

Diet of the weasel in Hungary

József LANSZKI¹ and Miklós HELTAI²

¹ Ecological Research Group, University of Kaposvár, P.O. Box 16, H-7401 Kaposvár, Hungary; e-mail: lanszki@mail.atk.u-kaposvar.hu

² Department of Wildlife Biology and Game Management, St Stephens University, Péter K. Str. 1, H-2103 Gödöllő, Hungary; e-mail: Heltai.Miklos@vvt.gau.hu

Received 10 April 2006; Accepted 1 March 2007

Abstract. The diet of weasel (*Mustela nivalis*) collected in agricultural mosaic plain regions of Hungary was studied using the analysis of stomach and rectum contents (n = 155). As a percentage relative frequency of occurrence, diets consisted of 85% small rodents (mainly *Microtus* spp.), 10% birds (mainly Passeriformes), and lizard, wasp, blood and plant matter. Consumption of small mammals increased from winter to summer and autumn. No predation on lagomorphs was found. Standardized trophic niche breadth was very narrow (mean, $B_{sta} = 0.07$). The food consisted of characteristically small (15–50 g) and terrestrial prey.

Key words: *Mustela nivalis*, stomach analysis, *Microtus*, Hungary

Introduction

Weasel *Mustela nivalis* (L.) is a Holarctic, a wide spread species in Europe (Reichstein 1993, Mitchell-Jones et al. 1999), and common predator in Hungary (Heltai 2002). Weasel habitat ranges from grasslands and meadows, wetlands to various types of forests and human settlements. The main food of weasel consists of small mammals (Sidorovich 1997, Jędrzejewska & Jędrzejewski 1998). However, depending on season and area, in addition to the dominance of rodents, considerable consumption of birds and eggs (Tapper 1979) or lagomorphs (Day 1968, Tapper 1979, McDonald et al. 2000), and rare, consumption of invertebrates (King et al. 1996) has been noted. The only carnivore of which the status is unclear in Hungary (unprotected and/or huntable only by permission). In contrast with the presumable wildlife management importance derived from earlier studies performed in other regions, the diet of the weasel had not yet been studied in the Pannonian ecoregion. The aim of this study was to investigate the diet composition and feeding habits of the weasel in Hungary.

Material and Methods

Animals (n = 155) were collected between 1999 and 2003 by live trapping, hunting and road kill (National Carnivore Monitoring Program) with the permission of the National Parks concerned. Weasels originated from plains regions situated on the west of the Danube River (n = 9), between Danube and Tisza Rivers (n = 83) and east of the Tisza (n = 63). These habitats were mosaics of arable land, meadows and forests (Biró et al. 2005). Feeding habits were examined by analysis of stomach content and faeces collected from the rectum. Half of the stomachs (51%) were empty and the state of digestion of items in each stomach varied, so

analysis of faeces collected from the rectum was necessary. Accordingly, no biomass, only the relative frequency of occurrence for each item was calculated. Prey were analysed by microscope on the basis of feather, bone, dental and hair characteristics using standard procedures (more detail: J e d r z e j e w s k a & J e d r z e j e w s k i 1998, B i r ó et al. 2005). To calculate diet composition and trophic niche breadth, the minimum number of food items identified from the stomachs and faeces were taken into account. Trophic niche breadth was calculated in accordance with Levins and standardized (K r e b s 1989). The following food taxa were used in these calculations: small mammals, birds, reptiles, invertebrates and plant matter. Distribution of prey body weight in the diet of weasel was determined in accordance with C l e v e n g e r (1993), and prey classification on the basis of zonation was performed according to published data from G i t t l e m a n (1985) on predators (Table 1). The statistics program SPSS 10 (1999) was used for processing data.

Results and Discussion

The difference between diet compositions of weasels living in the three regions of Hungary (Table 1) was not significant ($\chi^2 = 3.47$, $df = 8$, $P = 0.90$). The dominant food source of the weasel consisted of small mammals (mean: 84.7%, Table 1), the consumption of which significantly increased ($\chi^2 = 33.81$, $df = 12$, $P < 0.001$) from winter (55.6%) to summer-autumn period (92.9 – 93.8%, Fig. 1). M c D o n a l d et al. (2000) found a similar seasonal trend in small rodent consumption. Besides the most important *Microtus* voles, *Apodemus* mice were also frequently eaten. On agricultural lands, consumption of *Microtus* spp. (T a p p e r 1979, S i d o r o v i c h 1997, M c D o n a l d et al. 2000, present study), in forests bank vole *Clethrionomys glareolus* (S i d o r o v i c h 1997, J e d r z e j e w s k a & J e d r z e j e w s k i 1998), while in New Zealand, where the weasel is an alien predator, consumption of *Mus* spp. (K i n g et al. 1996) was considerable, and they showed varied small mammal hunting techniques. Occurrence of common hamster *Cricetus cricetus*, as frequent rodent in plains areas of Hungary (H e l t a i 2002) was found in one sample only. Consumption of shrews was also rare. Lagomorphs, similarly to studies performed in Poland (Jedrzejewska & Jedrzejewski 1998) or Belarus (S i d o r o v i c h 1997) was not found in

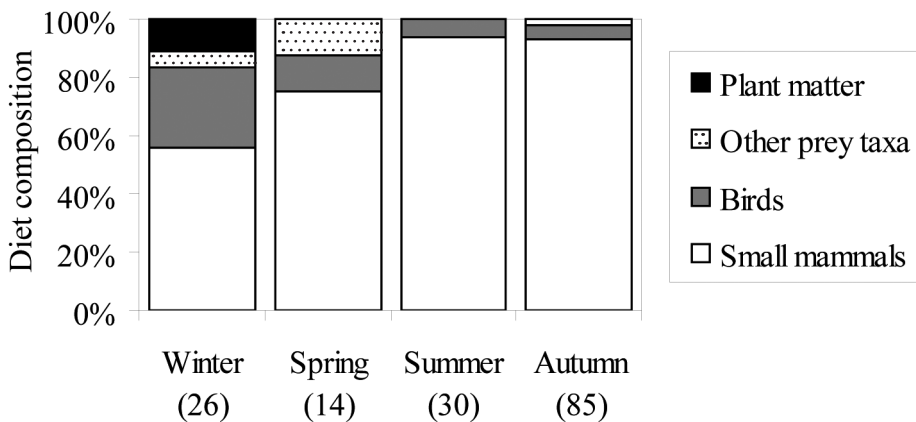


Fig. 1. Seasonal diet composition (percentage relative frequency of occurrence) of weasel in Hungary. Seasonal sample sizes are given in brackets.

the samples, however in Great Britain, rabbit *Oryctolagus cuniculus* occurred in diets of weasels in great proportions (Day 1968, Tapper 1979, McDonald et al. 2000). Egg consumption, contrary to most studies (Tapper 1979, King 1989, Jedrzejska & Jedrzejski 1998, McDonald et al. 2000), was not identifiable. Secondary important food of the weasel consisted of birds (mainly small-sized passerines, Table 1), which was closest to the findings of Tapper (1979), however medium-sized birds were hunted rarely. Bird consumption decreased (Fig. 1) gradually from winter (27.8%) to autumn (5.4%). Wasp in winter, lizard in spring and undetermined blood in autumn occurred in the diet. Amphibians (Sidorovich 1997, Jedrzejska & Jedrzejski 1998, McDonald et al. 2000) and reptiles, mainly lizards (Tapper 1979, King et al. 1996, McDonald et al. 2000) were preyed upon rarely by weasels in other examinations, as well. Domestic animals were not found in the diet, and consumption of grasses only in the winter diet indicated the low importance of plants. Similar diet compositions were found in winter and spring ($\chi^2 = 4.48$, $df = 4$, $P = 0.344$), or in summer and autumn ($\chi^2 = 0.15$, $df = 1$, $P = 0.903$), but the difference between these two season pairs was significant ($\chi^2 = 18.94$, $df = 4$, $P < 0.001$). The prey consumed was small-sized (less than 300 g); weasels preyed mainly on 15–50 g weight animals (92.6%). The majority (88.4%) of prey consumed by the weasel were terrestrial (Table 1), and aquatic prey did not occur in the samples examined. Standardized trophic niche breadth was very narrow ($B_{sta} = 0.07 \pm 0.03$, seasonal mean \pm SE), and decreased from winter (0.17) to autumn (0.02).

Summarized, the main foods of the weasel were easy accessible small-sized, terrestrial preys, mainly small rodents, and secondarily birds; trophic niche breadth was typically narrow.

Table 1. Diet composition of weasels in Hungary. Regions: Transdanubian (TD), between Danube and Tisza (bDT) and Transiscian (TT). Prey weight (w) categories: 1 = below 15 g; 2 = 15–50 g; 3 = 51–100 g; 4 = 101–300 g). Prey zonation (z) categories: t = terrestrial and mainly terrestrial but sometimes arboreal; a = arboreal and mainly arboreal but sometimes terrestrial. N = number of items in each taxa, O% = percentage relative frequency of occurrence.

Food items	Prey		TD	bDT	TT	Sum
	w	z	N	N	N	O%
Common vole <i>Microtus arvalis</i>	2	t	5	13	20	38.8
Field vole <i>Microtus agrestis</i>	2	t		1	2	3.1
Bank vole <i>Clethrionomys glareolus</i>	2	t		1		1.0
Other voles Microtinae spp.	2	t	1	8	2	11.2
Field mouse <i>Apodemus</i> spp.	2	t		10	6	16.3
Norway rat <i>Rattus norvegicus</i>	4	t			1	1.0
Dormouse <i>Muscardinus avellanarius</i>	2	a		1		1.0
Common hamster <i>Cricetus cricetus</i>	4	t		1		1.0
Other Rodentia spp.	2	t	1	5	3	9.2
Shrews Soricidae spp.	1	t			2	2.0
Perching birds Passeriformes spp.	2	a		5	4	9.2
Undetermined medium-sized birds	3	a			1	1.0
Lizards Sauria spp.	1	t			1	1.0
Blood					1	1.0
Social wasps Vespidae spp.	1	t		1		1.0
Plant matter				1	1	2.0
No. of samples			9	83	63	
No. of items			7	47	44	

Acknowledgements

This work was supported by the Wildlife Fund of Ministry of Agriculture and Rural Development, and the Bolyai scholarship (JL). Thanks to the anonymous referees for the helpful comments.

LITERATURE

- Biró Z., Lanszki J., Szemethy L., Heltai M. & Randi E. 2005: Feeding habits of feral domestic cats (*Felis catus*), wild cats (*Felis silvestris*) and their hybrids: trophic niche overlap among cat groups in Hungary. *J. Zool.* 266: 187–196.
- Clevenger A.P. 1993: Pine marten (*Martes martes* Linné, 1758) comparative feeding ecology in an island and mainland population of Spain. *Z. Säugetierkd.* 58: 212–224.
- Day M.G. 1968: The food habits of British stoats (*Mustela erminea*) and weasels (*Mustela nivalis*). *J. Zool.* 155: 458–487.
- Gittleman J.L. 1985: Carnivore body size: ecological and taxonomic correlates. *Oecologia* 67: 540–554.
- Heltai M. 2002: The status and distribution of mammal predators in Hungary. *Doctoral thesis, St. Stephen University, Gödöllő, Hungary.*
- Jedrzejewska B. & Jedrzejewski W. 1998: Predation in vertebrate communities. The Białowieża Primeval Forest as a Case Study. *Springer-Verlag, Berlin.*
- King C. 1989: The natural history of weasels and stoats. *Christopher Helm Publ. Ltd., Bromley, UK.*
- King C.M., Flux M., Innes J.G. & Fitzgerald B.M. 1996: Population biology of small mammals in Pureora Forest Park: 1. Carnivores (*Mustela erminea*, *M. furo*, *M. nivalis*, and *Felis catus*). *New Zealand J. Ecol.* 20: 241–251.
- Krebs C.J. 1989: *Ecological Methodology.* Harper Collins Publishers, New York.
- McDonald R.A., Webbon C. & Harris S. 2000: The diet of stoats (*Mustela erminea*) and weasels (*Mustela nivalis*) in Great Britain. *J. Zool.* 252: 363–371.
- Mitchell-Jones A.J., Amori G., Bogdanowicz W., Kryštufek B., Reijnders P.J.H., Stubbe M., Thissen J.B.M., Vohralík V. & Zima J. 1999: The Atlas of European Mammals. *Academic Press, London.*
- Reichstein V.H. 1993: *Mustela nivalis* Linnaeus, 1766 – Mauswiesel. In: Stubbe M. & Krapp F. (eds), *Handbuch der Säugetiere Europas, Band 5/1 Raubsäuger (Teil II).* Aula-Verlag, Wiesbaden: 571–626.
- Sidorovich V. 1997: Mustelids in Belarus. *Zolotoy uley publisher, Minsk.*
- SPSS 10 for Windows 1999: SPSS Inc. *Chicago, IL, USA.*
- Tapper S. 1979: The effect of fluctuating vole numbers (*Microtus agrestis*) on a population of weasels (*Mustela nivalis*) on farmland. *J. Anim. Ecol.* 48: 603–617.