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Food of the Barn Owl (*Tyto alba*) in the Eastern Mediterranean

Potrava plamienky driemavej (*Tyto alba*) vo východnom Stredomorí

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Abstract: The composition of the Barn Owl (*Tyto alba*) diet analysed from pellets collected in several regions of the Eastern Mediterranean is presented. In total, 27 samples from 21 sites in S Italy, S Greece (incl. Crete), S Turkey, NW Syria, SW Lebanon, N Israel, and N Egypt were composed of 8842 prey individuals. Mammals represented the dominant part of the prey (90% of the identified prey individuals, comprising 44 species). Birds were less abundant (7%), however, their diversity was enormous (64 species). Amphibians and reptiles were rarely represented in the diet (0.9%), while invertebrates we found more often (2.2%). The relative abundance of particular prey items in the Barn Owl diet was analysed in four geographical regions: (a) SE Europe (Calabria, Peloponnese, Crete), (b) Levantine parts of Turkey and Syria, (c) Lebanon and N Israel, and (d) N Egypt. In complex evaluation of the sample set, endemic forms composed a special group of prey items: *Microtus savii*, *Sorex samniticus*, and *Talpa romana* in Calabria; *Microtus thomasi* in Peloponnese; *Acomys minous* in Crete; and *Gerbillus amoenus* in Egypt. Another group of prey is represented by typical Levantine species: *Microtus guentheri*, *Meriones tristrami*, *Apodemus mystacinus*, and *Rana ridibunda*. *Apodemus flavicollis* and *Crocidura leucodon* were more abundant in Calabria while less abundant in the Levant. Synanthropic mammals (*Mus* spp., *Rattus rattus*, *Suncus etruscus*, *Crocidura suaveolens*) and birds (*Passer domesticus*) represented a significant part of the diet in the majority of the studied area.

Abstrakt: Študovali sme zloženie potravy plamienky driemavej (*Tyto alba*) z vývržkov nazbieraných v siedmich krajinách východného Stredozemia. Celkom 27 vzoriek z 21 lokalít v južnom Taliansku, južnom Grécku (vrátane Kréty), južnom Turecku, severovýchodnej Sýrii, juhozápadnom Libanone, severnom Izraeli a severnom Egypte sa skladali z 8842 jedincov koristi. Cicavce predstavovali dominantnú zložku potravy (90 % určených jedincov koristi, predstavujúcich 44 druhov). Vtáky boli menej početné (7 %), avšak ich diverzita bola vysoká (64 druhov). Obojživelníky a plazy boli nachádzané vzácne (0,9 %), no bezstavovce boli častejšie (2,2 %). Relatívna abundacia zložiek koristi plamienky bola analyzovaná v štyroch zemepisných regiónoch: (a) juhovýchodná Európa (Kalábria, Peloponéz, Kréta), (b) Levantské časti Turecka a Sýrie, (c) Libanon a severný Izrael a (d) severný Egypt. V celkovom vyhodnotení všetkých vzoriek tvorili špeciálnu skupinu koristi endemické formy: v Kalábrii *Microtus savii*, *Sorex samniticus* a *Talpa romana*, na Pleoponéze *Microtus thomasi*, na Kréte *Acomys minous* a v Egypte *Gerbillus amoenus*. Ďalšia skupina koristi bola predstavovaná typickou levantskou faunou: *Microtus guentheri*, *Meriones tristrami*, *Apodemus mystacinus* a *Rana ridibunda*. *Apodemus flavicollis* a *Crocidura leucodon* boli hojne nachádzané v Kalábrii no menej v Levante. Synantropické cicavce (*Mus* spp., *Rattus rattus*, *Suncus etruscus*, *Crocidura suaveolens*) a vtáky (*Passer domesticus*) predstavovali významnú zložku potravy plamienky takmer v celom študovanom území.

Key words: Barn Owl, *Tyto alba*, diet, Mediterranean, Levant

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Introduction

Barn Owl (*Tyto alba*) is a species tending to synanthropic habitats that has a cosmopolitan range of distribution. Remnants of the Barn Owl food in pellet form are relatively easily found in buildings and historical ruins. Therefore, there are comparatively more papers published about the diet of Barn Owls than other owl species, based on pellet analyses.

The Mediterranean region, due to its rather dry and warm climate along with long-time human settlement, creates optimal conditions for the prospering and relatively high densities of the Barn Owl. Other authors collected and analysed the Barn Owl diet from the Mediterranean; e.g., Contoli (1975) Contoli & Sammuri (1978), and Contoli et al. (1988) studied the diet composition in the Italian Peninsula; Contoli et al. (1978) in Sicily; Libois (1984) in Corsica; and Niethammer (1971, 1989) in Greek islands of Kithira and Kos and from Anatolian coast of Turkey. Analysis of the Barn Owl diet composition from the Balkans was published by Alivizatos & Goutner (1999) and Goutner & Alivizatos (2003) (NE Greece); Tome (1992) (Slovenia); and Miltschev et al. (2004) (SE Bulgaria). Pellets of the Barn Owl collected from dryer parts of Syria were analysed by Shehab (2005) and Shehab & Al Charabi (2006). Cheylan (1976) compared diet composition of this species from Spain, France, Corsica, Peloponnese and Crete. Pieper (1977) separately evaluated the occurrence of bats in the Barn Owl pellets from Crete.

Most of the above-mentioned papers were focused on the specific identification of mammal remnants in the food, while other groups of prey, like birds, reptiles, amphibians and/or invertebrates were cited in the diet reports under group names or overlooked totally. Exceptionally, some authors divided bird remnants into those from passerines and from other bird groups.

In our study, we evaluate the results of analyses of our own samples collected during trips throughout the eastern part of the Mediterranean region. The relative abundance of particular prey items in the Barn Owl diet was evaluated in four geographical regions: (a) SE Europe (Calabria, Peloponnese, Crete), (b) Levantine parts of Turkey and Syria, (c) Lebanon and N Israel, and (d) N Egypt.

Material and methods

List of samples

The pellet samples are numbered as in Tables 1–4; all the collection sites are complemented by geographical coordinates.

(1) Fuscaldo, SW Calabria, Italy, an abandoned house in a forest above a bridge, 17 May 1993, leg. J. Obuch, 39° 25' N, 16° 02' E;
(2) Skilohori, E Peloponnese, Greece, rocky overhang, 28 August 2001, leg. P. Benda, 37° 23' N, 22° 45' E;
(3) Hlemoutsi Castle, Kastro, W Peloponnese, Greece, 23 August 2001, leg. P. Benda, 37° 53' N, 21° 09' E;
(4) Kolymvari, W Crete, Greece, a cave above the village, 29 September 2006, leg. P. Benda, 35° 33' N, 23° 47' E;
(5) The same site as (4), pellets collected on 6 June 2008, leg. P. Benda;
(6) Agia Triada Monastery, Akrotiri Peninsula, W Crete, Greece, abandoned room inside the monastery, 28 September 2006, leg. P. Benda, 35° 34' N, 24° 08' E;
(7) The same site as (5), pellets collected on 9 October 2007, leg. P. Benda;
(8) The same site as (5), pellets collected on 27 May 2008, leg. P. Benda;
(9) Deveciuşağı, near Adana, S Turkey, under trees, 27 October 1991, leg. J. Červený, 36° 44' N, 35° 37' E;
(10) Qala'at Salah ad Din castle ruins, NW Syria, small caves near the castle, 30 June 1998, leg. J. Obuch, 35° 36' N, 36° 03' E;
(11) The same site as (10), pellets collected on 2 May 2001, leg. J. Obuch;
(12) Qala'at Sheisar castle ruins, NW Syria, 1 July 1998, 35° 17' N, 36° 34' E, leg. J. Obuch;
(13) The same site as (12), pellets collected on 1 May 2001, leg. J. Obuch;
(14) Qala'at al Hosn Castle (Crac des Chevaliers), NW Syria, 28 June 1998, leg. J. Obuch, 34° 45' N, 36° 18' E;
(15) The same site as (14), pellets collected on 1 May 2001, leg. J. Obuch;
(16) Mashta Deir Mama, NW Syria, small cave in a canyon, 1 June 2001, leg. M. Andreas, P. Benda, A. Reiter & D. Weinfurtová, 35° 08' N, 36° 20' E;
(17) Beit Oren, Mt. Carmel, NW Israel, small cave, 1 December 1996, leg. J. Obuch, 32° 44' N, 34° 58' E;
(18) Yesud ha-Ma'ala, Khula Reserve, N Israel, under trees in a wetland nature reserve, 30 November 1996, leg. J. Obuch, 33° 06' N, 35° 37' E;
(19) Gamla, NE Israel (officially Syria), nature reserve, 1 December 1996, leg. J. Obuch, 33° 03' N, 35° 40' E;

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Tab. 1. Composition of the Barn Owl (*Tyto alba*) diet in south-eastern Europe (Calabria, Peloponnese, Crete). For site numbers see Material and methods

Tab. 1. Zloženie potravy plamienky driemavej (*Tyto alba*) v juhovýchodnej Európe (Kalábria, Peloponéz, Kréta). Vysvetlivky sú uvedené v kapitole Material and methods

prey items / sites **korisť / lokality**	**1**		**3**		**2**		**4**		**7**		**5**		**6**		**8**		**∑**	**%**
Microtus savii	2+	107	3-	0	1-	0	2-	0	1-	0	2-	0	2-	0	1-	0	107	4.44
Apodemus flavicollis	2+	262	1-	29	1-	11	4-	0	3-	0	3-	0	3-	0	3-	0	302	12.52
Sorex samniticus	2+	61	2-	0			2-	0			1-	0	1-	0			61	2.53
Crocidura leucodon	2+	36	1-	0			1-	0									36	1.49
Suncus etruscus	1+	83		28		11	1-	11		7	1-	5		11	1-	2	158	6.55
Talpa romana	1+	8															8	0.33
Microtus thomasi	4-	0	3+	133	1-	0	3-	0	1-	0	2-	0	2-	0	2-	0	133	5.51
Orthoptera sp.	3-	0	2+	50		6	1-	0				2	1-	0			58	2.40
Hirundo rustica					1+	6											6	0.25
Apodemus epimelas	1-	0		1	2+	12											13	0.54
Apodemus sylvaticus	4-	0		29	2+	26	1+	26		11		8		12		9	121	5.02
Homoptera sp.	2-	0	1-	0			1+	15	2+	18							33	1.37
Mus sp.	3-	45	1-	95		56	1+	204	1+	71	1+	119	1+	157	1+	76	823	34.12
Rattus rattus		48	2-	9	2-	0		29		5	1+	43	1+	29		15	178	7.38
Coleoptera sp.	1-	3	1-	1			1-	0		2	1+	11	1+	10	1+	10	37	1.53
Passer domesticus		14		3				1		1		2		5	1+	9	35	1.45
Phoenicurus ochruros														1	2+	11	12	0.50
Crocidura suaveolens		74		28		9		32		7		19	1-	9	1-	6	184	7.63
Muscardinus avellanarius		7		4													11	0.46
Carduelis chloris				3				1						2		3	9	0.37
Acomys minous										1		4				2	7	0.29
Passer montanus		2		1						2				1			6	0.25
Sylvia atricapilla		1		4													5	0.21
Fringilla coelebs				2						1		2					5	0.21
Mammalia		**732**		**357**		**126**		**302**		**102**		**198**		**218**		**111**	**2146**	**88.97**
Aves	**1-**	**28**		**22**		**9**		**5**		**8**		**13**		**14**	**2+**	**27**	**126**	**5.22**
Amphibia, Reptilia		**3**		**1**		**0**		**0**		**2**		**0**		**0**		**0**	**6**	**0.25**
Evertebrata	**3-**	**4**	**1+**	**52**		**6**		**15**	**1+**	**22**		**14**		**11**		**10**	**134**	**5.56**
∑		**767**		**432**		**141**		**322**		**134**		**225**		**243**		**148**	**2412**	**100.00**
H'		2.13		2.13		1.86		1.28		1.74		1.60		1.38		1.78	2.45	

(20) Kfar Ruppin, NE Israel, under trees in fields near the Jordan River, 29 November 1996, leg. J. Obuch, 32° 28' N, 35° 33' E;

(21) Revadim, W Israel, under trees in fields, 26. November 1996, leg. J. Obuch, 31° 47' N, 34° 49' E;

(22) Saida (Sidon), SW Lebanon, Sea Castle, 18 September 2005, leg. J. Obuch, 33° 34' N, 35° 22' E;

(23) Sour (Tyre), SW Lebanon, Roman hippodrome, 18 September 2005, leg. J. Obuch, 33° 16' N, 35° 13' E;

(24) Wadi el Natrun, N Egypt, abandoned farm, 29 April 2002, leg. J. Obuch, 30° 19' N, 30° 19' E;

(25) Deir Amba Bishoi, Wadi el Natrun, N Egypt, 29 April 2002, leg. J. Obuch, 30° 19' N, 30° 22' E;

(26) el Giza, N Egypt, pyramids area, 14 April 2002, leg. J. Obuch, 29° 58' N, 31° 08' E;

(27) Saqqara, N Egypt, pyramids area, 15 April 2002, leg. J. Obuch, 29° 52' N, 31° 13' E.

Diet analysis

The pellets were dissociated using a 5% water solution of natrium hydroxide; the clear bones were than washed in pure water. After drying the material, the jaws of mammals, beaks, humeri, metacarpi and tarsometatarsi of birds, ossa iliaca of frogs, jaws of reptiles and heads of invertebrates were separated for further identification. The number of individuals of the particular identified prey item were estimated according to the most numerous body parts

Tab. 2. Composition of the Barn Owl (*Tyto alba*) diet in the Levantine parts of Turkey and Syria. For site numbers see Material and methods

Tab. 2. Zloženie potravy plamienky driemavej (*Tyto alba*) v levantských častiach Turecka a Sýrie. Vysvetlivky sú uvedené v kapitole Material and methods

prey items / sites **korisť / lokality**	**14**		**15**		**12**		**13**		**16**		**11**		**10**		**9**		**∑**	**%**
Microtus guentheri	1+	512		144	1-	126	2-	20	1-	90	3-	5	1-	21		55	973	33.17
Ptyonoprogne rupestris			1+	5												1	6	0.2
Mus sp.	1-	130	1+	125		151	1+	98	1-	75	1-	29		28	1+	93	729	24.86
Cricetulus migratorius	1-	12	1+	22	1+	48	1+	20	1-	11	1-	0	1-	0	1-	0	113	3.85
Rattus rattus		2		1	1+	10		5		1		1		1			21	0.72
Passer domesticus	2-	8		23	2+	120	1+	37	2-	3	2-	1	2-	0	2-	0	192	6.55
Crocidura leucodon		12		8	1-	0	1+	8		1		1				1	31	1.06
Meriones tristrami	1-	25	2-	7	1-	22	1+	37	2+	99	1-	2		8		12	212	7.23
Apodemus whiterbyi		5		5	1-	0			2+	22							32	1.09
Apodemus mystacinus	4-	2	3-	1	4-	0	3-	0	2+	123	3+	100	2+	47	3-	0	273	9.31
Apodemus flavicollis	1-	0			1-	0					2+	13	2+	11			24	0.82
Crocidura suaveolens		45		25		26	2-	2	1-	18		3	1+	21	1+	20	170	5.8
Suncus etruscus	1-	1		4		7		4		5		1		4	1+	12	38	1.3
Rana ridibunda						7		2		5							14	0.48
Coleoptera sp.		1		1		1				2						1	6	0.2
Alauda arvensis						2		2		1						1	6	0.2
Galerida cristata						2		2						1			5	0.17
Emberiza calandra				1		1		2		1							5	0.17
Mammalia		**747**		**344**	**1-**	**392**		**198**		**448**		**165**		**44**		**193**	**2631**	**89.7**
Aves	**2-**	**16**		**42**	**2+**	**137**	**1+**	**55**	**2-**	**6**	**1-**	**7**	**1-**	**5**	**1-**	**7**	**275**	**9.38**
Amphibia, Reptilia		**2**		**1**		**8**		**2**		**5**		**0**		**2**		**0**	**19**	**0.65**
Evertebrata		**1**		**0**		**3**		**0**		**2**		**0**		**0**		**1**	**8**	**0.27**
∑		**766**		**387**		**540**		**255**		**461**		**172**		**151**		**201**	**2933**	**100**
H'		1.19		1.82		1.95		2.09		1.92		1.45		2.02		1.51	2.11	

from the respective species. The results are presented in modified contingence tables, where the order of compared samples is changed according to similarities of their species composition. Significant deviations from mean (+, –) and levels of significance of the deviations for each item were counted using methods published by Obuch (2001). In the tables prey items with significant deviations from mean were outlined. Prey items without any significance in their deviations from the mean were placed under a dashed line, in accordance to their amount in the respective subset (from the most numerous to the least one). Prey items infrequently occurring in a subset ($\sum n<5$) are mentioned in the Appendix (per particular sample). The diversity index (H') was calculated by using the Shannon index and placed in the last line of each table.

Results and discussion

27 samples of the Barn Owl (*Tyto alba*) diet, collected at 21 sites throughout seven countries of the Eastern Mediterranean, were analysed; viz. Italy, Greece, Turkey, Syria, Lebanon, Israel, and Egypt. In these samples, 8842 individuals of prey were identified; mammals were most numerous (90% of identified prey individuals, 44 species), birds were much less abundant (7%), but more diversified (64 species). Reptiles and amphibians were the least abundant amongst the prey items (0.9%). Invertebrates (2.2%) were mostly identified only to their higher taxonomic level (order or higher).

South-eastern Europe (Calabria, Peloponnese, Crete), samples 1–8 (Table 1)

The sample of food remnants from Fuscaldo in western Calabria is typical by the dominance of forest mouse species, Yellow-necked Field Mouse, *Apodemus flavicollis*, and the numerous occurrence of small mammal species endemic for the Italian Peninsula: *Microtus savii*, *Sorex samniticus* and *Talpa romana*. Unlike Greek samples, in

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the Calabrian sample the Etruscan Shrew, *Suncus etruscus*, is more abundant both absolutely and relatively. The sample from the Hlemoutsi Castle in western Peloponnese is characterised by the dominance of the Greek endemic Thomas' Pine Vole, *Microtus thomasi*, and the abundant presence of the orthopteran family Tettigoniidae. In the sample from eastern Peloponnese (Skilohori) the endemic vole is absent, likely due to lack of available wet lowlands which surround the west Peloponnese site. In the Skilohori sample a similar volume is substituted by murid rodents, viz. House Mice, *Mus* sp., Western Broad-toothed Field Mouse, *Apodemus epimelas* and Long-tailed Field Mouse, *Apodemus sylvaticus.* Mice of the genus *Mus* are the main part of the Barn Owl food in all five samples from Crete. Although House Mice individuals were identified to the generic level only (*Mus* sp.), the occurrence of two species is possible among the prey, *Mus macedonicus* and/or *M. domesticus*. The Roof Rat, *Rattus rattus*, represents a significant weight volume in the Barn Owl food in Crete. Homopterans are more abundant in two Cretan samples (4, 7), whereas in other samples (5, 6, 8) beetles (Coleoptera) are prevalent; the difference is probably caused by seasonal variances in the availability of the particular insects, as the landscape features in both sites are similar. Among the less frequent prey items the occurrence of the Hazel Dormouse, *Muscardinus avellanarius* is noteworthy; in Calabrian and E Peloponnese samples, the Forest Dormouse, *Dryomys nitedula*, in W Peloponnese sample and the endemic Crete Spiny Mouse, *Acomys minous* is in most of the Cretan samples.

Levantine parts of Turkey and Syria, samples 9–16 (Table 2)

In comparison with continental parts of the Middle East, the Levantine region is characterised by relatively wet climate and thus by the occurrence of forests. In Syria, the Mediterranean arboreal habitats cover the area of the Jabal an Nusariyah Mts. up to the valley of the Orontes river in the East. In the Barn Owl food samples from that region, rodents were significantly dominant. 33% of prey individuals were represented by Günther Vole, *Microtus guentheri* (namely in the samples from the Qala'at al Hosn castle), 25% by the House Mouse, *Mus* cf. *macedonicus* (mostly in the samples from the Qala'at Sheisar castle) and 9% were represented by the Eastern Broad-toothed Field Mouse, *Apodemus mystacinus*. The latter species were along with another field mouse, a forest dwelling Yellow-necked Field Mouse, *Apodemus flavicollis*, most abundant in samples collected at the Qala'at Salah ad Din castle. The sample from the latter site is interesting due to the presence of other forest mammals, a mole *Talpa* sp. (first record of a mole in Syria, comments on this will be published elsewhere) and the Forest Dormouse, *Dryomys nitedula*. In the sample from Mashta Deir Mama, which lies in a drier region than the latter one, Tristram's Jird, *Meriones tristrami*, is more abundant, while House Sparrow, *Passer domesticus* is more abundant in the Qala'at Sheisar castle in the same region. The sample from Deveciuşağı in southern Turkey is characterised by a relatively high abundance of semi-synathropic small mammal species, such as *Mus* cf. *macedonicus*, *Crocidura suaveolens*, and *Suncus etruscus*.

Some mammals from the Barn Owl pellets collected at the castle Crac des Chevaliers (= Qala'at al Hosn) were published by Nadachowski et al. (1990). From our complete material of the Barn Owl pellets from Syria, composed of 21,459 prey individuals (mostly still unpublished results) were partially evaluated occurrences of dormice (Obuch 1999), hedgehogs (Benda & Obuch 2001), and bats (Benda et al. 2006).

SW Lebanon and N Israel, samples 17–23 (Table 3)

In Lebanon two smaller samples of the Barn Owl pellets were collected in two towns on the sea coast in the south-western part of the country. These samples are characterised by the absence of Günther's Vole, *Microtus guentheri*, in comparison with the Israeli samples, and also by the high volume of the Roof Rat, *Rattus rattus*, in Saida, and Tristram's Jird, *Meriones tristrami*, along with the House Sparrow, *Passer domesticus*, in Soura. From Israel, only samples coming from the northern part of the country with presence of the Günther's Vole, *Microtus guentheri*, were evaluated. This vole was dominant among prey in the samples from the wetland reserve at Khula and in Gamla, both located in the north-eastern part of the country. Other small mammal species, *Crocidura leucodon*, *Apodemus mystacinus*, *A. flavicollis*, and *Acomys cahirinus* were more abundant in the sample collected at Beit Oren, which lies on the southern edge of a forested range of Mount Carmel. In samples from rather dry fields at Kfar Ruppin, the most numerous item of prey was the House Mouse, *Mus* cf. *macedonicus*. Small insectivorous mammals, *Suncus etruscus*, *Crocidura suaveolens*, and *Pipistrellus kuhlii* were more abundant in the sample collected near water pools at Revadim.

Dor (1947) drew attention to the Barn Owl pellets collected in the Khula area the occurrence of the Eurasian Water Vole, *Arvicola terrestris* (= *A. amphibius*), as this represents the only record site of this species in Israel.

Tab. 3. Composition of the Barn Owl (*Tyto alba*) diet in south-western Lebanon and northern Israel. For site numbers see Material and methods

Tab. 3. Zloženie potravy plamienky driemavej (*Tyto alba*) v juhozápadnom Libanonu a severnom Izraeli. Vysvetlivky sú uvedené v kapitole Material and methods

prey items / sites **korisť / lokality**	**22**		**23**		**17**		**18**		**19**		**20**		**21**		**∑**	**%**
Rattus rattus	1+	5		2	1-	8		20				2		2	39	1.25
Meriones tristrami			2+	56	1-	62	1-	65		1		11		13	208	6.65
Passer domesticus			3+	49		33	3-	1					1-	0	83	2.65
Crocidura leucodon		1	1-	2	1+	109	1-	38		2	1-	0		11	163	5.21
Apodemus flavicollis		1			1+	26	1-	2							29	0.93
Apodemus mystacinus					1+	36	2-	1							37	1.18
Acomys cahirinus					1+	23	1-	1							24	0.77
Microtus guentheri	1-	0	5-	0		466	1+	669	1+	60		57	1-	56	1308	41.79
Mus sp.		8		37		290		371	1-	8	1+	62	1+	128	904	28.88
Suncus etruscus		3		1	1-	11	1-	10				2	2+	21	48	1.53
Crocidura suaveolens				4		56		38		2		3	1+	17	120	3.83
Pipistrellus kuhlii					1-	0	1-	1					2+	12	13	0.42
Spalax ehrenbergi				1		8	1-	0		2					11	0.35
Coleoptera sp.				1		3		8						4	16	0.51
Rattus norvegicus				2		6									8	0.26
Cricetulus migratorius						6		1							7	0.22
Hirundo rustica								7							7	0.22
Sturnus vulgaris								7							7	0.22
Streptopelia senegalensis						5								1	6	0.19
Alauda arvensis						4								1	5	0.16
Rana ridibunda						1		2						2	5	0.16
Gryllotalpa sp.								2						3	5	0.16
Mammalia		**18**	**1-**	**105**		**1114**		**1217**		**75**		**137**		**260**	**2926**	**93.48**
Aves		**0**	**2+**	**55**		**79**	**1-**	**25**	**1-**	**0**	**1-**	**2**	**1-**	**6**	**167**	**5.34**
Amphibia, Reptilia		**0**		**1**		**8**		**2**		**0**		**0**		**2**	**13**	**0.42**
Evertebrata		**0**		**2**	**1-**	**4**		**10**		**0**		**1**	**1+**	**7**	**24**	**0.77**
∑		**18**		**163**		**1205**		**1254**		**75**		**140**		**275**	**3130**	**100.00**
H'		1.34		1.66		2.08		1.37		0.76		1.24		1.74	1.87	

In our material of 1254 prey items from the Khula area, this species was absent.

Northern Egypt,
samples 24–27 (Table 4)

Lower Egypt including the Nile delta between the sea shore and the El Faiyum oasis is the most wet and fertile part of Egypt. This area is densely occupied by the Barn Owl. This species does not occupy the oases of the Western Desert of Egypt. However, two other owl species were found there *Athene noctua* and *Bubo ascalaphus* (Obuch & Krištín 2004).

In the relatively small samples from northern Egypt the most numerous are the synanthropic species, the House Mouse, *M.* cf. *domesticus*, the Roof Rat, *R. rattus*, the House Sparow, *Passer domesticus*, and the Laughing Dove, *Streptopelia senegalensis*. In the samples from Wadi el Natrun, the semi-desert region to the west of Cairo, the Pleasant Gerbil, *Gerbillus amoenus* was slightly more abundant. In the suburban Cairo sites, el Giza and Saqqara, other gerbillid rodents were present, *Gerbillus gerbillus* and *G. pyramidum*. Of interest in these samples is the complete absence of the Northeast African Spiny Mouse, *Acomus cahirinus*, a typical synanthropic rodent, common in the Cairo area (Osborn & Helmy 1980). On the other hand, the Asian House Shrew, *Suncus murinus*, also represents a synathropic element among the prey items in these samples. This Oriental shrew was introduced to Egypt likely in ancient times (Osborn & Helmy 1980).

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Tab. 4. Composition of the Barn Owl (*Tyto alba*) diet in northern Egypt. For site numbers see Material and methods
Tab. 4. Zloženie potravy plamienky driemavej (*Tyto alba*) v severnom Egypte. Vysvetlivky sú uvedené v kapitole Material and methods

prey items / sites **korisť / lokality**	**24**		**25**		**27**		**26**		**∑**	**%**
Mus sp.	1+	62		104		6	1-	6	178	48.50
Lacertidae sp.	1-	0	1+	44					44	11.99
Gryllotalpa sp.				11	1+	5			16	4.36
Rattus rattus	1-	1		39		1		4	45	12.26
Passer domesticus				17		2		2	21	5.72
Streptopelia senegalensis				8		2		2	12	3.27
Gerbillus amoenus		3		4					7	1.91
Coleoptera sp.				6					6	1.63
Mammalia	**1+**	**66**		**148**		**10**		**17**	**241**	**65.67**
Aves	**2-**	**0**		**41**		**4**	**1+**	**10**	**55**	**14.99**
Reptilia	**1-**	**0**	**1+**	**44**		**0**		**0**	**44**	**11.99**
Evertebrata	**1-**	**0**		**22**		**5**		**0**	**27**	**7.36**
∑		**66**		**255**		**19**		**27**	**367**	**100.00**
H'		0.26		1.97		1.74		2.49	1.97	

Comparison (Table 5)
When comparing the relative abundance of particular prey items in the Barn Owl diet from eight regions of the Eastern Mediterranean, several mostly synanthropic or semi-synathropic forms, like House Mice, *Mus* sp., Roof Rat, *Rattus rattus*, House Sparrow, *Passer domesticus*, Etruscan Shrew, *Suncus etruscus*, and the Lesser White-toothed Shrew, *Crocidura suaveolens*, are present and very abundant in almost the whole studied region. The Yellow-necked Field Mouse, *Apodemus flavicollis*, and Bicoloured Shrew, *Crocidura leucodon*, showed higher relative abundance in the diet of the Barn Owl in the Calabrian sample, while both are less abundant (although well present) in the Levantine samples (incl. Syria and Israel). However, the diet of the Barn Owl in the Levant is characterised by a group of four prey species composed of *Microtus guentheri*, *Meriones tristrami*, *Apodemus mystacinus*, and *Rana ridibunda*. An extraordinarily high abundance of reptiles was recorded in the Egyptian samples, whilst in the Greek samples (both from Peloponnese and Crete) there was a prevalence of large insects (Orthoptera, Coleoptera, Homoptera). On the other hand, several endemic mammalian species, in some cases in high numbers, complement well the selection of the available prey of the Barn Owl in the Mediterranean: *Microtus savii*, *Sorex samniticus*, and *Talpa romana* in Italy, *Microtus thomasi* in mainland Greece, *Acomys minous* in Crete, and *Gerbillus amoenus* in northern Egypt. Although bats were present mainly in the Levantine samples of the Barn Owl food (*Nycteris thebaica*, *Taphozous nudiventris*, *Myotis blythii*, *Eptesicus bottae*, *Pipistrellus kuhlii*, *Tadarida teniotis*), we did not observe any specialisation to bat hunting by the Barn Owl in the Mediterranean – according to its food composition (though described from Central Europe and some dry parts of the Middle East, Bauer 1956, Obuch 1988, Benda et al. 2006).

The results of analyses of 27 samples of pellets containing almost nine thousand prey individuals from a relatively broad area of the Eastern Mediterranean (approximately five thousand kilometres along the Mediterranean sea coast) showed the Barn Owl to be a feeding opportunist, which can hunt all available prey in its hunt territory, mostly small mammals of the size of mouse to rat. On the other hand, the results confirmed the traditional good availability of Barn Owl pellet analysis for faunal evidence and research. The significant records among mammalian species will be evaluated elsewhere.

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Tab. 5. Comparison of the Barn Owl (*Tyto alba*) diet composition from eight regions of the Eastern Mediterranean. For explanations see Material and methods

Tab. 5. Porovnanie potravy plamienky driemavej (*Tyto alba*) z ôsmich regiónov východného Stredomoria

region / oblasť food item / druh potravy	Calabria		Pelop.		W Crete		S Turkey		N Egypt		SW Leban.		W Syria		Israel		∑	%
Microtus savii	3+	107	1-	0	2-	0			1-	0			4-	0	4-	0	107	1.21
Sorex samniticus	3+	61			1-	0							3-	0	3-	0	61	0.69
Talpa romana	1+	8															8	0.09
Muscardinus avellanarius	1+	7		4													11	0.12
Apodemus flavicollis	3+	262	1+	40	4-	0	2-	0	2-	0	1-	1	2-	24	2-	28	355	4.01
Suncus etruscus	2+	83	1+	39		36	1+	12	2-	0		4	2-	26	1-	44	244	2.76
Crocidura leucodon	1+	36	2-	0	3-	0	1-	1	2-	0		3	1-	30	1+	160	230	2.60
Crocidura suaveolens	1+	74		37	1+	73	1+	20	3-	0	1-	4	1-	50	1-	116	474	5.36
Microtus thomasi	2-	0	4+	133	3-	0			1-	0			4-	0	4-	0	133	1.50
Orthoptera sp.	1-	0	3+	56	1-	2				1			3-	0	3-	0	59	0.67
Hirundo rustica			1+	6										1		7	14	0.16
Apodemus sylvaticus	2-	0	3+	55	2+	66			1-	0			4-	0	4-	0	121	1.37
Homoptera sp.					2+	33							2-	0	2-	0	33	0.37
Coleoptera sp.		3		1	2+	33		1		6		1	2-	5		15	65	0.74
Phoenicurus ochruros					2+	12									1-	0	12	0.14
Carduelis chloris				3	1+	6										1	10	0.11
Acomys minous					1+	7											7	0.08
Rattus rattus	1+	48	1-	9	2+	121	1-	0	2+	45		7	2-	21	2-	32	283	3.20
Mus sp.	2-	45		151	1+	627	1+	93	1+	178		45	1-	636		859	2634	29.79
Gerbillus amoenus									1+	7							7	0.08
Streptopelia senegalensis									2+	12			1-	0		6	18	0.20
Gryllotalpa sp.									2+	16			1-	2		5	23	0.26
Lacertidae sp.		1			1-	2			3+	44		1	1-	4	2-	2	54	0.61
Passer domesticus	1-	14	2-	3	1-	18	1-	0	1+	21	3+	49	1+	192	2-	34	331	3.74
Meriones tristrami	4-	0	3-	0	4-	0		12	3-	0	2+	56	1+	200		152	420	4.75
Apodemus whiterbyi													2+	32	2-	0	32	0.36
Apodemus mystacinus s. l.	3-	0	1-	13	4-	0	1-	0	2-	0	1-	0	2+	273	2-	37	323	3.65
Cricetulus migratorius	2-	0	1-	0	2-	0			1-	0			2+	113	2-	7	120	1.36
Rana ridibunda													1+	14		5	19	0.21
Microtus guentheri	6-	0	6-	0	7-	0		55	5-	0	4-	0	1+	918	1+	1308	2281	25.80
Acomys cahirinus													1-	0	1+	24	24	0.27
Pipistrellus kuhlii														2	1+	13	15	0.17
Spalax ehrenbergi												1		4		10	15	0.17
Fringilla coelebs				2		3								3		4	12	0.14
Alauda arvensis								1						5		5	11	0.12
Emberiza calandra				1		1								5		3	10	0.11
Rattus norvegicus												2		2		6	10	0.11
Ptyonoprogne rupestris				2				1		1				5			9	0.10
Sturnus vulgaris										1						7	8	0.09
Galerida cristata						1				1				5		1	8	0.09
Carduelis carduelis				2				1								4	7	0.08
Carduelis cannabina				2		1						1		1		1	6	0.07
Passer montanus		2		1		3											6	0.07
Sylvia atricapilla		1		4												1	6	0.07
Columba livia										2						4	6	0.07
Coturnix coturnix										2		1		1		2	6	0.07
Erithacus rubecula				2		2								1			5	0.06
Parus major		1				3								1			5	0.06
Mammalia		**732**		**483**		**931**		**193**	**1-**	**241**	**1-**	**123**		**2438**		**2803**	**7944**	**89.84**
Aves	**1-**	**28**		**31**		**67**	**1-**	**7**	**1+**	**55**	**2+**	**55**	**1+**	**268**	**1-**	**112**	**623**	**7.05**
Amphibia, Reptilia		**3**	**1-**	**1**	**1-**	**2**		**0**	**3+**	**44**		**1**		**19**	**1-**	**12**	**82**	**0.93**
Evertebrata	**1-**	**4**	**2+**	**58**	**2+**	**72**		**1**	**1+**	**27**		**2**	**3-**	**7**	**2-**	**22**	**193**	**2.18**
∑		**767**		**573**		**1072**		**201**		**367**		**181**		**2732**		**2949**	**8842**	**100.00**
H'		2.13		2.22		1.65		1.51		1.97		1.79		2.11		1.79	2.48	

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Appendix

Prey items found in the samples, not included in Tables 1–5 (in parentheses the number of individuals)

(1) Fuscaldo, Italy: *Myodes glareolus* (1), *Jynx torquilla* (2), *Motacilla alba* (1), *Lanius collurio* (2), *Ficedula* sp. (1), *Parus major* (1), Passeriformes sp. (4), *Rana* sp. (2), Lacertidae sp. (1), Limacidae sp. (1);

(2) Skilohori, Greece: *Martes foina* (1), *Ptyonoprogne rupestris* (2), *Emberiza calandra* (1);

(3) Hlemoutsi Castle, Greece: *Dryomys nitedula* (1), *Apus melba* (1), *Acrocephalus* sp. (1), *Erithacus rubecula* (2), *Emberiza schoeniclus* (1), *Carduelis carduelis* (2), *Carduelis cannabina* (2), *Hyla* cf. *arborea* (1), Decapoda sp. (1);

(4) Kolymvari, Crete: *Phoenicurus phoenicurus* (2), *Parus major* (1);

(5) Kolymvari, Crete: Sylviidae sp. (5), *Oenanthe* sp. (1), *Turdus merula* (3), Scorpionida sp. (1);

(6) Agia Triada Mon., Crete: *Galerida cristata* (1), Sylviidae sp. (1), *Parus major* (1), *Emberiza calandra* (1), *Carduelis cannabina* (1), Gastropoda sp. (1);

(7) Agia Triada Mon., Crete: Sylviidae sp. (2), *Erithacus rubecula* (2), Lacertidae sp. (2), Hymenoptera sp. (1), Gastropoda sp. (1);

(8) Agia Triada Mon., Crete: *Lepus europaeus* (1), *Streptopelia turtur* (1), *Regulus* sp. (1), Sylviidae sp. (1), *Parus major* (1);
(9) Deveciuşağı, Turkey: *Calidris alpina* (1), Sylviidae sp. (1), *Muscicapa striata* (1), *Luscinia* sp. (1), *Carduelis carduelis* (1);
(10) Qala'at Salah ad Din, Syria: *Talpa* sp. (1), *Sciurus anomalus* (1), *Dryomys nitedula* (1), Alaudidae sp. (1), Sylviidae sp. (2), *Garrulus glandarius* (1), Lacertidae sp. (1), Agamidae sp. (1);
(11) Qala'at Salah ad Din, Syria: Sylviidae sp. (1), *Erithacus rubecula* (1), *Turdus viscivorus* (1), *Fringilla coelebs* (2), Aves sp. juv. (1);
(12) Qala'at Sheisar, Syria: *Spalax ehrenbergi* (1), *Mesocricetus auratus* (1), *Riparia riparia* (1), Sylviidae sp. (2), *Cercotrichas galactotes* (1), Fringillidae sp. (4), *Petronia petronia* (2), Passeriformes sp. (2), Lacertidae sp. (1), *Gryllotalpa* sp. (2);
(13) Qala'at Sheisar, Syria: *Pipistrellus kuhlii* (1), *Spalax ehrenbergi* (2), *Rattus norvegicus* (1), *Coturnix coturnix* (1), *Ammomanes deserti* (1), *Motacilla alba* (1), *Motacilla flava* (1), *Lanius* sp. (1), *Monticola* sp. (3), *Emberiza melanocephala* (2), *Carduelis cannabina* (1), Passeriformes sp. (1),
(14) Qala'at al Hosn, Syria: *Rattus norvegicus* (1), *Hirundo rustica* (1), *Riparia riparia* (1), *Parus major* (1), *Emberiza* sp. (1), Passeriformes sp. (4), Lacertidae sp. (2);
(15) Qala'at al Hosn, Syria: *Tadarida teniotis* (1), *Dryomys nitedula* (1), *Tringa* sp. (1), *Pycnonotus xanthopygos* (1), *Sylvia communis* (1), Sylviidae sp. (1), *Luscinia* sp. (1), *Fringilla coelebs* (1), *Rhodospiza obsoleta* (3), Passeriformes sp. (4);
(16) Mashta Deir Mama, Syria: *Pipistrellus kuhlii* (1), *Allactaga euphratica* (1), *Spalax ehrenbergi* (1), *Acrocephalus* sp. (1);
(17) Beit Oren, Israel: *Myotis blythii* (1), *Eptesicus bottae* (1), *Taphozous nudiventris* (1), *Gerbillus dasyurus* (4), *Coturnix coturnix* (1), *Porzana porzana* (1), *Columba livia* (4), *Streptopelia decaocto* (1), *Jynx torquilla* (1), *Galerida cristata* (1), Alaudidae sp. (4), *Sylvia atricapilla* (1), Sylviidae sp. (2), *Turdus* sp. (1), *Troglodytes troglodytes* (1), *Emberiza calandra* (2), *Emberiza hortulana* (1), *Fringilla coelebs* (2), *Carduelis carduelis* (3), *Carduelis cannabina* (1), *Carduelis chloris* (1), Passeriformes sp. (6), Aves sp. (2), Aves sp. juv. (1), *Pelobates syriacus* (4), Lacertidae sp. (2), Agamidae sp. (1), Decapoda sp. (1);
(18) Yesud ha-Ma'ala, Khula, Israel: *Riparia riparia* (2), *Turdus philomelos* (3), *Emberiza calandra* (1), *Fringilla coelebs* (2), *Carduelis carduelis* (1), Passeriformes sp. (1);
(20) Kfar Ruppin, Israel: *Coturnix coturnix* (1), *Sylvia borin* (1), Decapoda sp. (1);
(21) Revadim, Israel: Sylviidae sp. (4);
(23) Sour, Lebanon: *Coturnix coturnix* (1), *Lanius* sp. (1), *Acrocephalus arundinaceus* (1), *Carduelis cannabina* (1), *Passer hispaniolensis* (1), Passeriformes sp. (1), Lacertidae sp. (1), Solifugida sp. (1);
(25) Deir Amba Bishoi, Wadi el Natrun, Egypt: *Crocidura floweri* (1), *Columba livia* (1), *Alcedo atthis* (1), Alaudidae sp. (1), *Ptyonoprogne rupestris* (1), *Anthus* sp. (3), *Pycnonotus xanthopygos* (1), Sylviidae sp. (3), *Sturnus vulgaris* (1), Passeriformes sp. (2), Aves sp. juv. (2), Diptera sp. (1), Hymenoptera sp. (2), Orthoptera sp. (1), Solifugida sp. (1);
(26) el Giza, Egypt: *Hemiechinus auritus* (1), *Suncus murinus* (1), *Jaculus jaculus* (1), *Arvicanthis nilotica* (2), *Gerbillus gerbillus* (1), *Gerbillus pyramidum* (1), *Anas crecca* (1), *Coturnix coturnix* (2), *Columba livia* (1), *Galerida cristata* (1), Passeriformes sp. (1);
(27) Saqqara, Egypt: *Nycteris thebaica* (1), *Gerbillus pyramidum* (2).