small mustelids (11-19 individuals/forestry) was observed in the



● *Mustela nivalis* Linnaeus, 1766

○ *Mustela erminea* Linnaeus, 1758

Fig. 1. The situation of the localities of birds of prey in Poland where bony remains of weasels and stoats were collected.

Zielona Góra, Gdańsk and Bydgoszcz regions. Bony remains in pellets indicate the presence of weasels in the diet of the owls in the Zielona Góra and Gdańsk regions, there being no traces of theirs in the Bydgoszcz region, where the average density of the Mustelidae population was 11-19 individuals. The greatest groupings of owl habitations, providing pellets with weasel remains, were observed in the Gdańsk, Olsztyn, Białystok, Lublin, Wrocław, Zielona Góra and Poznań regions (Figs 1 and 2).

(3) The dates of the collecting of pellets containing weasel remains (Table I: N = 30) show that weasels were taken by owls from March to December. The largest number of weasels were taken in July (n = 2), August (n = 7), September (n = 2), and October (n = 4). In March, April, May, November, and December only one small mustelid was caught in each. As the results of the researches conducted in different parts of Poland between 1962 and 1986 show, pregnant females are typical of the period from April to October, whereas nursing females – from May to October (JĘDRZEJSKA 1987). Young weasels which have left their family nests are observed from the last days of May throughout late October. Two females were found to be at the same time pregnant

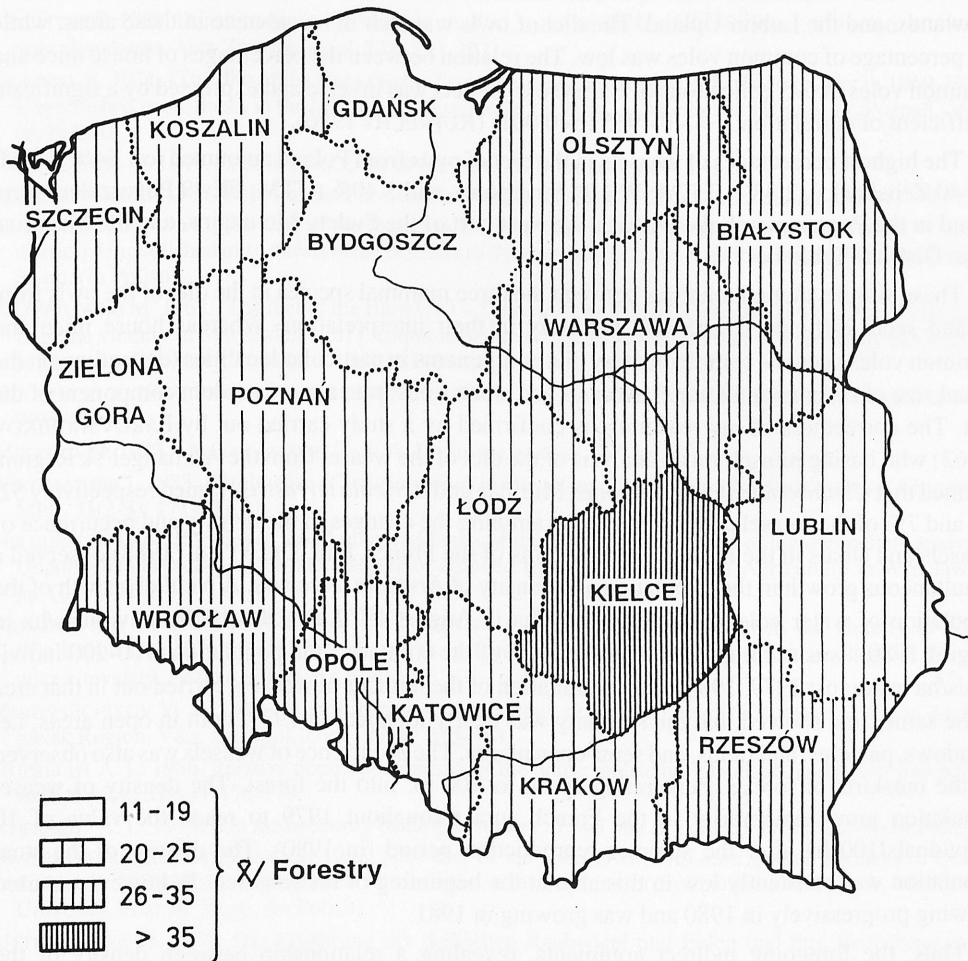


Fig. 2. A total number of small Mustelidae, i.e. weasels and stoats, in forest areas in Poland, between 1961 and 1965, estimated on the basis of snow-tracking censuses and estimations of forest inspectorates. After BUCHALCZYK (in manuscript).

and lactating. No reproducing weasels were observed in winter. There seems to be a temporal correlation between the frequency of weasels in the owls' diet and the occurrence of young weasels in the area.

(4) The percentage of weasels and stoats in the owl diet was also interpreted relative to (1) the distribution of the sites of birds of prey, where the pellets with bony remains of Mustelidae were collected and (2) the population density of two rodent species, the common vole and house mouse, which constitute the main diet component of weasels and owls in Poland. A very high population density of the common vole was found in southwestern and western Poland, well-known for the mass occurrence of this rodent.

Medium and low densities of *Microtus arvalis* are typical of the remaining parts of Poland. The relative density of *M. arvalis* is consistent with the data from the forecast questionnaires (CABOŃ-RACZYŃSKA & RUPRECHT 1977). The results of an analogous study on the relative population density of the house mouse revealed the areas situated west of the Vistula River as those of the low and medium density of this rodent. The high population density of *Mus musculus* was, on the other hand, found in the Pomeranian Lake District, the Mazovian and the Sandomierz Lowlands, and the Lublin Upland. The diet of owls was rich in house mice in these areas, while the percentage of common voles was low. The relation between the percentages of house mice and common voles in 695 collections of Barn Owls' pellets was inverse and expressed by a significant coefficient of correlation:  $r = -0.4965$  ( $p < 0.001$ ) (RUPRECHT 1986).

The highest percentages of weasels in the diet of owls from Poland amounted to 1.64% (UTM: CF 40 Żeliszawki), 2.38% (UTM: WS 94 Strzegom), and 3.40% (UTM: FE 49 Pogorzelec) were found in the Pomeranian Lake District, the west part of the Sudety Mountains, and the Mazurian Lake District (Table I).

These simple, mutual relations between the three mammal species in the diet of the owls from Poland seem difficult to establish precisely in their interpretation. Whereas house mice and common voles occur as complementary diet components in particular localities (depending on the actual size of rodent populations), weasels and stoats constitute a more random component of the diet. The correctness of my reasoning is confirmed by a study carried out by PAROVSHCHIKOV (1963) who basing himself on an analysis of the diet of the weasel from the Arkhangel'sk Region, claimed that *Clethrionomys* and *Microtus*, Muridae and *Arvicola terrestris* formed respectively 52, 18, and 7% of the weasel diet. Moreover, examining the changes in the density and occurrence of weasels and stoats in the meadow agrosystems of the French Jura, DELATTRE (1988) observed a simultaneous growth in the population and density of *Arvicola terrestris*. A parallel growth of the population of water voles (200 individuals/ha in August 1979 and 500-1000 individuals/ha in August 1980), was accompanied by the growth of the common vole population (100-200 individuals/ha in August 1979, 1980). An examination of the number of weasels carried out in that area at the same time showed that their density was nearly identical in 1979, both in open areas, i.e. meadows, pastures, and fields, and semi-open places. The occurrence of weasels was also observed on the outskirts of forests, penetrating as far as 200 m. into the forest. The density of weasel population grew temporarily in the French Jura throughout 1979 to reach the value of 10 individuals/100 ha after the summer reproduction period (in 1980). The density of the stoat population was constantly low in this area at the beginning of the research. It, however, started growing progressively in 1980 and was growing in 1981.

Thus, the foregoing indirect arguments, revealing a relationship between density of the population of rodents, i.e. common voles, house mice and that of small Mustelidae: weasels and stoats, suggest that in the areas of high density of rodent populations more mustelids are expected and so the chance of hunting them by owls increases.



## REFERENCES

- BOCHEŃSKI Z. M., TOMEK T., BOEV Z., MITEV I. 1993. Patterns of bird bone fragmentation on pellets of the Tawny owl (*Strix aluco*) and the Eagle owl (*Bubo bubo*) and their taphonomic implications. *Acta zool. cracov.*, **36**(2): 313-328.
- BUCHALCZYK T. (Msc.). Population density of Weasel, *Mustela nivalis* Linnaeus, 1766 and Stoat, *Mustela erminea* Linnaeus, 1758 in Poland. Based on data from Carnivora Questionnaire (1965) made by Mammal Research Institute Polish Academy of Sciences at Białowieża.
- BUCHALCZYK T. 1983. 0076. *Mustela nivalis* Linnaeus, 1766. [In:] Z. PUCEK, J. RACZYŃSKI (Eds.) – Atlas of Polish mammals. PWN, Warszawa, text: 158-160, maps: 155.
- BRUNTON D. F., REYNOLDS W. D. 1984. Winter predation on an ermine by a Great Gray Owl. *Blue Jay*, **42**(3): 171-173.
- CABOŃ-RACZYŃSKA K., RUPRECHT A. L. 1977. Estimation of population density of the common vole in Poland: an analysis of owl pellets. *Acta theriol.*, **22**(25): 349-354.
- CAIS L. 1963. [Studies of the diet of a few owl species]. *Zesz. nauk. Uniw. A. Mickiewicza w Poznaniu*, **44**(Biologia 4): 3-21. (In Polish).
- DAVID P. G. 1988. Further distribution of *Mustela nivalis* in Kentucky. *Trans. Kentucky Acad. Sci.*, **49**: 37.
- DELATTRE P. 1988. Density of weasel (*Mustela nivalis* L.) and stoat (*Mustela erminea* L.) in relation to water vole abundance. *Acta Zool. Fennica*, **174**: 221-222.
- DOLEŻAŁ Z. 1971. [The diet of the Barn Owl – *Tyto alba guttata* (BREHM) in Kościan district in 1969-1970.] Unpublished m.sc. thesis in the Institute of Systematic Zoology, A. Mickiewicz University, Poznań, 35 pp. (In Polish).
- HANDLEY Ch. O. 1949. Least weasel, prey of barn owl. *J. Mammal.*, **30**(4): 431.
- JĘDRZEJEWSKA B. 1987. Reproduction in weasels *Mustela nivalis* in Poland. *Acta theriol.*, **32**(31): 493-496.
- KOZŁOWSKA M. 1964. [The diet of the Barn Owl – *Tyto alba guttata* (BREHM) in 1962-1964 in Września district]. Unpublished m.sc. thesis in the Institute of Systematic Zoology, A. Mickiewicz University, Poznań, 36 pp. (In Polish).
- KRZEPTOWSKI M. 1962. [The diet of the Barn Owl – *Tyto alba guttata* (BREHM) and Tawny Owl – *Strix aluco* L. in the vicinity of Stargard in 1961]. Unpublished m.sc. thesis in the Institute of Systematic Zoology, A. Mickiewicz University, Poznań, 37 pp. (In Polish).
- KULCZYCKI A. 1964. Study of the make up of the diet of owls from the Beskid Niski Mts. *Acta zool. cracov.*, **9**(9): 529-559.
- MIKKOLA H. 1983. *Owls of Europe*. T. & A. D. Poyser, Calton, 397 pp.
- NIETHAMMER J. 1983. Rötelmäuse (*Clethrionomys*) in Gewöllen der Sperbereule (*Surnia ulula*). *Säugetierk. Mitt.*, **31**(2-3): 171-177.
- NIKODEM Z. 1974. [Studies of small mammal fauna of the Lublin region based of the owl pellets analysis]. Unpublished doctor thesis in the Institute of Applied Biology, Academy of Agriculture in Wrocław. 92 pp. (In Polish).
- PARADOWSKA D. 1978. [The diet of the Barn Owl – *Tyto alba guttata* (BR.) in the vicinity of Krzyż Wielkopolski in 1976-1977]. Unpublished m.sc. thesis in the Institute of Systematic Zoology, A. Mickiewicz University, Poznań, 40 pp. (In Polish).
- PAROVSHCHIKOV V. Ja. 1963. A contribution to the ecology of *Mustela nivalis* LINNAEUS, 1766 in Archangelsk Region. *Věst. Čs. Spol. Zool.*, **27**(4): 335-344.
- RUPRECHT A. L. 1986. Relative population density of the house mouse in Poland: an analysis of owl pellets. *Acta theriol.*, **31**(14): 176-179.
- RUPRECHT A. L. 1995. [On the necessity of further studies of owl diet in Poland]. *Orlik* **5**: 2-3. (In Polish).
- ŚWIERKOWSKA-GRUSZCZYŃSKA J. 1952. [The diet of the Barn Owl (*Tyto alba guttata* BREHM) in Ostrów district in 1950/1951]. Unpublished m.sc. thesis in the Institute of Systematic Zoology, A. Mickiewicz University, Poznań, 39 pp. (In Polish).
- UTTENDÖRFER O. 1939. *Die Ernährung der deutschen Raubvögel und Eulen und ihre Bedeutung in der heimischen Natur*. Verl. J. Neumann, Neudamm, 412 pp.
- UTTENDÖRFER O. 1952. *Neue Ergebnisse über die Ernährung der Greifvögel und Eulen*. Eugen Ulmer, Stuttgart, Ludwigsburg, 230 pp.
- WALLEY W. J. 1982. Weasel skull in Short-eared Owl pellet. *Can. Field-Nat.*, **96**: 85.



