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Spatial Diversity in the Diet of the Eurasian Eagle Owl *Bubo bubo* in Iran

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Abstract
During five stays in Iran, the author collected remnants of the diet from seven species of owls. The most numerous were samples from the Eurasian Eagle Owl *Bubo bubo*, which were found in 38 sites, usually on rocky cliffs where the owls breed or where they roost during the day. A total of 7,862 items of prey were analysed. Mammals predominated (Mammalia, 56 species, 77.0%), and the species representation of birds was diverse (Aves, more than 100 species, 15.3%); lower vertebrates were hunted less often (Amphibia, Reptilia, Pisces, 5.0%), while invertebrates (Evertebrata, 2.7%) were an occasional food supplement. The most commonly represented rodents (Rodentia) in the Elborz and Talysh Mountains were: Snow Vole *Chionomys nivalis*, Steppe Field Mouse *Apodemus witherbyi* and Common Vole *Microtus obscurus*; in the northern part of the Zagros Mountains: Brandt's Hamster *Mesocricetus brandti*, Williams' Jerboa *Allactaga williamsi* and Setzer's Mouse-tailed Dormouse *Myomimus setzeri*; in the central wetter part of the Zagros: Persian Jird *Meriones persicus*, Tristam's Jird *Meriones tristrami*, Transcaucasian Mole Vole *Ellobius lutescens* and Grey Hamster *Cricetulus migratorius*; in the drier part of the Zagros: Libyan Jird *Meriones libycus*, Sundevall's Jird *Meriones crassus* and Indian Gerbil *Tatera indica*; in the southern part of the Zagros in Fars Province: Iranian Vole *Microtus irani*, the rats *Rattus rattus* and *R. norvegicus* and mice *Mus* sp.; in the south-eastern part of Iran: Short-tailed Bandicoot Rat *Nesokia indica*; and in the Koppeh Dagh Mountains: Southern Mole Vole *Ellobius fuscocapillus*, Afghan Vole *Microtus afghanus*, Midday Jird *Meriones meridianus* and Small Five-toed Jerboa *Allactaga elater*. Analysis of diet samples from the Eurasian Eagle Owl from the northern Zagros Mountains and eastern Turkey showed that Setzer's Mouse-tailed Dormouse *Myomimus setzeri* occured only in samples from locations above 1800 m a.s.l., where Brandt's Hamster *Mesocricetus brandti* was the predominant prey.

1. Introduction

The Eurasian Eagle Owl *Bubo bubo* inhabits the extensive territory of the Eurasian sub-continent. It mainly utilises broken relief with rocky formations in which there are possibilities for nesting and roosting by day. The territory of Iran not only offers a surplus of rocky massifs but also suitable prey for *B. bubo* in the mountain steppes and semi-deserts. The owl avoids deserts with a low density of vertebrates and thickly forested areas. Obuch & Rybin (1993) deduced that in the mountain steppes of southern Kyrgyzstan, *B. bubo* is nutritionally linked to the natural steppe vertebrate fauna, but in the cultivated landscapes of Central Europe, the species is dependent on the agricultural activities of human beings. Piechocki *et al.* (1977) found a species-rich steppe fauna in the diet remnants of *B. bubo* in the mountains of Mongolia.

Obuch (1994) published the first collections of *B. bubo* pellets from the eastern part of Turkey. Shehab (2004) collected pellets of *B. bubo* in the more arid parts of Syria, and Amr *et al.* (1997) and Rifai *et al.* (2000) collected pellets near Azraq oasis in eastern Jordan. In

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theses studies in Jordan and Syria, only the remains of mammals were determined. Obuch (2001a) evaluated the proportional representation of dormice in the diet of seven species of owls in the Middle East. Data on the dissemination of bats from the diet remnants of owls in Syria (Benda *et al.* 2006), Jordan (Benda *et al.* 2011) and Iran (Benda *et al.* 2012) are also used to determine the distribution of bat species. In a study on the range of hedgehogs in Syria, Benda & Obuch (2001) used data from the analysis of pellets from *B. bubo* and the Barn Owl *Tyto alba*. Kryštufek *et al.* (2009) speculated on the dominant representation of the hamster *Mesocricetus brandti* in the food of *B. bubo* in eastern Turkey and north-western Iran, although data from snap-trapping of this rodent are rare. Čermák *et al.* (2006) mentiond the Afghan Pika *Ochotona* cf. *rufescens* as a new species for the fauna of Turkey on the basis of its discovery in pellets of *B. bubo*.

Because the samples of diet remnants of *B. bubo* were obtained from different parts of Iran with different environmental conditions, the aim of the present work is to outline differences in the dominance of the main prey species in seven regions of the country. The mountainous regions in Turkey and north-western Iran form a single zoogeographic unit in which the differences in the composition of the prey of *B. bubo* are evaluated according to the elevation of the habitat above sea level.

2. Materials and methods

In the years 1996, 1997, 1998, 2000 and 2002, the author took part in expeditions to Iran organised by the Natural Sciences Faculty of Charles University and the National Museum in Prague. He specialised in searching out diet remnants from owls. He obtained material from seven species of owls. The most numerous finds were those of pellets and bones in the nests of *B. bubo*.

Osteological material from nests of *B. bubo* was separated by washing in a container with still water. The pellets were cleared of fur and feathers in a 5% solution of NaOH, and the bones were washed under running water and then dried. For identification purposes, the jaws of mammals were sorted, as were four types of bird bones (humerus, metacarpus, tarsometatarsus and beaks), the ilium bones (os ilium) of frogs, the jaws of reptiles and fishes, the pharyngeal bones (os pharyngeum inferior) of carp fishes, and some parts of the bodies of invertebrates, mainly heads (caput) and jaws of different insect orders and pincers of scorpions and crabs. The number of individual species, or taxa, in the sample was determined from the most abundant of their body parts found.

The identification of bones was undertaken using collections of vertebrate skeletons from captured and deceased individuals and according to published identification features (Gromov & Erbajeva 1995; Harrison & Bates 1991; Lay 1967; DeBlase 1980; Kryštufek & Vohralík 2001, 2005, 2009; Aulagnier *et al.* 2009; Porter *et al.* 1996). Some taxa were identified to the level of the genus, mainly the lower taxa of vertebrates, while invertebrates were identified from the level of the family up to the level of the order. These prey items are labelled with the symbol sp. (*e.g. Mus* sp., Coleoptera sp.). Whenever there is some uncertainty in the identification of a taxon, the symbol cf. is used before the species name (*e.g. Pelophylax* cf. *ridibundus*). The status of some taxa is presently being re-evaluated on the basis of genetic analysis.

The results are presented in the form of modified tables in which the sequence of samples is determined on the basis of similarity in representation of the most abundant prey species with plus values, which are highlighted in blocks bordered by a solid line. Plus and minus values are calculated as marked differences from the mean (MDFM, Obuch 2001b). The numerous species without marked differences, i.e. with an equal representation in the samples of the evaluated file, are presented under a broken line. The diversity index H', calculated according to Shannon & Weaver (1949), is presented in the bottom line of the tables. The least abundant species are given beneath the tables; these species are not listed in the table appendices.

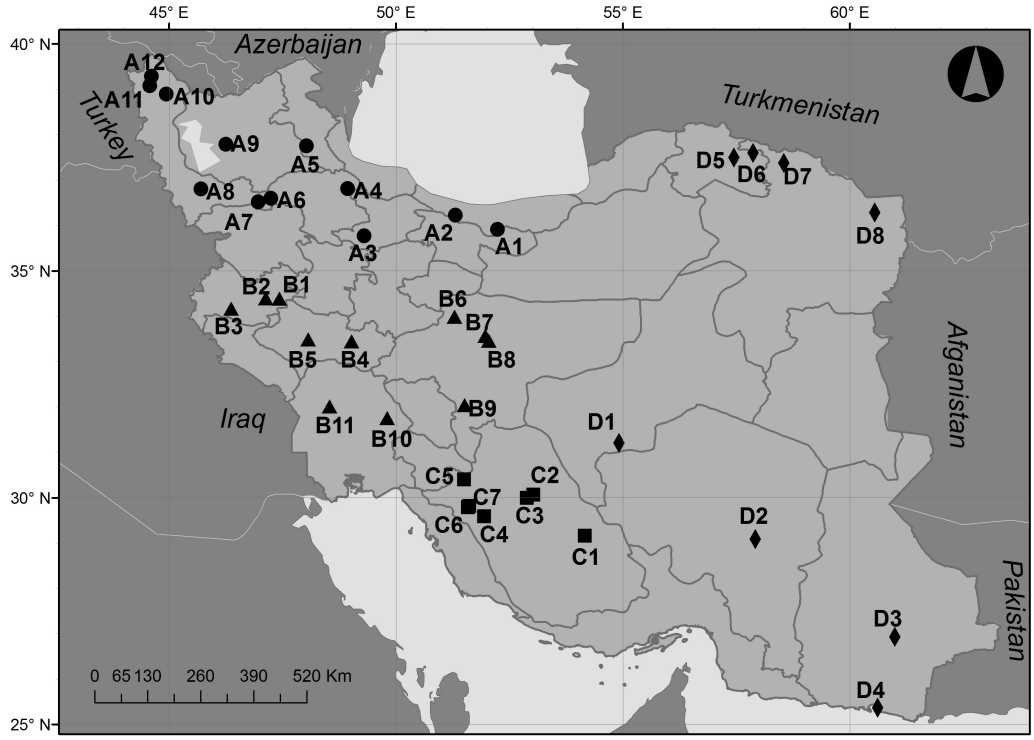

Fig. 1. Location of the study sites in Iran. The sites are listed in Appendix 1.

3. Results

A total of 7,862 pieces of prey were obtained in the collections of diet remnants of *Bubo bubo* at 38 sites from the territory of Iran. Mammals (Mammalia, 56 species, 77.0%) were the most numerous component. Rodents (Rodentia) were the dominant group with the highest number of species: *Meriones persicus* (17.6%), *Cricetulus migratorius* (11.8%) and *Mesocricetus brandti* (10.4%). Birds (Aves, 15.3%) were the second very diverse component (more than 100 taxa were determined), with only the Rock Dove *Columba livia* surpassing the 1% level of predominance. From the lower classes of vertebrates (Amphibia, Reptilia, Pisces, 5.0%), the frog *Pelophylax* cf. *ridibundus* (1.5%) was the most abundant. Agamids (Agamidae, 1.6%) were the most abundant reptile, while carp (Cypriniformes, 0.9%) were the most abundant fish. Of the invertebrates (Evertebrata), the larger species of beetles (Coleoptera, 1.9%) were the most abundant. The samples of *B. bubo* diet are divided into four territorial units with specific zoogeographic characteristics:

A. Northern Iran (Table 1)

In this set, the collections from the Elborz and Talysh Mountains and from the northern part of the Zagros Mountains with montane steppe vegetation are evaluated.

In mountain environments, *B. bubo* predominately hunts mammals (Mammalia, 85.4%), from which the species *Mesocricetus brandti* (20.9%), *Meriones persicus* (20.2%), *Cricetulus migratorius* (9.1%), *Ellobius lutescens* (6.8%) and *Microtus obscurus* (6.7%) were dominant. Of the birds (Aves, 8.1%, 68 taxa), the most abundant species was *Alectoris chukar* (0.7%); of the frogs, *Pelophylax* cf. *ridibundus* (1.9%), and of the invertebrates, Coleoptera (2.2%).

Relatively small diet samples of *B. bubo* were collected in the Elborz and Talysh Mountains, and the numbers from the Talysh Mountains are insufficient to distinguish differences from the other parts of northern Iran (the Sorkheh Dizaj and Hassan Baghi sites). These are from the drier, steppic parts of the mountains. In the small sample from the Gafarabad locality in the foothills of the Elborz Mountains, the water vole *Arvicola amphibius* was the most abundant species. In the higher locations of the Elborz Mountains (collections from Valiabád and Gazanak), small rodents were the most abundant species in the owl's diet: *Chionomys nivalis, Apodemus witherbyi,*

M. obscurus and *C. migratorius*. In Azarbayjan-e Garbi Province in the Zagros Mountains, the dormouse *Myomimus setzeri* was abundant at elevations of about 2000 m a.s.l. This species was found for the first time in Kordestan Province (Rosolimo 1976). In the higher mountains, *M. brandti* and *E. lutescens* predominated in the owl's diet, while near the Turkish border (the Qare Kelisa locality), *Allactaga williamsi* and *P.* cf. *ridibundus* also predominated In the most numerous sample near Choplu, which is near a river, *B. bubo* also hunted fish (Cypriniformes) and smaller types of passerine birds (*Delichon urbica, Riparia riparia* and *Passer domesticus*). In drier biotopes at lower elevations (samples from Bastam and Maku), the rodents *Meriones tristrami, M. persicus, Allactaga elater* and *Microtus irani* were more abundantly represented.

B. Central Zagros (Table 2)

The western part of the central Zagros Mountains has a wetter climate with a predominant steppe to forested steppe vegetation. On the northern slopes of the Zagros Mountains, in the northern part of the Kuh-a Qohrud Mountains (Esfahan Province) and on the edge of the Mesopotamian lowlands (Khuzestan Province), the climate is drier with semi-deserts.

In the diet of *B. bubo* from this region, there was a lower representation of mammals (Mammalia, 38 species, 68.4%), with *M. persicus* (18.1%), *C. migratorius* (13.8%) and *E. lutescens* (10.7%) being predominant. The share of birds (Aves, 76 taxa, 21.8%) was higher, with *Alectoris chukar* (4.2%) being hunted most often. Of the reptiles, Agamidae (3.7%) were the most abundant, and of the invertebrates, Coleoptera (1.5%).

Fresh pellets of *B. bubo* were found in rocky chimneys near Bisotun in October 1998 along with older pellets of *Tyto alba* in the back of the chimneys (Obuch & Khaleghizadeh 2011). The Rock Dove *Columba livia* was the most abundant species in these pellets. The skeletal remnants in an old nest of *B. bubo* found in a rocky wall near the historical spring of Taq-e Bostam contained a high abundance of *Arvicola amphibius*. The largest sample was from a nest near the settlement of Lenje-Abad in the narrow valley of the Rud-e Dez River. In several places in the wetter parts of the central Zagros, the dominant species in the pellets were *C. migratorius, E. lutescens, M. persicus* and *M. tristrami*, while in the drier parts, the dominant species were *M. libycus* and *M. crassus*. At Choqazanbil (Khuzestan Province), *Tatera indica* and *Nesokia indica* were also dominant. At the same site, *T. alba* mainly hunted mice (*Mus* sp., Obuch & Khaleghizadeh 2011). At a nest of *B. bubo* in the semi-desert near Qamishlu, the jerboas *Allactaga williamsi* and *Allactaga elater* and the Long-eared Hedgehog *Hemiechinus auritus* were the most abundant species. At the Deh Zire site, reptiles from the families Agamidae and Lacertidae predominated.

C. Southern Zagros, Fars Province (Table 3)

In Fars Province, there are favourable conditions for the nesting of *B. bubo* in the numerous rocky formations on the edge of fertile river valleys. Forest steppe is predominant on the slopes.

Mammals (Mammalia, 26 species, 63.5%) were a less important component of the diet of *B. bubo*, because smaller species of rodents predominated: *M. irani* (14.6%), *Mus* sp. (14.3%) and *C. migratorius* (9.3%). Birds were more important in the diet (Aves, 27.7%) because of the greater weight of the dominant species: *A. chukar* (4.1%) and *C. livia* (2.8%). The frog *P. ridibundus* (4.3%) and Agamidae (2.6%) were also abundantly represented.

Pellets of *B. bubo* were located in the upper part of a canyon between Sivand and Saadat Shahr, and in 2002, in a cave in the lower part of the canyon, there were pellets of *T. alba* (Obuch & Khaleghizadeh 2011). *M. irani, C. migratorius* and *Mus* sp. predominated in the diet of both owls, but *B. bubo* also hunted frogs (*P.* cf. *ridibundus*), bats and pigeons. In the forest steppe near Hane-ye Zenyan, *B. bubo* mainly hunted the partridge *A. chukar*, and in the narrow valley near Absar, the jird *M. persicus*. Like the Tawny Owl *Strix aluco*, the eagle owl flew after bats into the Shahpur and Bisahpur caves (Obuch 2011a). When outside of Bisahpur cave, the Tawny Owl hunted fish, frogs and crabs in the river valley, whereas the eagle owl preferred the rodents *Mus* sp., *Rattus rattus* and *M. persicus*.

Table 1. Similarity in the prey items of *Bubo bubo* in 12 samples from northern Iran. Codes: 1+, 2+, 1-, 4-: marked differences from the mean (MDFM) (see Obuch 2001).

Species \ Sites	**3**	**1**	**2**	**6**	**12**	**7**	**11**	**10**	**8**	**9**	**5**	**Total**	**%**
Arvicola amphibius	1+ 6		1	3	17	22		1- 4				53	1.35
Chionomys nivalis	1+ 8	1+ 9	6	10	2- 0			1- 1	1	2		37	0.94
Apodemus witherbyi	1+ 7	1+ 8	2	1- 3	13			1- 1		1	1	36	0.92
Cricetulus migratorius	6	6	1+ 23	41	84	118	12	1- 43	16		4 2	355	9.05
Microtus obscurus		2	3+ 62	2+ 96	66	1- 36	1- 1	4- 0	2- 0			263	6.71
Myomimus setzeri				1+ 14	15	19		2- 0	1			49	1.25
Ellobius lutescens	2	2	1- 3	2+ 84	3- 8	1+ 138	1- 1	2- 19	9		4	270	6.89
Mesocricetus brandti	2- 1	1- 1	3- 2	1+ 126	1+ 366	310	3- 0	5- 2	3- 0	9	4	821	20.94
Allactaga williamsi	4	2	1- 2	1- 12	1+ 100	85	9	66	6		2	288	7.35
Meriones vinogradovi					1+ 6		1					7	0.18
Pelophylax ridibundus				1- 2	2+ 6 7	3- 1	2	2- 2			1	75	1.91
Cypriniformes sp.				1- 0	2- 0	2+ 38		2- 0				38	0.97
Delichon urbicum						1+ 9			1			10	0.26
Riparia riparia						1+ 11						11	0.28
Passer domesticus					1	1+ 14	1		1			17	0.43
Meriones tristrami				2- 0	2- 1	1+ 37	1+ 10	1+ 27		1	3	79	2.01
Alectoris chukar	1	3	3	1	5	6	1+ 5	3		1		28	0.71
Allactaga elater						1- 0	1+ 5	1+ 12				17	0.43
Coleoptera sp.				1- 1	16	1- 14		2+ 55	1			87	2.22
Microtus irani	3		1- 0	3- 0	34	54	1	1+ 49	7	2	3	153	3.90
Meriones persicus	18	1- 2	3- 0	2- 32	4- 8	1- 172	17	2+ 491	1+ 46	1- 0	5	791	20.17
Mus sp.		2		1- 0	1- 2	17	1	9	5		2	38	0.97
Lepus europaeus	1	1	1	1	10	1- 3	3	6		2	1 1	30	0.77
Sturnus vulgaris					7	10		5	3			25	0.64
Crocidura suaveolens			4		3	2	1	6	3			19	0.48
Solifugida sp.					6	10						16	0.41
Oenanthe sp.		1		1	3	5	2	1		1		14	0.36
Melanocorypha calandra				2	3	5		2	1			13	0.33
Galerida cristata	2				4	2		4				12	0.31
Columba livia	1	1			2	4	1	2				11	0.28
Alauda arvensis				1	2	2	1	4				10	0.26
Hemiechinus auritus	2							3		4		9	0.23
Corvus cornix+frugilegus	1		1		4			2	1			9	0.23
Agamidae sp.				1	1	2		2	3			9	0.23
Gryllotalpa sp.					6	2						8	0.20
Coturnix coturnix				1	3	2		1	1			8	0.20
Perdix perdix				1	3	3						7	0.18
Lanius sp.						6		1				7	0.18
Scorpionida sp.	1			1			1	2	1	1		7	0.18
Ochotona rufescens		4				1		1				6	0.15
Athene noctua	1			1	2	1			1			6	0.15
Lacertidae sp.				1		2		1	2			6	0.15
Erinaceus concolor				1		1	1		1		1	5	0.13
Falco tinnunculus		1	1		1	1		1				5	0.13
Ptyonoprogne rupestris						5						5	0.13
Bufo viridis					1	1			2	1		5	0.13
Mammalia	**44**	**37**	**116**	**419**	**734**	**1033**	**63**	**747**	**99**	**22**	**12 22**	**3348**	**85.39**
Aves	**1+ 13**	**1+ 9**	**8**	**1- 13**	**81**	**120**	**1+ 14**	**1- 33**	**1+ 20**	**2**	**1 2**	**316**	**8.06**
Amphibia,Reptilia,Pisces	**0**	**0**	**1- 0**	**1- 4**	**1+ 69**	**44**	**2**	**2- 7**	**7**	**1**	**0 1**	**135**	**3.44**
Evertebrata	**1**	**0**	**0**	**2- 2**	**28**	**29**	**1**	**1+ 58**	**2**	**1**	**0 0**	**122**	**3.11**
Total	**58**	**46**	**124**	**438**	**912**	**1226**	**80**	**845**	**128**	**26**	**13 25**	**3921**	**100.00**
Diversity Index H'	2.54	2.59	1.76	2.05	2.42	2.74	2.60	1.82	2.60	2.12	1.78 2.21	2.85	

Sites: 3 - Gafarabad, 8 May 1996, **1** - Gazanak, 15 May 1997, **2** - Valiabad, 9 May 1996, **6** - Takht-e Soleyman, 3 Oct. 1998, **12** - Qareh Kelisa, 20 Oct. 1998, 21 Oct. 2002, **7** - Choplu, 2 Oct. 1998, **11** - Maku, 30 Apr. 1997, **10** - Bastam, 30 Sep. 1998, **8** - Mahabad, 19 Oct. 1998, **9** - Kandovan, 1 Oct. 1998, **4** - Sorkhe Dizaj, 18 May 1997, **5** - Hassan Baghi, 2 Oct. 2002.
Other species (**Site**-Number): *Rhinolophus ferrumequinum* (**7**-2; **10**-1; **8**-1), *Myotis blythii* (**7**-1; **10**-2; **4**-1), *Miniopterus schreibersii* (**3**-1), *Taphozous nudiventris* (**8**-1), *Calomyscus bailwardi* (**10**-1; **8**-1), *Vulpes vulpes* (**12**-1; **10**-1), *Mustela nivalis* (**6**-1; **7**-2; **9**-1), *Meles meles* (**2**-1), Artiodactyla sp. (**10**-2; **8**-1), *Tachybaptus ruficollis* (**11**-1), *Ixobrychus minutus* (**7**-1), *Anas crecca* (**12**-1), *Accipiter gentilis* (**7**-1), *Accipiter nisus* (**12**-3), *Buteo* sp. (**10**-1), *Falco subbuteo* (**12**-1), *Falco naumanni* (**7**-1), *Falco* sp. (**12**-2), *Tetraogallus caspius* (**7**-1; **8**-1), *Ammoperdix griseogularis* (**4**-1), *Gallus gallus dom.* (**8**-1), *Rallus aquaticus* (**7**-2), *Porzana porzana* (**12**-1; **11**-1; **8**-1), *Porzana parva* (**3**-1; **12**-1), *Porzana pusilla* (**6**-1; **7**-1), *Crex crex* (**12**-1), *Gallinula chloropus* (**3**-2; **6**-1), *Fulica atra* (**3**-1; **2**-1), *Vanellus vanellus* (**12**-1), *Calidris minuta* (**7**-1), *Tringa sp.* (**12**-1; **7**-1), *Actitis hypoleucos* (**12**-1), *Scolopax rusticola* (**7**-1), Limicolae sp. (**12**-1; **8**-1), *Larus* sp. (**8**-1), Pteroclidae sp. (**12**-1; **7**-1; **10**-1), *Columba oenas* (**12**-1), *Streptopelia senegalensis* (**7**-1), *Cuculus canorus* (**12**-1; **7**-1), *Bubo bubo* (**10**-1), *Asio otus* (**7**-1; **8**-1), *Apus apus* (**12**-1; **7**-1), *Apus melba* (**1**-1; **7**-1), *Merops apiaster* (**7**-1; **10**-1), *Coracias garrulus* (**7**-1; **11**-1), *Upupa epops* (**12**-1), Alaudidae sp. (**2**-1; **7**-3), *Hirundo rustica* (**1**-1; **10**-1), *Anthus* sp. (**12**-1), *Monticola* sp. (**7**-3), *Turdus pilaris* (**3**-1), *Sitta tephronata* (**12**-1; **8**-2; **5**-1), *Sitta neumayer* (**6**-1; **7**-1; **8**-2), *Emberiza calandra* (**7**-1), *Emberiza* sp. (**6**-1; **7**-2), *Carduelis cannabina* (**12**-2), *Petronia petronia* (**3**-1; **6**-1; **12**-8; **7**-4; **11**-1), *Petronia brachydactyla* (**12**-2), *Pica pica* (**12**-1), *Pyrrhocorax pyrrhocorax* (**1**-1), *Corvus corax* (**12**-2), *Corvus monedula* (**7**-1), Passeriformes sp. (**3**-1; **12**-5; **7**-1; **10**-2; **8**-1; **5**-1), Aves sp. (**2**-1), Gekkonidae sp. (**10**-1), Sauria sp. (**10**-1), Decapoda sp. (**7**-3; **10**-1).

Table 2. Similarity in the prey items of *Bubo bubo* in 11 samples from central Zagros Mountains.

Species \ Sites	**1**	**2**	**4**	**5**	**3**	**6**	**7**	**11**	**10**	**9**	**8**	**Total**	**%**
Columba livia	2+ 15		2- 3	9	2	4			10	7		50	2.00
Arvicola amphibius	3+ 22		1- 1				1					24	0.96
Cricetulus migratorius	13	1+ 15	1+ 234	1+ 53	1- 21	1- 1	2- 1	2- 0	4- 0	1- 6		344	13.76
Microtus obscurus	1		1+ 32		1- 0				1- 0			33	1.32
Lepus europaeus		1	1+ 40	1- 1	3	2			1- 2	3	1	53	2.12
Meriones persicus	1- 3	2- 1	1+ 342	48	1- 36	1- 1	2- 0	3- 0	4- 2	18	2	453	18.12
Alectoris chukar			1+ 62	1- 3	1+ 30	2			1- 3	3	1	104	4.16
Ellobius lutescens	1- 2	1- 2	1+ 163	1+ 42	1+ 51	1- 0	2- 0	2- 0	4- 0	1- 7		267	10.68
Apodemus witherbyi		1	1- 14	2+ 24	9				2		1	51	2.04
Suncus etruscus				1+ 5								5	0.20
Meriones tristrami	5	3	3- 0	1+ 18	2+ 45				1- 1			72	2.88
Microtus irani	4	1	3- 0	4	2+ 31				1- 0	1		41	1.64
Columba oenas			5		1+ 7			1				13	0.52
Athene noctua		1	1- 0	2	1+ 7				3	1		14	0.56
Garrulus glandarius			1	2	1+ 9							12	0.48
Coleoptera sp.	1		1- 7	1- 0	1+ 18		5	1	1	4		37	1.48
Cypriniformes sp.	3		2- 0	2	1+ 10	1+ 6				5		26	1.04
Rattus rattus						1+ 5		1				6	0.24
Agamidae sp.	7	1	1+ 56	2- 1	2- 1	1	2+ 17		5	2	2	93	3.72
Lacertidae sp.			2- 1	1- 0	1- 0		2+ 19		2+ 25			45	1.80
Meriones crassus			2- 0	5	1		2+ 15	1+ 10	1- 0	1	1	33	1.32
Nesokia indica			1- 0			2		1+ 8	1			11	0.44
Columba palumbus			2- 0					2+ 19				19	0.76
Hemiechinus auritus			2- 0					1+ 8	2	2+ 12	2	24	0.96
Tatera indica			2- 0					2+ 14	1+ 13			27	1.08
Mus sp.	5	2	1- 14	14	1- 2			1+ 8	2+ 40	1- 0	1	86	3.44
Meriones libycus			3- 0	1- 0	1- 0	1	5		3+ 53	1	1	61	2.44
Calomyscus bailwardi			13						1+ 9			22	0.88
Bufo viridis			1- 1	4					1+ 11			16	0.64
Passer domesticus	2		1- 4	3	1		1		1+ 14	1	1	27	1.08
Galerida cristata			2- 0	3	1			2	2+ 24		1	31	1.24
Allactaga williamsi	1		3- 0	1- 0	1- 0		1		1- 0	3+ 36		38	1.52
Allactaga elater							1			1+ 5		6	0.24
Ammoperdix griseogularis			12	6	4	2	1	1	9	1		36	1.44
Pelophylax ridibundus		1	8	3					5			17	0.68
Sitta tephronata	1		6	1			2		2			12	0.48
Coturnix coturnix			1		3			2	5			11	0.44
Myotis blythii			2	1					5			8	0.32
Falco tinnunculus	3		1		1			1		2		8	0.32
Streptopelia senegalensis		1	5		1	1						8	0.32
Ochotona rufescens						1	4			2		7	0.28
Crex crex			1		1	1			1	2	1	7	0.28
Sturnus vulgaris	1	1		3	1				1			7	0.28
Crocidura suaveolens				3	1				1		1	6	0.24
Streptopelia turtur				2				1	3			6	0.24
Petronia petronia							1		3	2		6	0.24
Otus scops		1	2	1			1		1			6	0.24
Emberiza calandra				2					4			6	0.24
Corvus cornix+frugilegus	2		2		1					1		6	0.24
Erinaceus concolor		1			1	3						5	0.20
Vanellus vanellus		1				1			2		1	5	0.20
Tringa sp.						1		1			3	5	0.20
Mammalia	**1- 35**	**50**	**863**	**220**	**202**	**1- 17**	**1- 32**	**55**	**1- 134**	**92**	**1- 10**	**1710**	**68.40**
Aves	**1+ 31**	**9**	**1- 130**	**50**	**80**	**1+ 20**	**15**	**1+ 36**	**1+ 126**	**34**	**1+ 14**	**545**	**21.80**
Amphibia,Reptilia,Pisces	**10**	**2**	**1- 68**	**1- 12**	**1- 12**	**7**	**2+ 36**	**1- 0**	**1- 47**	**7**	**2**	**203**	**8.12**
Evertebrata	**1**	**0**	**1- 7**	**1- 0**	**1+ 18**	**0**	**5**	**4**	**3**	**4**	**0**	**42**	**1.68**
Total	**77**	**61**	**1068**	**282**	**312**	**44**	**88**	**95**	**310**	**137**	**26**	**2500**	**100.00**
Diversity Index H'	2.72	2.23	2.23	2.79	2.76	2.94	2.54	2.70	3.23	2.81	2.92	3.42	

Sites: 1 - Bisotun, 7 Oct. 1998, **2** - Taq-e Bostan, 6 Oct. 1998, **4** - Lenje Abad, 9 Oct. 1998, **5** - Gholaman, 7 May 1996, 19 Oct. 2002, **3** - Khosrow Abad, 18 Oct. 1998, **6** - Kashan, 1 May 1997, 6 Apr. 2000, **7** - Deh Zire, 27 Apr. 1996, **11** - Choqazanbil, 18 Oct. 2002, **10 -** Izeh, 13 Oct. 1998, **9** - Quamislu, 28 Apr. 1996, **8** - Espidan, 3 May 1997.
Other species (**Site**-Number):
Paraechinus hypomelas (**4**-1), *Rhinolophus ferrumequinum* (**10**-1), *Rhinolophus euryale* (**7**-1), *Rhinopoma microphyllum* (**10**-2), *Otonycteris hemprichi* (**2**-1; **6**-1; **7**-2), *Taphozous nudiventris* (**1**-1), *Myomimus* sp. (**3**-1), *Jaculus jaculus* (**11**-3), *Rattus norvegicus* (**4**-4), *Gerbillus nanus* (**7**-1; **11**-3), *Chionomys nivalis* (**4**-2), *Vulpes vulpes* (**4**-1; **5**-1), *Meles meles* (**5**-1), *Tachybaptus ruficollis* (**11**-1), Ardeidae sp. (**10**-1), *Anas crecca* (**4**-1; **11**-1; **8**-2), *Anas querquedula* (**1**-1), Anatidae sp. (**6**-1; **10**-1; **8**-1), *Falco*

sp. (**5**-1), *Tetraogallus caspius* (**6**-2), *Perdix perdix* (**4**-1; **11**-2), *Gallus gallus dom.* (**5**-1; **10**-1), *Porzana porzana* (**3**-1; **9**-3), *Porzana parva* (**10**-1), *Porzana pusilla* (**11**-1; **10**-1), *Gallinula chloropus* (**9**-1), *Fulica atra* (**4**-2; **5**-1; **9**-1), *Hoplopterus spinosus* (**11**-1), *Scolopax rusticola* (**4**-1; **9**-1), Limicolae sp. (**10**-1), Pteroclidae sp. (**9**-1; **8**-1), *Cuculus canorus* (**4**-3), *Bubo bubo* (**4**-2), *Asio otus* (**1**-1; **3**-1), *Caprimulgus europaeus* (**9**-1), *Apus apus* (**4**-2), *Apus melba* (**4**-1), *Merops apiaster* (**4**-1; **5**-1; **3**-1; **10**-1), *Coracias garrulus* (**4**-1), *Upupa epops* (**3**-1; **10**-1), *Dendrocopos syriacus* (**5**-1), *Jynx torquilla* (**5**-1), *Alauda arvensis* (**5**-1; **3**-1; **7**-1; **9**-1), *Melanocorypha calandra* (**3**-1; **10**-1), Alaudidae sp. (**7**-1; **10**-3), *Riparia riparia* (**2**-1), *Ptyonoprogne rupestris* (**1**-1; **9**-2), *Ptyonoprogne obsoleta* (**7**-1), *Hypocolius ampelinus* (**11**-1), *Lanius excubitor* (**10**-4), *Lanius minor* (**7**-2), *Lanius senator* (**4**-1), *Lanius collurio* (**10**-1), *Lanius* sp. (**2**-1; **5**-1), Sylviidae sp. (**7**-1; **10**-1), *Monticola* sp. (**10**-4), *Oenanthe* sp. (**4**-1; **7**-1), *Phoenicurus* sp. (**7**-1), *Parus major* (**5**-2; **10**-2), *Parus* sp. (**10**-1), *Sitta neumayer* (**4**-2; **3**-1), *Emberiza* sp. (**4**-1; **5**-1; **10**-3; **9**-1; **8**-1), *Carduelis carduelis* (**2**-1; **9**-1), Fringillidae sp. (**10**-4), *Petronia xanthocollis* (**3**-2), *Petronia* sp. (**5**-1), *Pica pica* (**1**-1; **3**-1; **6**-1), *Pyrrhocorax pyrrhocorax* (**4**-1; **6**-2), *Corvus ruficollis* (**11**-1), Passeriformes sp. (**1**-1; **2**-1; **4**-4; **5**-1; **3**-1; **6**-2; **7**-1; **10**-8), Aves sp. (**10**-1; **9**-1; **8**-1), Aves sp.juv. (**1**-2), *Testudo* sp. (**4**-1), Gekkonidae sp. (**10**-1), Sauria sp. (**3**-1), Serpentes sp. (**4**-1), Salmonidae sp. (**5**-1), Pisces sp. (**5**-1), *Gryllotalpa* sp. (**11**-1), Decapoda sp. (**10**-1), Solifugida sp. (**11**-1), Scorpionida sp. (**11**-1; **10**-1).

Table 3. Similarity in the prey items of *Bubo bubo* in seven samples from southern Zagros Mountains.

Species \ Sites	**2**	**3**	**4**	**5**	**7**	**6**	**1**	**Total**	**%**
Cricetulus migratorius	1+ 37	14		3	1- 0			54	9.29
Pelophylax ridibundus	1+ 20	1- 1		2	2			25	4.30
Microtus irani	36	1+ 49	1- 0	2- 0	2- 0			85	14.63
Meriones libycus	1- 0	1+ 12						12	2.07
Alectoris chukar	1- 4	1- 0	2+ 18		1		1	24	4.13
Meriones persicus	22	2- 0		1+ 15	5			42	7.23
Mus sp.	2- 8	23	1- 0	1+ 26	1+ 26			83	14.29
Rattus rattus	1- 0	1- 0			2+ 19			19	3.27
Rhinolophus euryale					1+ 5			5	0.86
Agamidae sp.	1- 1	3		6	5			15	2.58
Myotis blythii	11	1		1	6		1	20	3.44
Columba livia	6	6			3	1		16	2.75
Sitta tephronata	6			2		2		10	1.72
Passer domesticus	5	2			1			8	1.38
Galerida cristata	4	2		2				8	1.38
Miniopterus schreibersii	2				3	1		6	1.03
Calomyscus bailwardi	2		1	2		1		6	1.03
Ammoperdix griseogularis	3	1					2	6	1.03
Hemiechinus auritus	3			1	1			5	0.86
Rattus norvegicus		5						5	0.86
Otus scops			2			3		5	0.86
Apus melba	5							5	0.86
Bufo viridis	1	1		1		2		5	0.86
Mammalia	**130**	**106**	**1- 6**	**49**	**1+ 70**	**6**	**2**	**369**	**63.51**
Aves	**67**	**31**	**1+ 27**	**15**	**1- 7**	**7**	**1+ 7**	**161**	**27.71**
Amphibia,Reptilia	**23**	**1- 5**	**0**	**9**	**7**	**2**	**0**	**46**	**7.92**
Evertebrata	**2**	**1**	**0**	**0**	**2**	**0**	**0**	**5**	**0.86**
Total	**222**	**143**	**33**	**73**	**86**	**15**	**9**	**581**	**100.00**
Diversity Index H'	3.06	2.42	1.74	2.29	2.29	2.21	1.89	3.37	

Sites: 2 - Sivand, 30 Apr. 1996, 14 Oct. 2002, **3** - Naght-e Rostan, 23 Apr. 2000, 13 Oct. 2002, **4** - Hane-ye Zenyan, 22 Apr. 2000, **5** - Dashtak, 2 May 1996, **7** – Bisahpur cave, 21 Apr. 2000, **6** - Shahpur cave., 3 May 1996, **1** – Post Chenar, 20 Apr. 2000.

Other species (**Site**-Number):

Erinaceus concolor (**3**-1; **4**-1; **1**-1), *Rousettus aegyptiacus* (**7**-2), *Rhinolophus ferrumequinum* (**2**-1; **6**-1), *Myotis capaccinii* (**7**-1), *Pipistrellus pipistrellus* (**7**-2; **6**-1), *Lepus europaeus* (**2**-2; **5**-1), *Dryomys nitedula* (**2**-1), *Apodemus witherbyi* (**4**-3), *Meriones tristrami* (**4**-1; **6**-2), *Meriones crassus* (**2**-1), *Tatera indica* (**3**-1), *Ellobius lutescens* (**2**-1), *Arvicola amphibius* (**2**-2), *Vulpes vulpes* (**2**-1), *Anas crecca* (**4**-1), *Falco tinnunculus* (**2**-1; **3**-2), *Falco naumanni* (**2**-2), *Falco* sp. (**2**-1; **5**-1), *Perdix perdix* (**2**-1), *Coturnix coturnix* (**2**-2), *Gallinula chloropus* (**2**-1), *Fulica atra* (**2**-1), *Tringa* sp. (**4**-1), Limicolae sp. (**7**-1), Pteroclidae sp. (**3**-1), *Columba oenas* (**3**-2; **1**-1), *Streptopelia turtur* (**2**-1; **5**-1), *Streptopelia senegalensis* (**2**-3; **5**-1), *Athene noctua* (**2**-1; **5**-1), *Caprimulgus europaeus* (**2**-1), *Apus apus* (**2**-1), *Apus affinis* (**2**-3; **6**-1), *Merops apiaster* (**5**-1), *Upupa epops* (**4**-1), *Alauda arvensis* (**2**-2; **3**-1; **5**-1), *Melanocorypha calandra* (**3**-1), Alaudidae sp. (**3**-1), *Ptyonoprogne rupestris* (**1**-1), *Lanius minor* (**5**-1), *Turdus philomelos* (**4**-1), *Parus major* (**2**-1), *Emberiza* sp. (**2**-5; **3**-1; **5**-1), *Carduelis carduelis* (**2**-1), *Petronia petronia* (**2**-3), *Petronia xanthocollis* (**2**-1; **3**-2), *Sturnus vulgaris* (**3**-1), *Garrulus glandarius* (**4**-2; **5**-1), *Pica pica* (**3**-1), *Pyrrhocorax pyrrhocorax* (**3**-2), *Corvus cornix+frugilegus* (**3**-3), *Corvus monedula* (**3**-1), Passeriformes sp. (**2**-2; **3**-1; **4**-1; **5**-2; **7**-1; **1**-2), Serpentes sp. (**2**-1), Mantodea sp. (**3**-1), Orthoptera sp. (**7**-1), Decapoda sp. (**2**-2), Solifugida sp. (**7**-1)

D. Eastern Iran (Table 4)

The predominant part of eastern Iran is distinguished by a hot and dry climate with semi-deserts and the vast Dasht-e Kavir desert, which *B. bubo* avoids. Its pellets were found in the Kuhha Qohrud Mountains (Sams, Deh Bakri), on the shore of the Gulf of Oman (Tiss) and in several sites in the wetter Koppeh Dagh Mountains.

The dominant component of *B. bubo* diet was made up of mammals (Mammalia, 73.0%, 32 species), with *C. migratorius* (20.7%), *M. persicus* (11.1%), *Ochotona rufescens* (7.6%) and *Ellobius fuscocapillus* (5.7%) predominating. Birds (Aves, 21.1%, 42 taxa) were a supplementary component of the diet, and lower vertebrates (Amphibia, Reptilia, Pisces, 1.3%) were rare prey items, while invertebrates (Evertebrata, 4.7%), especially Coleoptera (2.6%) and Solifugida (1.6%), were found more often in diet remnants.

In the southern part of this region, the most significant sample was from the Deh Bakri site, with *M. persicus* and *A. chukar* being the notable dominants. In a smaller sample from the shores of the Gulf of Oman (the Tiss locality), the representation of birds was more numerous than that of mammals (*Larus* sp. and *Tatera indica*). The Short-tailed Bandicoot Rat *Nesokia indica* dominated in the smaller sample from the Qarloq site in the foothills of the Koppeh Dagh Mountains. At the sites in this area of montane steppe where *B. bubo* pellets were found, central Asian mammals are plentiful and include *E. fuscocapillus, O. rufescens, Microtus afghanus, Meriones meridianus, Paraechinus hypomelas* and rarely *Myomimus personatus*.

A comparison of the diet of *B. bubo* in different regions of Iran (Appendix 2)

An analysis of the diet of *B. bubo* in the four regions as described above reveals that in three of these regions, **A**, **B** and **D,** it is possible to differentiate sub-regions: **Aa** – Elborz and Talysh Mountains near the Caspian Sea, **Ab** – northern Zagros, **Ba** – wetter western parts of the central Zagros, **Bb** – drier eastern parts of the central Zagros, north-western part of the Kuhha Qohrud Mountains and eastern edge of Mesopotamia, **Da** – south-eastern part of Iran south of the Dasht-e Kavir desert, and **Db** – Koppeh Dagh Mountains in north-eastern Iran.

Blocks of species with plus MDFM values (Obuch 2001) characterise the specifics in domination of food components in these regions:

Aa – in the Elborz and Talysh mountains, *M. obscurus* is the dominant species, while *Ch. nivalis* and *A. witherbyi* are significantly more numerous than in other regions.

Ab – in the northern part of the Zagros Mountains, *M. brandti* dominated and the rodents *A. williamsi* and *M. setzeri*, the birds *Sturnus vulgaris, Delichon urbica* and *Riparia riparia* and the frog *P. ridibundus* were significantly more abundant than elsewhere.

Ba – in the wetter western part of the central Zagros, *M. persicus* was the dominant species and the rodents *E. lutescens, M. tristrami* and *C. migratorius*, the birds *A. chukar, Ammoperdix griseogularis* and *C. livia*, and reptiles from the Agamidae were represented more frequently than in other regions.

Bb – in the drier part of the central Zagros, in the north-western part of the Kuhha Qahrud Mountains (Esfahan Province) and on the edge of the Mesopotamian lowlands (Khuzestan Province), *M. libycus* dominated while *M. crassus, Mus* sp. and *H. auritus* were more abundant in the samples than elsewhere. As in the south-western part of Iran (region **Da**), *T. indica, N. indica* and *C. bailwardi* were also more relatively abundant than in other regions.

C – in the southern part of Zagros in Fars Province, the vole *M. irani* dominated, and the rats *R. rattus* and *R. norvegicus*, the mouse *Mus* sp., cave species of bats and cliff-nesting birds (*Sitta tephronota* and *Apus melba*) were commonly represented.

Db – the fauna of the Koppeh Dagh Mountains was reflected in the diet of *B. bubo* by the dominant representation of the Grey Hamster *C. migratorius* and a high proportion of Central Asian species of mammals: *E. fuscocapillus, M. afghanus, M. meridianus, O. rufescens, A. elater, P. hypomelas* and *Otonycteris hemprichi*. The Rock Sparrow *Petronia petronia* was the most numerous bird and Solifugida the most numerous invertebrate.

Table 4. Similarity in the prey items of *Bubo bubo* in eight samples from eastern Iran.

Species \Sites		**2**		**4**		**5**		**6**		**7**		**8**	**1**	**3**	**Total**	**%**
Meriones persicus	1+	52				1		2	1-	21	1-	19			95	11.05
Calomyscus bailwardi	1+	9								2					11	1.28
Alectoris chukar	2+	35							1-	2	2-	0			37	4.30
Tatera indica			1+	6										1	7	0.81
Larus sp.			1+	5											5	0.58
Nesokia indica		5		3	1+	6			1-	0	1-	0		1	15	1.74
Ellobius fuscocapillus	1-	6				1	2+	24		12	1-	5	1		49	5.70
Cricetulus migratorius		35	1-	0		2	1+	21		62		58			178	20.70
Ochotona rufescens	2-	2				5		1	1+	30		27			65	7.56
Allactaga elater	1-	0							1+	19		4	1		24	2.79
Microtus irani	1-	0						1	1+	27	1-	3			31	3.60
Microtus afghanus	2-	0							1+	33	1-	4			37	4.30
Coleoptera sp.	1-	0						1	1+	18		3			22	2.56
Paraechinus hypomelas								2			1+	8			10	1.16
Otonycteris hemprichi											1+	9			9	1.05
Meriones meridianus	1-	0							2-	0	1+	27			27	3.14
Petronia petronia										1	1+	13			14	1.63
Solifugida sp.									1-	0	1+	14			14	1.63
Galerida cristata		8								4		4	1		17	1.98
Lepus europaeus		7		1						3		2	1		14	1.63
Meriones libycus						1				1		5	1		8	0.93
Ammoperdix griseogularis		1		1								6			8	0.93
Myomimus personatus										5		1			6	0.70
Mus sp.		2				1				2		1			6	0.70
Columba livia		2								1		3			6	0.70
Athene noctua		2								1		3			6	0.70
Agamidae sp.				1						1		3	1		6	0.70
Mammalia		**130**	**1-**	**10**		**19**		**51**		**222**		**184**	**8**	**4**	**628**	**73.02**
Aves	**1+**	**72**	**1+**	**13**		**1**	**1-**	**3**	**1-**	**33**		**58**	**1**	**0**	**181**	**21.05**
Amphibia,Reptilia,Pisces		**4**		**1**		**0**		**0**		**2**		**3**	**1**	**0**	**11**	**1.28**
Evertebrata	**2-**	**0**		**0**		**2**		**1**		**18**	**1+**	**19**	**0**	**0**	**40**	**4.65**
Total		**206**		**24**		**22**		**55**		**275**		**264**	**10**	**4**	**860**	**100.00**
Diversity Index H'		2.63		2.12		2.11		1.41		2.70		3.04	1.75	1.39	3.34	

Site: 2 - Deh Bakri, 7.-8 Apri. 2000, **4** - Tiss, 13 Apr. 2000, **5** - Quarloq, 12 May 1997, **6** - Bik, 7 Oct. 2002, **7** - Agh Mazar, 12 May 1997, 8 - Bazangan, 11 May 1997 + 8 Oct. 2002, **1** - Sams, 5 May 1997, **3** - Kahiri, 11 Apr. 2000.
Other species (**Site**-Number):
Erinaceus concolor (**2**-2; **8**-2), *Hemiechinus auritus* (**5**-2; **8**-2), *Crocidura suaveolens* (**8**-2), *Myotis emarginatus* (**8**-1), *Myotis blythii* (**2**-3; **3**-1), *Eptesicus bottae* (**2**-1), *Dryomys nitedula* (**2**-1), *Apodemus witherbyi* (**7**-4), *Gerbillus nanus* (**3**-1), *Meriones crassus* (**1**-4), *Rhombomys opimus* (**8**-3), *Ellobius talpinus* (**8**-1), *Microtus kermanensis* (**2**-3), *Chionomys nivalis* (**2**-1), *Mustela nivalis* (**7**-1), Artiodactyla sp. (**2**-1), *Anas crecca* (**7**-1), *Falco tinnunculus* (**7**-1; **8**-2), *Perdix perdix* (**7**-1; **8**-1), *Coturnix coturnix* (**7**-1; **8**-1), *Crex crex* (**7**-1), *Gallinula chloropus* (**7**-1), *Tringa* sp. (**4**-1; **5**-1; **7**-2), *Gallinago* sp. (**7**-1), *Sterna* sp. (**4**-1), Pteroclidae sp. (**2**-1; **7**-1), *Columba oenas* (**8**-1), *Columba eversmanni* (**4**-3), *Streptopelia senegalensis* (**2**-1; **6**-1; **7**-1), *Otus scops* (**2**-1), *Caprimulgus europaeus* (**2**-1; **6**-1), *Apus melba* (**8**-1), *Merops apiaster* (**2**-1; **8**-2), *Upupa epops* (**2**-1), *Dendrocopos syriacus* (**2**-1), *Melanocorypha calandra* (**8**-4), Alaudidae sp. (**2**-1; **6**-1; **7**-3; **8**-4), *Hirundo rustica* (**8**-1), *Lanius* sp. (**2**-1), *Oenanthe* sp. (**2**-1; **7**-1; **8**-2), *Turdus* sp. (**2**-1), *Sitta tephronata* (**8**-1), *Emberiza* sp. (**7**-2), *Rhodospiza obsoleta* (**8**-1), *Passer domesticus* (**2**-4), *Passer montanus* (**8**-3), *Petronia brachydactyla* (**2**-1), *Sturnus vulgaris* (**7**-2), *Pyrrhocorax pyrrhocorax* (**2**-4), *Corvus cornix+frugilegus* (**7**-2), *Corvus ruficollis* (**4**-1), Passeriformes sp. (**2**-2; **7**-2; **8**-4), Aves sp. (**2**-2), Aves sp.juv. (**4**-1; **7**-1; **8**-1), *Pelophylax ridibundus* (**7**-1), Cypriniformes sp. (**2**-4), Orthoptera sp. (**8**-2), Decapoda sp. (**5**-1), Scorpionida sp. (**5**-1)

4. Discussion

Osteological material from the diet remnants of *B. bubo* was obtained during five expeditions to Iran. These expeditions had a broad expert focus and involved around 20 participants, so the author did not decide on the stopping places. The bus could move only along quality asphalt roads and stops were dependent on the possibilities of parking the bus off the road. During these stops, the author used his experience in searching for the pellets of various species of owl. One of the possibilities was to search rocky cliffs around the stopping places in an effort to find nesting sites or roosting sites of *B. bubo*.

The Eurasian EagleOwl is the largest predator amongs the owls; therefore, it hunts the largest prey. These include hedgehogs, especially *Erinaceus concolor* and *Hemiechinus auritus*; the hare *Lepus europaeus*; the pika *Ochotona rufescens*; the hamsters *Criceturus migratorius, Mesocricetus brandti* and *Calomyscus baiwardi*; the mole voles *Ellobius fuscocapillus* and *E. lutescens*; the water vole *Arvicola amphibius*; the voles *Chionomys nivalis, Microtus obscurus* and *M.*

afghanus; the dormouse *Myomimus setzeri*; and the jerboa *Allactaga williamsi*. The birds that are most often hunted are game-birds (Galliformes, 4 species); pigeons (Columbidae, 3 species); raptors (Falconiformes), especially *Falco tinnunculus*; the owl (Strigiformes) *Athene noctua*; and the crows (Corvidae) *Corvus corone* and *C. frugilegus*. The most commonly hunted reptiles (Reptilia) are species of Agamidae.

Material from the diet remnants of *B. bubo* offer valuable zoogeographic data on the distribution of species of mammals and birds in Iran. The status of some taxa is changing at present especially on the basis of genetics studies. Faunistic data were used in a contribution on the distribution of bats (Benda *et al.* 2012). In a work on the occurrence of dormice in the diet of owls in the Middle East, Obuch (2001a) presents three species of the genus *Myomimus*. The species *M. personatus* (Ognev, 1924) was obtained from the Turkmenistan part of the Koppeh Dagh Mountains (Ognev 1947). Lay (1967) did not list this species from Iran. In our pellets from *B. bubo* a total of six individuals were found in two localities (Agh Mazar and Bazangan). The species *M. personatus* is also considered rare on the Turkmenistan side of this mountain range (Gromov & Erbajeva 1995). In Kordestan Province, three dormice were captured which Rosolimo (1976) described as the separate species *Myomimus setzeri*. Later this species was found at three localities in Azarbaijan-e Garbi Province and at three localities in eastern Turkey (Obuch 1994, 2001a; Krištufek & Vohralík 2005) at elevations from 1,880 m a.s.l. to 2,330 m a.s.l. However, this species was not found in a larger sample of *B. bubo* pellets collected near Karakurt (1,550 m a.s.l.) in the valley of the Aras River in eastern Turkey 30 km from the Sarikamis locality (2,080 m a.s.l.) (Appendix 3). Similarly, in Iran *M. setzeri* was abundantly represented in *B. bubo* pellets collected near Qareh Kelisa (2,020 m a.s.l.), but was not found in collections from sites at lower elevations near Maku (1,210 m a.s.l.) and near Bastam (1,320 m a.s.l.). In 1998, another hitherto undescribed species of dormouse from the genus *Myomimus*, with a mandible in shape and size more similar to that of *M. personatus* from the Koppeh Dagh Mountains than to that of *M. setzeri* from the northern Zagros, was found in the pellets of *T. alba* near Bisotun (1,600 m a.s.l.) and *B. bubo* near Khosrow Abad (1,500 m a.s.l.) in the central Zagros (Obuch 2001a). In pellets from the last collection at the Ishak Pasa Sarayi locality in 2002, the big jaw of a pika was found and this was tentatively identified as that of the species *Ochotona* cf. *rufescens*. A similar mandible was also located in the collection from the site near Bastam in 1998 (Čermák *et al.* 2006). It is assumed that in the event of the capture of living individuals, it would be possible to describe both taxa (*Myomimus* sp. and *Ochotona* cf. *rufescens*) as separate species.

From the results of this study, it is also possible to deduce the relative abundance of the individual species of prey at the various localities in Iran. The relative representation of individual species differs not only when compared with the results from other species of owls, but also when compared with the results from other methods of quantitative research. For example, Obuch & Rybin (1993) found significant differences in the representation of mammals in the food of *B. bubo* as compared with the results of captures in traps at the same localities over a period of 20 years. Kryštufek *et al.* (2009) state that *Mesocricetus brandti* was confirmed in Turkey with the trapping of three individuals, which represented 0.3% of the mammals trapped. However, 1,970 specimens were found in *B. bubo* pellets, representing 33.5% of the owl's diet. *M. brandti* was not found at all by trapping in Iran, but 821 (13.6%) individuals were found in the diet of *B. bubo*.

The finding of diet remnants is also proof of the occurrence of a species at a given locality. During the present surveys, the occurrence of *B. bubo* was established at 38 localities. According to the size of the samples at these localities, it is possible to conclude that conditions for this species are optimal in mountainous areas with a relatively wet climate and steppic vegetation. Smaller samples of pellets were found in the dry semi-desert regions of Iran, and in some areas, *e.g.* in south-eastern Iran, where our stay was of short duration. In the more extensive desert regions, inspections of rocky cliffs revealed no signs of the occurrence of *B. bubo*, although there was evidence of the occurrence of the Little Owl *Athene noctua*, which survives

in these regions by hunting invertebrates (Obuch & Krištín 2004).

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Appendix 1. Overview of study sites

No.	Site	Province	Date of sample	N	E	Sea level
	Iran					
A1	Gazanak	Mazandaran	15 May 1997	35.9078°	52.2417°	1780
A2	Valiabad	Mazandaran	9 May 1996	36.2218°	51.3127°	2180
A3	Gafarabad	Zanjan	8 May 1996	35.7648°	49.2981°	1560
A4	Sorkhe Dizaj	Zanjan	18 May 1997	36.8078°	48.9371°	690
A5	Hassan Baghi	East Azarbaijan	2 October 2002	37.7523°	48.0275°	1880
A6 (6)	Takht-e Soleyman	West Azarbaijan	3 October 1998	36.5975°	47.2441°	2330
A7 (5)	Choplu	West Azarbaijan	2 October 1998	36.5200°	46.9623°	2050
A8	Mahabad	West Azarbaijan	19 October 1998	36.8026°	45.7049°	1530
A9	Kandovan	East Azarbaijan	1 October 1998	37.7899°	46.2504°	2260
A10 (8)	Bastam	West Azarbaijan	30 September 1998	38.8914°	44.9406°	1320
A11	Maku	West Azarbaijan	30 April 1997	39.2842°	44.6080°	1210
A12 (4)	Qareh Kelisa	West Azarbaijan	20 October 1998, 21 October 2002	39.0751°	44.5734°	2020
B1	Bisotun	Kermanshah	7 October 1998	34.3861°	47.4267°	1600
B2	Taq-e Bostan	Kermanshah	6 October 1998	34.3892°	47.1311°	1400
B3	Khosrow Abad	Kermanshah	18 October 1998	34.1652°	46.3692°	1500
B4	Lenje Abad	Lorestan	9 October 1998	33.4406°	49.0216°	1440
B5	Gholaman	Lorestan	7 May 1996, 19 October 2002	33.4849°	48.0674°	1130
B6	Kashan	Esfahan	1 May 1997, 6 April 2000	33.9813°	51.2884°	1210
B7	Deh Zire	Esfahan	27 April 1996	33.5640°	51.9677°	1350
B8	Espidan	Esfahan	3 May 1997	33.4556°	52.0439°	1440
B9	Qamishlu	Esfahan	28 April 1996	32.0351°	51.5078°	2530
B10	Izeh	Khuzestan	13 October 1998	31.7476°	49.8057°	880
B11	Choqazanbil	Khuzestan	18 October 2002	32.0074°	48.5344°	70
C1	Post Chenar	Fars	20 April 2000	29.1502°	54.1554°	2310
C2	Sivand	Fars	30 April 1996, 14 October 2002	30.0572°	53.0249°	1980
C3	Naght-e Rostan	Fars	23 April 2000, 13 October 2002	29.9912°	52.8784°	1700
C4	Hane-ye Zenyan	Fars	22 April 2000	29.5835°	51.9362°	2015
C5	Dashtak	Fars	2 May 1996	30.3913°	51.4971°	1750
C6	Shahpur	Fars	3 May 1996	29.8077°	51.6118°	1330
C7	Bisahpur	Fars	21 April 2000	29.7839°	51.5848°	870
D1	Sams	Yazd	5 May 1997	31.1990°	54.9123°	1760
D2	Deh Bakri	Kerman	7 April 2000, 8 April 2000	29.0807°	57.9205°	1980
D3	Kahiri	Sistan va Baluchestan	11 April 2000	26.9262°	60.9921°	1160
D4	Tiss	Sistan va Baluchestan	13 April 2000	25.3629°	60.6138°	70
D5	Qarloq	Khorasan-e Razavi	12 May 1997	37.4963°	57.4473°	1040
D6	Bik	Khorasan-e Razavi	7 October 2002	37.5953°	57.8644°	1470
D7	Agh Mazar	Khorasan-e Razavi	12 May 1997	37.3753°	58.5423°	1750
D8	Bazangan	Khorasan-e Razavi	11 May 1997, 8 October 2002	36.2798°	60.5481°	730
	Turkey (Appendix 4)					
Ap: (1)	Sarikamis	Kars	4 June 1992	40.3042°	42.6683°	2080
Ap: (7)	Karakurt	Kars	1996–2002	40.1282°	42.5041°	1550
Ap: (3)	Ishak Pasa Sarayi	Agri	1996–2002	39.5238°	44.1461°	2100
Ap: (2)	Muradiye	Van	5 June 1992	39.0040°	43.7384°	1880

Appendix 2. Similarity of species abundance in the diet of *Bubo bubo* in seven regions of Iran. Key to symbols: Aa= Elborz and Talysh Mountains, Ab= northern Zagros, Ba= wetter western parts of the central Zagros, Bb= drier eastern parts of the central Zagros and Mesopotamia, C= southern part of Zagros in Fars Province, Da= south-eastern part of Iran south of the Dasht-e Kavir, and Db= Koppeh Dagh Mountains.

Species \ Region	Aa		Ab		Ba		C		Bb		Da		Db	Total	%
Chionomys nivalis	2+	17	20	1-	2						1			40	0.51
Apodemus witherbyi	2+	16	1- 20	1+	48		3	1-	3				4	94	1.20
Microtus obscurus	2+	64	1+ 199	1-	33	3-	0	3-	0	2-	0	3-	0	296	3.76
Mesocricetus brandti	2-	8	1+ 813	6-	0	4-	0	5-	0	3-	0	5-	0	821	10.44
Allactaga williamsi		10	1+ 178	4-	1	3-	0		37	2-	0	3-	0	326	4.15
Myomimus setzeri			1+ 49	2-	0			1-	0					49	0.62
Sturnus vulgaris			1+ 25		6		1		1				2	35	0.45
Delichon urbicum			1+ 10											10	0.13
Riparia riparia			1+ 11		1									12	0.15
Coleoptera sp.	1-	0	1+ 87		26	2-	0		11	1-	0	1+	22	146	1.86
Pelophylax cf. *ridibundus*		1	1+ 74	1-	12	1+	25	1-	5			1-	1	118	1.50
Meriones tristrami		3	76	1+	71	1-	3	2-	1	1-	0	2-	0	154	1.96
Meriones persicus	1-	25	766	1+	430	1-	42	2-	23		52	1-	43	1381	17.57
Ellobius lutescens	1-	11	259	1+	260	3-	1	2-	7	3-	0	4-	0	538	6.84
Columba oenas			1- 1	1+	12		3		1				1	18	0.23
Garrulus glandarius			1- 0	1+	12		3							15	0.19
Cricetulus migratorius		41	1- 314	1+	336	1-	54	3-	8		35	1+	143	931	11.84
Lepus europaeus		5	1- 25	1+	45		3		8	1+	9		5	100	1.27
Ammoperdix griseogularis		1	3- 0	1+	22		6	1+	14		2		6	51	0.65
Alectoris chukar		7	2- 21	1+	95	1+	24	1-	9	2+	35	2-	2	193	2.45
Columba livia		2	2- 9	1+	29	1+	16	1+	21		2		4	83	1.06
Agamidae sp.	1-	0	2- 9	1+	66	1+	15	1+	27		2	1-	4	123	1.56
Microtus irani		6	147	1-	40	2+	85	3-	1	2-	0		31	310	3.94
Rattus rattus			2- 0	1-	0	2+	19		6					25	0.32
Myotis blythii		1	2- 3	1-	3	2+	20		5		4			36	0.46
Miniopterus schreibersii		1				1+	6							7	0.09
Rhinolophus euryale						1+	5		1					6	0.08
Rattus norvegicus			1- 0		4	1+	5							9	0.11
Apus melba		1	1		1	1+	5						1	9	0.11
Sitta tephronata		1	1- 3		8	1+	10		4				1	27	0.34
Mus sp.		4	2- 34	1-	37	2+	83	1+	49	1-	2	1-	4	213	2.71
Meriones libycus			4- 0	3-	0	1+	12	3+	61		1		7	81	1.03
Lacertidae sp.			2- 6	2-	1			3+	44					51	0.65
Meriones crassus			3- 0		6		1	2+	27		4			38	0.48
Hemiechinus auritus		2	1- 7	2-	0		5	2+	24				4	42	0.53
Columba palumbus			2- 0	1-	0			2+	19					19	0.24
Crex crex			1		2			1+	5				1	9	0.11
Coturnix coturnix			8		4		2	1+	7				2	23	0.29
Passer domesticus			1- 17		10		8	1+	17		4	1-	0	56	0.71
Bufo viridis			1- 5		5		5	1+	11					26	0.33
Tatera indica			3- 0	2-	0		1	2+	27	1+	7			35	0.45
Galerida cristata		2	1- 10	1-	4		8	2+	27	1+	9		8	68	0.86
Nesokia indica			2- 0	1-	0			1+	11	1+	9		6	26	0.33
Calomyscus bailwardi			2- 2		13		6	1+	9	1+	9		2	41	0.52
Larus sp.			1							1+	5			6	0.08
Ellobius fuscocapillus			3- 0	2-	0			1-	0	1+	7	3+	42	49	0.62
Ochotona rufescens		4	3- 2	3-	0	1-	0		7		2	3+	63	78	0.99
Microtus afghanus			3- 0	2-	0							3+	37	37	0.47
Meriones meridianus			2- 0	1-	0							3+	27	27	0.34
Allactaga elater			17	2-	0				6		1	2+	23	47	0.60
Paraechinus hypomelas			1- 0		1							1+	10	11	0.14
Myomimus personatus												1+	6	6	0.08
Otonycteris hemprichi			1- 0		1				3			1+	9	13	0.17
Petronia petronia		1	14	2-	0		3		6			1+	14	38	0.48
Solifugida sp.			16	1-	0		1		1			1+	14	32	0.41
Falco tinnunculus		2	1- 3		5		3		3				3	19	0.24
Streptopelia senegalensis			1- 1		7		4		1		1		2	16	0.20
Athene noctua		1	1- 5		10		2		4		2		4	28	0.36
Otus scops			1- 0		4		5		2		1			12	0.15
Arvicola amphibius		7	46		23		2	1-	1			1-	0	79	1.00
Cypriniformes sp.			38		15	1-	0		11		4	1-	0	68	0.86
Crocidura suaveolens		4	15		4				2				2	27	0.34
Melanocorypha calandra			13		1		1		1				4	20	0.25
Corvus cornix+frugilegus		2	7		5		3		1				2	20	0.25
Oenanthe sp.		1	13		1				1		1		3	20	0.25
Alauda arvensis			10		2		4		2					18	0.23
Erinaceus concolor		1	4		2		3		3		2		2	17	0.22
Perdix perdix			7		1		1		2				2	13	0.17
Tringa sp.			2				1		5		1		3	12	0.15
Merops apiaster			2		3		1		1		1		2	10	0.13
Pyrrhocorax pyrrhocorax		1	1- 0		1		2		2		4			10	0.13
Scorpionida sp.		1	6						2				1	10	0.13
Gryllotalpa sp.			8						1					9	0.11
Ptyonoprogne rupestris			5		1		1		2					9	0.11
Streptopelia turtur					2		2		4					8	0.10
Pteroclidae sp.			3				1		2		1		1	8	0.10

Species \ Region	Aa	Ab	Ba	C	Bb	Da	Db	Total	%
Decapoda sp.		4		2	1		1	8	0.10
Mammalia	**231**	**3117**	**1370 1-**	**369 1-**	**340 1-**	**152**	**476**	**6055**	**77.02**
Aves	**33 1-**	**283**	**300 1+**	**161 1+**	**245 1+**	**86**	**95**	**1203**	**15.30**
Amphibia,Reptilia,Pisces	**2- 1 1-**	**134**	**104 1+**	**46 2+**	**99 1-**	**6 2-**	**5**	**395**	**5.02**
Evertebrata	**1- 1 1+**	**121 1-**	**26 1-**	**5**	**16 1-**	**0 1+**	**40**	**209**	**2.66**
Total	**266**	**3655**	**1800**	**581**	**700**	**244**	**616**	**7862**	**100.00**
Diversity Index H'	2.84	2.78	2.79	3.37	3.87	2.97	3.10	3.48	

Appendix 3. Diet of *Bubo bubo* in different elevations of eastern Turkey and north-western Iran

Metres above sea level	**1880**	**2330**	**2050**	**2020**	**2100**	**2080**	**1550**	**1320**		
Species \Sites	**2**	**6**	**5**	**4**	**3**	**1**	**7**	**8**	**Total**	**%**
Microtus obscurus	2+ 1054	96	3- 36	2- 66	1- 82	6- 0	1- 259	6- 0	1593	18.30
Nannospalax leucodon	1+ 9					4	8		21	0.24
Fringilla coelebs	1+ 7								7	0.08
Carduelis carduelis	1+ 8					1			9	0.10
Myomimus setzeri	1- 4	1+ 14	1+ 19	1+ 15	6	1- 3	2- 0	1- 0	61	0.70
Ellobius lutescens	1- 17	3+ 84	2+ 138	2- 8	2- 5	4- 0	4- 0	19	271	3.11
Passer domesticus	10		1+ 14	1	1	1	4		31	0.36
Sturnus vulgaris	7		1+ 10	7		1	4	5	34	0.39
Delichon urbicum	1		1+ 9		1		1		12	0.14
Riparia riparia			1+ 11						11	0.13
Cypriniformes sp.	1- 0		2+ 38			1- 0	2- 0		38	0.44
Solifugida sp.			1+ 10	6			2		18	0.21
Allactaga williamsi	3- 7	12	1+ 85	2+ 100	24	2- 6	2- 11	1+ 66	311	3.57
Arvicola amphibius	18	3	1+ 22	1+ 17	4	8	1- 7	4	83	0.95
Lepus europaeus	1- 0	1	3	1+ 10	3	1	1- 1	6	25	0.29
Gryllotalpa sp.			2	1+ 6					8	0.09
Mesocricetus brandti	1- 195	126	310	1+ 366	1+ 341	348	1+ 712	6- 2	2400	27.56
Coleoptera sp.	1- 4	1	14	1+ 16	1- 1	1- 2	2- 2	2+ 55	95	1.09
Pelophylax cf. ridibundus	24	1- 2	2- 1	2+ 67	1+ 34	1- 7	2- 6	2- 2	143	1.64
Agamidae sp.		1	2	1	1+ 6			2	12	0.14
Petronia petronia	9	1	4	8	1+ 12	2	13	1- 0	49	0.56
Falco tinnunculus	2		1	1	1+ 6	2		1	13	0.15
Chionomys nivalis	8	6	2- 0	10	1+ 20	11	15	1- 1	71	0.82
Microtus irani	5- 0	3- 0	54	34	2+ 88	1+ 86	1- 60	1+ 49	371	4.26
Meriones vinogradovi	2- 0		1- 0	6	1- 0	2+ 50	2- 0	1- 0	56	0.64
Apodemus witherbyi	32	1- 2	1- 13	2- 3	1- 6	2+ 56	38	2- 1	151	1.73
Mus sp.	2- 2		17	1- 2	1- 0	1+ 23	1+ 25	9	78	0.90
Cricetulus migratorius	2- 63	1- 41	1- 118	1- 84	2- 19	2+ 479	1+ 373	2- 43	1220	14.01
Apodemus cf. uralensis							1+ 7		7	0.08
Crocidura s. gueldenstaedtii	8		1- 0			5	1+ 24		37	0.42
Crocidura suaveolens	10		2	3	1	1- 0	1+ 13	6	35	0.40
Orthoptera sp.							1+ 13		13	0.15
Alectoris chukar	7	1	6	5	4	1- 0	1+ 15	3	41	0.47
Coturnix coturnix	1- 1	1	2	3		2	1+ 19	1	29	0.33
Meriones tristrami	4- 0	2- 0	37	2- 1	2- 1	3- 0	2+ 131	1+ 27	197	2.26
Meriones persicus	5- 0	32	1+ 172	3- 8	4- 2	5- 0	6- 0	3+ 491	705	8.10
Allactaga elater								2+ 12	12	0.14
Perdix perdix	3	1	3	3	4	6	7		27	0.31
Columba livia	5		4	2	3	1	3	2	20	0.23
Alauda arvensis	3	1	2	2	4		2	4	18	0.21
Galerida cristata	3		2	4	2		3	4	18	0.21
Melanocorypha calandra		2	5	3	1		1	2	14	0.16
Corvus cornix+frugilegus	1			4	4	2	1	2	14	0.15
Oenanthe sp.		1	5	3	1		2	1	13	0.15
Mustela nivalis	3	1	2		3	1	2		12	0.14
Columba oenas				1	4		6		11	0.13
Erinaceus concolor		1	1			5	3		10	0.11
Mammalia	**1436**	**419**	**1033**	**734**	**612**	**1092**	**1694**	**747**	**7767**	**89.20**
Aves	**97 1-**	**13 1+**	**120 1+**	**81 1+**	**78 1-**	**30**	**132 1-**	**33**	**584**	**6.71**
Amphibia,Reptilia,Pisces	**1- 24 1-**	**4 1+**	**44 2+**	**69 1+**	**47 1-**	**8 2-**	**6 1-**	**7**	**209**	**2.40**
Evertebrata	**2- 5 1-**	**2 1+**	**29 1+**	**28 1-**	**3 2-**	**2 1-**	**20 2+**	**58**	**147**	**1.69**
Total	**1562**	**438**	**1226**	**912**	**740**	**1132**	**1852**	**845**	**8707**	**100.00**
Diversity Index H'	1.49	2.05	2.74	2.42	2.26	1.74	2.17	1.82	2.64	

Site: 2 – Muradiye, 5 Jun. 1992 (Obuch 1994), **6** - Takht-e Soleyman, 3 Oct. 1998, **5** - Choplu, 2 Oct. 1998, **4** - Qareh Kelisa,, 20 Oct. 1998, 21 Oct. 2002, **3** - Ishak Pasa Sarayi, 24 Apr. 1996, 30 Apr. 1997, 30 Sep. 1998, 1 Oct. 2002, **1** – Sarikamis 4 Jun. 1992 (Obuch 1994), **7** – Karakurt, 14 May 1996, 21 May 1997, 21 Oct. 1998, 27 Apr. 2000, 23 Oct. 2002, **8** - Bastam, 30 Sep. 1998.