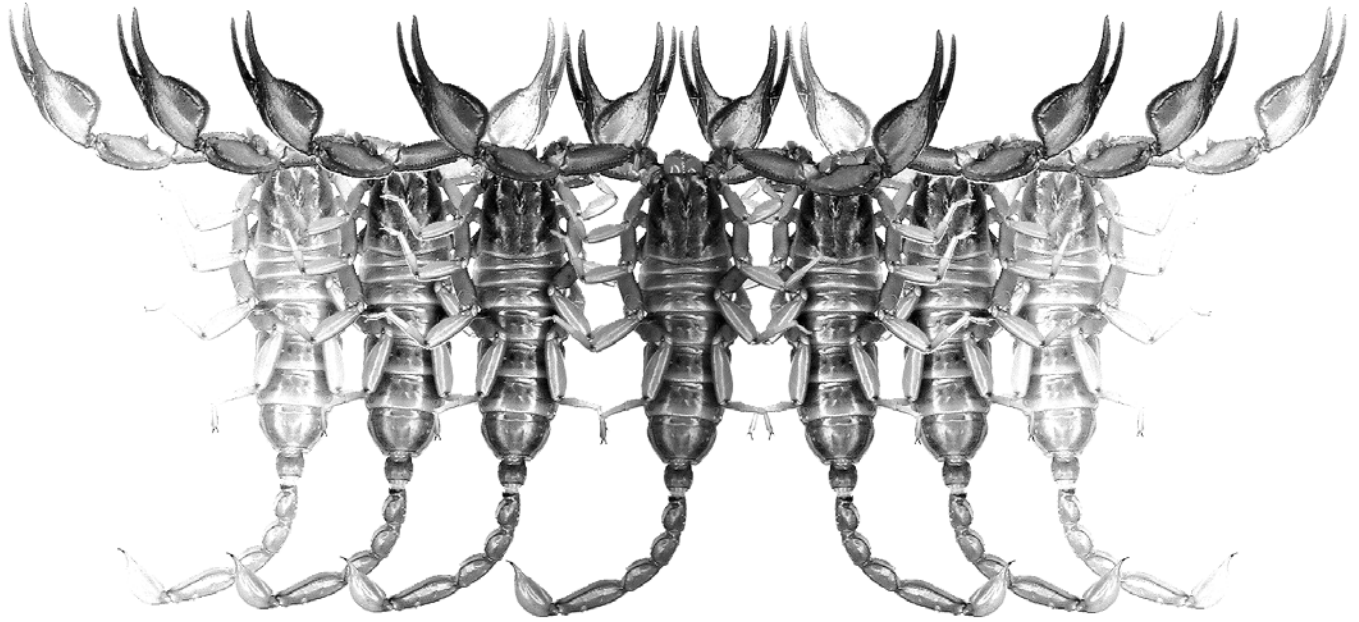


Euscorpius

Occasional Publications in Scorpiology



***Mesobuthus eupeus* (C.L. Koch, 1839)
(Scorpiones: Buthidae) in Turkey**

Ayşegül KARATAŞ & Ahmet KARATAŞ

July 2003 – No. 7

Euscorpilus

Occasional Publications in Scorpiology

EDITOR: Victor Fet, Marshall University, 'fet@marshall.edu'

ASSOCIATE EDITOR: Michael E. Soleglad, 'soleglad@la.znet.com'

Euscorpilus is the first research publication completely devoted to scorpions (Arachnida: Scorpiones). *Euscorpilus* takes advantage of the rapidly evolving medium of quick online publication, at the same time maintaining high research standards for the burgeoning field of scorpion science (scorpiology). *Euscorpilus* is an expedient and viable medium for the publication of serious papers in scorpiology, including (but not limited to): systematics, evolution, ecology, biogeography, and general biology of scorpions. Review papers, descriptions of new taxa, faunistic surveys, lists of museum collections, and book reviews are welcome.

Derivatio Nominis

The name *Euscorpilus* Thorell, 1876 refers to the most common genus of scorpions in the Mediterranean region and southern Europe (family Euscorpilidae).

Euscorpilus is located on Website '<http://www.science.marshall.edu/fet/euscorpilus/>' at Marshall University, Huntington, WV 25755-2510, USA.

The International Code of Zoological Nomenclature (ICZN, 4th Edition, 1999) does not accept online texts as published work (Article 9.8); however, it accepts CD-ROM publications (Article 8). *Euscorpilus* is produced in two *identical* versions: online (ISSN 1536-9307) and CD-ROM (ISSN 1536-9293). Only copies distributed on a CD-ROM from *Euscorpilus* are considered published work in compliance with the ICZN, i.e. for the purposes of new names and new nomenclatural acts. All *Euscorpilus* publications are distributed on a CD-ROM medium to the following museums/libraries:

- **USNM**, United States National Museum of Natural History (Smithsonian Institution), Washington, DC, USA
- **AMNH**, American Museum of Natural History, New York, USA
- **CAS**, California Academy of Sciences, San Francisco, USA
- **FMNH**, Field Museum of Natural History, Chicago, USA
- **MCZ**, Museum of Comparative Zoology, Cambridge, Massachusetts, USA
- **MNHN**, Museum National d'Histoire Naturelle, Paris, France
- **NMW**, Naturhistorisches Museum Wien, Vienna, Austria
- **BMNH**, British Museum of Natural History, London, England, UK
- **MZUC**, Museo Zoologico "La Specola" dell'Universita de Firenze, Florence, Italy
- **ZISP**, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
- **WAM**, Western Australian Museum, Perth, Australia
- **NTNU**, Norwegian University of Science and Technology, Trondheim, Norway

Publication date: 7 July 2003

Mesobuthus eupeus (C.L. Koch, 1839) (Scorpiones: Buthidae) in Turkey

Ayşegül KARATAŞ & Ahmet KARATAŞ

Niğde Üniversitesi, Fen-Edebiyat Fakültesi, Biyoloji Bölümü, TR-51200 Niğde, TÜRKİYE
(Division of Natural Sciences, Niğde University, TR-51200 Niğde, TURKEY)
e-mail: karatash@scientist.com

Summary

Distribution of *Mesobuthus eupeus* (C.L. Koch, 1839) (Scorpiones: Buthidae) in Turkey is investigated and new distributional records are given. In addition, data on the variation of the number of pectinal teeth, and some ecological features of *M. eupeus* are provided.

Introduction

The genus *Mesobuthus* Vachon, 1950 is widespread in the Palaearctic Region from the Balkans to Korea (Birula, 1917; Vachon & Kinzelbach, 1987; Fet, 1989; Kovařík, 1998; Fet & Lowe, 2000; Fet et al., 2000; Gantenbein et al., 2000). Three of 13 species are also found in Turkey (Kinzelbach, 1975; Vachon & Kinzelbach, 1987; Kovařík, 1996; Karataş & Karataş, 2001; Crucitti & Vignoli, 2002). Of these, *Mesobuthus gibbosus* (Brullé, 1832), which is an endemic scorpion species to the Balkan-Anatolian region, is common to the west of the Anatolian Diagonal, except for the coastal parts of the Black Sea and the Sea of Marmara. On the other hand, *M. eupeus* (C.L. Koch, 1839) is widespread in the Palaearctic Region; it ranges from central Anatolia through Caucasus and Turkestan to China; it is also found in Iraq, Iran, Afghanistan, and Pakistan (Birula, 1917; Vachon, 1951, 1966; Kinzelbach, 1975, 1984; Vachon & Kinzelbach, 1987; Fet, 1989; Kovařík, 1996, 1998; Fet & Braunwalder, 2000; Fet & Lowe, 2000). *M. eupeus* is syntopic with *M. gibbosus* in central Anatolia, to the west of the Anatolian Diagonal (Karataş & Karataş, 2001). *Mesobuthus nigrocinctus* (Ehrenberg, 1828), which was recently confirmed at a species level, is found in the eastern Mediterranean area (Fet et al., 2000). Most recently, this species was also reported in southeastern Turkey (Crucitti & Vignoli, 2002).

The first records of *M. eupeus* in Turkey were given by Birula (1917) from Artvin, Kars, and Oltu (Erzurum). Kinzelbach (1984) reported some new localities from eastern and southeastern Anatolia. Crucitti (1993, 1999, 2000) and Crucitti & Cicuzza (2000, 2001a, 2001b) found this species in Adıyaman, Ağrı, Kars, and Van, and also suggested the first

first locality as the possible westernmost site in the range of the species. However, Karataş & Karataş (2001) and Teruel (2002) gave new distributional localities westward, first for Niğde and then for Manisa provinces, reporting the species for the first time from central and northwestern Anatolia, respectively.

The number of teeth on the paired pectinal organ – an important sensory organ of scorpions – is utilized to discriminate among sexes and to identify species. The number of teeth is higher in male than in female, and there is a variation among individuals and between right and left pectens (Birula, 1917; Crucitti et al., 1998; Crucitti & Cicuzza, 2001b; Karataş & Karataş, 2001).

The purpose of the present study is to establish distribution of *M. eupeus* in Anatolia, and to provide data on variation in the number of pectinal teeth for this part of the species' range.

Material and Methods

During the period between 1994 and 2002 as a result of studies of the Turkish scorpiofauna, 151 specimens (96 ♀♀, 55 ♂♂) of *M. eupeus* were found in 35 different localities of the country. Most of them were taken under stones in daytime, and others were found at night using the UV lamp. The voucher samples were put into 70 % ethanol and have been deposited in the scorpion collection at Biology (Zoology) Department of Niğde University (ZDNU). Counts of pectinal teeth and morphological investigation were carried out under the stereo-microscope Olympus SZX9. Discrimination among

	<i>Mesobuthus eupeus</i>				<i>Mesobuthus gibbosus</i>			
	Females		Males		Females		Males	
	Min-Max	Mean ± SD	Min-Max	Mean ± SD	Min-Max	Mean ± SD	Min-Max	Mean ± SD
Segment I L/W (N= 5)	0.91-0.97	0.94 ± 0.02	0.89-0.94	0.93 ± 0.02	1.05-1.11	1.07 ± 0.02	1.11-1.26	1.18 ± 0.06
Segment II L/W (N= 5)	1.09-1.15	1.11 ± 0.02	1.10-1.15	1.13 ± 0.03	1.29-1.42	1.36 ± 0.05	1.39-1.54	1.48 ± 0.07
Segment III L/W (N= 5)	1.12-1.21	1.16 ± 0.04	1.13-1.23	1.18 ± 0.04	1.38-1.48	1.43 ± 0.04	1.47-1.68	1.59 ± 0.08
Segment IV L/W (N= 5)	1.41-1.50	1.43 ± 0.04	1.40-1.45	1.43 ± 0.02	1.66-1.78	1.70 ± 0.05	1.10-2.00	1.75 ± 0.37
Segment V L/W (N= 5)	1.81-2.00	1.92 ± 0.07	1.96-2.21	2.06 ± 0.11	2.08-2.23	2.15 ± 0.07	2.26-2.53	2.37 ± 0.12

Table 1: Morphometric characteristics of *Mesobuthus gibbosus* and *M. eupeus* in Turkey.

sexes on the basis of pectinal teeth number was confirmed by the presence of genital papillae in males.

Results and Discussion

The following key distinguishes species of *Mesobuthus* found in Turkey:

1. Metasomal segments robust (Length/Width (mean ± SD) I, 0.93 ± 0.02; II, 1.12 ± 0.02; III, 1.17 ± 0.04; IV, 1.43 ± 0.03; V, 1.99 ± 0.11) (Table 1), octocarinata. Pedipalp chelae relatively inflate and wider than patella, robust, with short fingers. Fixed finger of pedipalps with maximum of 10 diagonal rows of granules; 11 on movable finger. Telson oblong-ovoid (subglobose), with dorsal surface flat. Pectines with 16-23 teeth in females, 22-28 in males.

M. eupeus

– Metasomal segments much more slender, decacarinata. Pedipalp chelae more slender, with longer, slender fingers. (2)

2. Metasomal segments more slender (L/W; I, 1.13 ± 0.07; II, 1.42 ± 0.08; III, 1.51 ± 0.10; IV, 1.72 ± 0.25; V, 2.26 ± 0.14) (Table 1), fixed finger of pedipalps with maximum of 11 diagonal rows of granules; 12 on movable finger. Telson oval, elongate with a deep oval dorsobasal depression. Pectines with 20-27 teeth in females, 26-33 in males.

M. gibbosus

– Metasomal segments (L/W): I, 1.75; II, 1.53; III, 1.67; IV, 1.91; V, 2.67; Fixed finger of pedipalps with maximum of 12 diagonal rows of granules; 13 on movable finger. Pectines with 21-24 teeth in females, 27-31 in males.

M. nigrocinctus

Specimens examined (Fig.1): *Mesobuthus eupeus*: Total 151 specimens (96 ♀♀, 55 ♂♂). **1.** Adıyaman: Gerger, 1 ♀ (2.VI.2001), **2.** Kâhta, Akdoğan Village, 1 ♀, 1 ♂ (July

2001), 6 ♀♀, 4 ♂♂ (21.V.2002), **3.** Kâhta, Karadut Village, Nemrut Mt., 3 ♀♀, 1 ♂ (16.VII.2001), **4.** Sincik, Aksu Village 13 ♀♀, 1 ♂ (24.VI.2001); **5.** Aksaray: Güzelyurt, Ihlara Valley, 1 ♀ (14.IV.2001); **6.** Artvin: Yusufeli, Kılıçkaya, YİBO, 2 ♀♀, 2 ♂♂ (26.VIII.2001); **7.** Bingöl-Elazığ provinces boundary, Kuruca Pass, 1 ♂ (03.X.2001); **8.** Elazığ: Baskil, Karakaş Village, 2 ♀♀, 3 ♂♂ (15.VII.2001); **9.** Erzurum: İspir, Elmalı Village, 4 ♀♀, 2 ♂♂ (27.VIII.2001); **10.** Kars (centrum) 1 ♀ (13.IX.2000), **11.** Sarıkamış, 3 ♀♀ (16.IX.2000); **12.** Kayseri: Kocasinan, Boztepe vicinity, 3 ♀♀ (30.V.1999), **13.** Yeşilhisar, Büget Village, 1 ♀ (18.VIII.1999); **14.** Konya: Ereğli, Zengen, 2 ♀♀, 2 ♂♂ (19.VIII.2001); **15.** Malatya, 1 ♀ (20.V.2002), **16.** Battalgazi, Karahan Quarter, 1 ♀ (28.IX.2001), **17.** Yarımcıhan Village, 2 ♀♀ (15.IX.2001); **18.** Mardin: Eskikale Village, 3 ♀♀, 2 ♂♂ (25.IX.2002); **19.** Nevşehir: Derinkuyu, Goble Stream, 2 ♂♂ (05.VIII.1997); **20.** (a). Niğde (centrum), Bucakçayır Quarter, 1 ♀, 2 ♂♂ (26.V.2002), (b). Özbelde Quarter, 1 ♀ (21.V.2001), 11 ♀♀, 3 ♂♂ (29.V.2002), (c). Tepebağları Quarter, 4 ♀♀ (05.VI.2001), **21.** Aktaş Village (Kayseri road, c. 10th km), 1 ♀, 2 ♂♂ (02.V.1996), **22.** Aşlama, 4 ♀♀, 1 ♂ (28.V.2001), 1 ♀ (28.V.2001), 2 ♂♂ (24.VI.2001), **23.** (a). Fertek road, 1 ♀ (23.VI.2001), (b). Fertek, Mandilbos, 1 ♂ (summer 2002), **24.** (a). Gümüşler, 1 ♀, 1 ♂ (June 1997), (b). Gümüşler Dam Lake, 1 ♀, 2 ♂♂ (07.V.1997), 11 ♀♀ (06.V.2001), 1 ♀, 2 ♂♂ (20.V.2002), **25.** Gümüşler, Epçik High Plateau, 2 ♂♂ (17.V.2001), **26.** (a). Koyunlu, 1 ♂ (15.XII.1997), (b). Niğde Univ. Campus, 1 ♀ (15.XI.1997), 1 ♀, 3 ♂♂ (18.IV.2001), 1 ♀ (15.V.2001), 2 ♂♂ (08.V.2002), **27.** between Ovacık and Uluğağaç villages, 1 ♀, 2 ♂♂ (03.V.1996), **28.** Yeşilyurt Village, 2 ♀♀, 2 ♂♂ (23.IV.2001), **29.** Bor, near Bor Sugar Factory, Yediödarlar, 2 ♀♀ (22.X.1995), **30.** Bor, Pınarbaşı vicinity, 2 ♀♀, 2 ♂♂ (24.III.1996), **31.** Bahçeli, 1 ♂ (23.IV.1996), **32.** Balçılı Village, 1 ♂ (20.VII.1996), **33.** Ş.Urfa: Viranşehir, Büyükbardakçı Village, 1 ♂ (02.VII.2002); **34.**

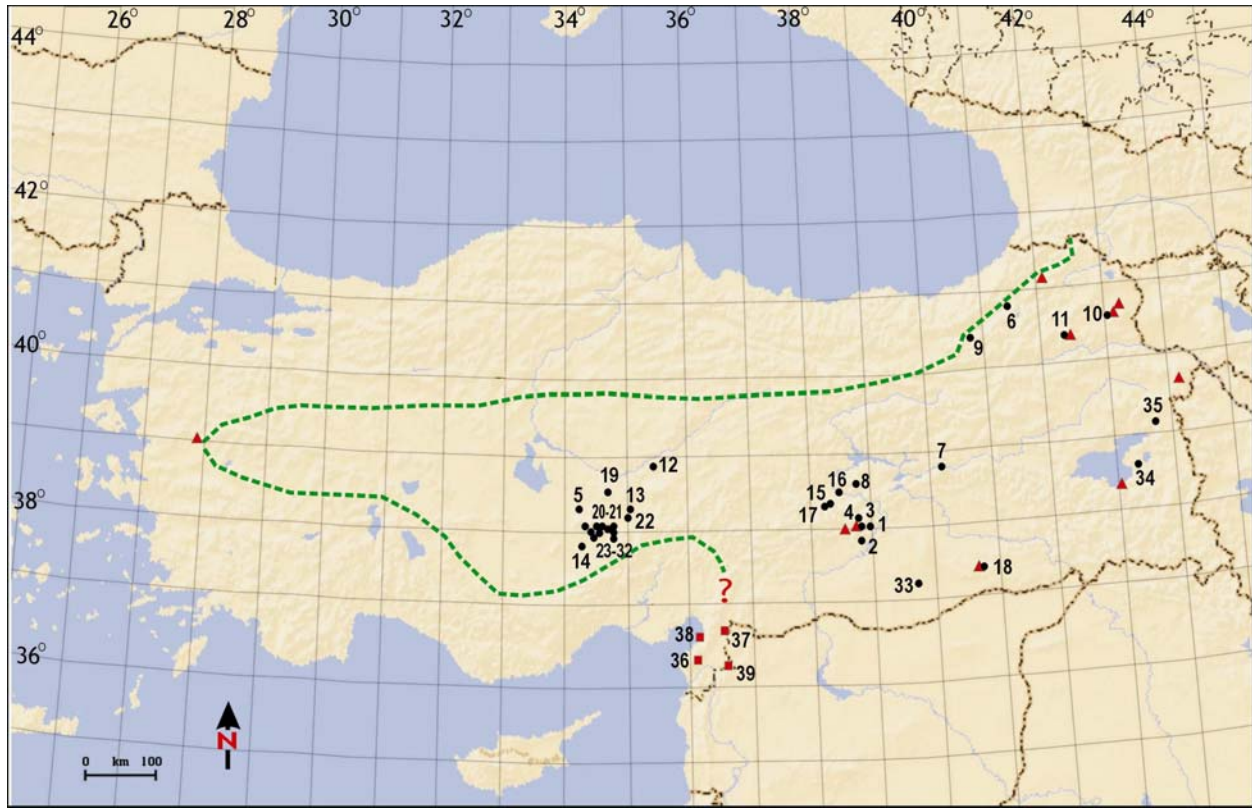


Figure 1: Localities of *M. eupeus* in Turkey (dots: original findings, triangles: published records; line: possible distributional area. Explanation is given in the text).

Van: Çoban Village, 1 ♂ (02.X.2001), **35.** Muradiye-Çaldıran road, near Şeytan Bridge, 1 ♂ (07.VII.2002); *Mesobuthus* sp.: Total 5 specimens (2 ♀♀, 3 ♂♂); **36.** Hatay: Antakya, Alahan Village, Alahan Castle, 2 ♂♂ (27.VII.1998), **37.** Hassa, Söğüt Village, 1 ♂ (28.VII.1998), **38.** İskenderun, Payas Castle, 1 ♀ (25.VII.1998), **39.** Reyhanlı, Turkish-Syrian border, Oğulpınar Village, 1 ♀ (15.VII.2001).

Sexual dimorphism: Adult females of *M. eupeus* are larger than males. However, males have a higher number of pectinal teeth (22-28) than females (16-23), and therefore have longer pectines. The metasoma in males is longer and wider than in females of the same total length.

Pectinal organ: Average of female pectinal tooth counts was 19.34 ± 1.16 , with variations as follows: there were 4 combs with 16 teeth, 4 combs with 17 teeth, 25 combs with 18 teeth, 82 combs with 19 teeth, 54 combs with 20 teeth, 15 combs with 21 teeth, 6 combs with 22 teeth, 2 combs with 23 teeth. For males, average of pectinal tooth counts was 25.14 ± 1.03 , with variations as follows: there was one comb with 22 teeth, 8 combs with 23 teeth, 19 combs with 24 teeth, 40 combs with 25 teeth, 25 combs with 26 teeth, 9 combs with 27 teeth, 2 combs with 28 teeth. The number of pectinal tooth, between right and left pectens, exhibit differences based on individuals and sexes (Fig.2). However, no clear differences in this number were

established in accordance with geographic regions within Turkey. Although pectinal tooth counts ranged from 17 to 23 in females (N= 92) and from 22 to 28 in males (N= 52), the most common numbers found were 19-19 and 20-20 in females (N= 28 and 17, respectively), and 25-25 in males (N= 13). But right portion in females was 18-23 with average of 19.4 ± 1.05 , left 17-22 with average of 19.4 ± 1.01 . In males, right is 23-28 with average of 25.2 ± 1.10 , left 22-27 with average of 25.2 ± 1.16 .

Karataş & Karataş (2001), for Anatolian samples, reported that the number varied from 16 to 23 in females, and from 21 to 28 in males. Birula (1917) gave the numbers as 16-22 and 20-28 for females and males, respectively. There were no differences in number of pectinal teeth among eastern, central, and southeastern Anatolia specimens. However, specimens from Hatay (Fig. 1, 36-39) have some characters as follows. Ventrolateral carinae enlarging towards posterior on metasomal segments II and III, dorsomedian carinae serrate and terminating distally in a few large spinoid denticles as in *M. eupeus*. Intermediary carinae are developed moderately, and seen in only posterior three-fourths on metasomal segment IV. The latter carinae are weakly developed in *M. gibbosus* and no carinae in *M. eupeus* are present on segment IV. Number of the rows of the outer accessory denticles is 10 on the fixed finger, 11 on the movable finger in *M. eupeus*; 11-12 in *M. gibbosus* and 12-13 in *M. nigro-*

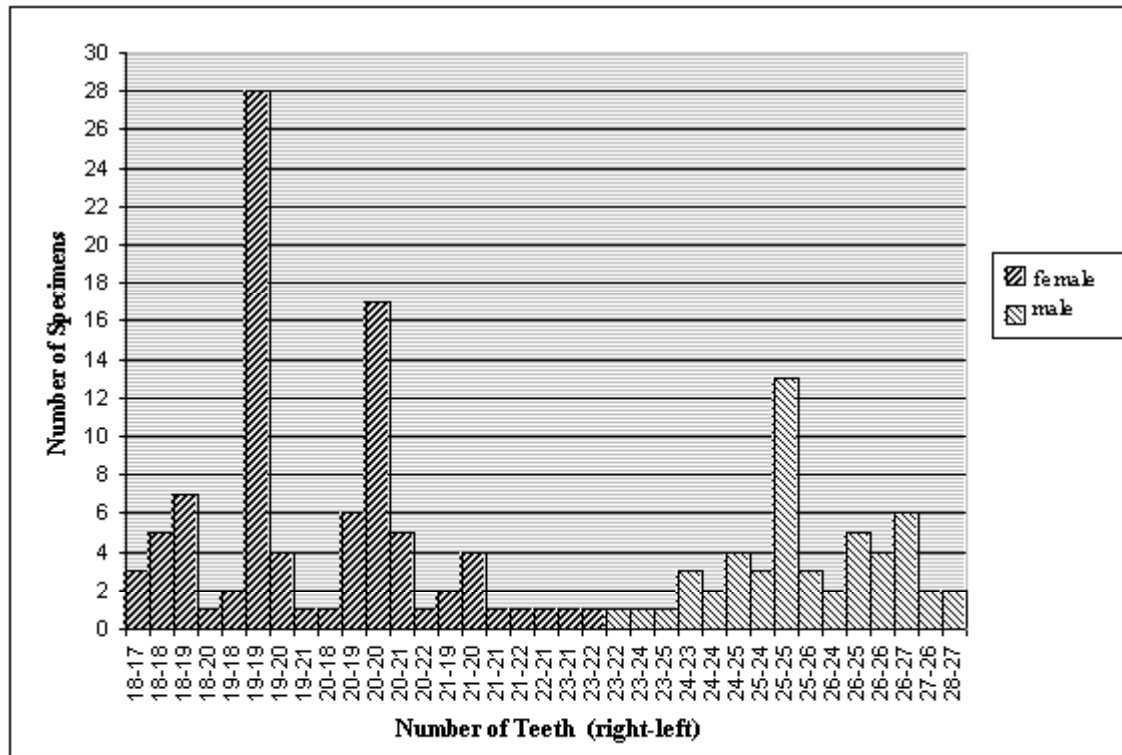


Figure 2: Variation in number of pectinal teeth of Turkish *M. eupeus* (92 ♀♀ and 52 ♂♂).

cinctus. Number of these denticles is 11-12 in specimens from Hatay. Because of these characteristics it is difficult to clearly identify Hatay specimens as *M. eupeus*, *M. gibbosus* or *M. nigrocinctus*. By this reason, these scorpions are currently identified as *Mesobuthus* sp. *M. gibbosus* and *M. nigrocinctus* are the only two widespread species of *Mesobuthus* recognized to occur in the Mediterranean area (Fet et al., 2000). In addition, an endemic species *M. cyprius* Gantenbein & Kropf, 2000 has been recently described from Cyprus (Gantenbein et al., 2000).

According to recent findings, *M. eupeus* occurs commonly in eastern, southeastern, and central Anatolia, and also it ranges westward toward the Aegean Sea, but does not reach the coastal regions in Anatolia (Fig.1). This scorpion species ranges vertically between 500 and 1800 m asl, and occupies habitats with a typical continental climate and steppe vegetation. Some specimens have been found also in forested areas. These findings are consistent with information of Birula (1917) and Crucitti & Ciczuzza (2000, 2001a, 2000b).

Mesobuthus eupeus was found to live syntopically in Turkey with six other scorpion species: *Androctonus crassicauda* (Olivier, 1807) in Adiyaman and Ş.Urfa, *Hottentotta sauleyi* (Simon, 1880) in Mardin, and *Leiurus quinquestriatus* (Ehrenberg, 1828) in Adiyaman, *Mesobuthus gibbosus* from all localities in central Anatolia (all family Buthidae); *Calchas nordmanni* Birula, 1899 (fam. Iuridae)

in Artvin and Erzurum; and *Scorpio maurus* Linnaeus, 1758 (fam. Scorpionidae) in Adiyaman.

Most of the samples were collected under stones at day-time, some of them were found at night with the UV lamp. With respect to our field surveys, *M. eupeus* emerges about an hour (sometimes several hours) after dusk from under stones, and also continues its feeding activity during the night. The scorpion preys mainly on insects, spiders, and millipedes. In captivity, it preferred especially flies (Diptera), grasshoppers (Orthoptera), and spiders (Araneae), but did not feed on bees, ants (Hymenoptera) and beetles (Coleoptera).

According to Birula (1917), specimens from Kars Province and its environs belong to the nominotypical subspecies, *M. eupeus eupeus* (C. L. Koch, 1839), while neighbouring Iraq is inhabited by *M. eupeus mesopotamicus* (Penther, 1912). Kovařík (1996, 1998) considered the nominotypical form to be present in Anatolia. Nevertheless, when compared central Anatolian samples with those from northeastern Anatolia in our collection, the former with slender pedipalp chelae has much light yellow colour on both ventral and dorsal surfaces and darker pigmentation on the carapace and mesosoma; no other morphological differences were found. Similarly, Teruel (2001) compared adult males from Van Province with those from Manisa, and reported that the specimens from the western Anatolia (Manisa) show an overall lighter coloration and more slender pedipalp

chela; these differences appear to reflect merely variation between populations.

Acknowledgements

We wish to thank Professor Victor Fet and Michael Sologlad for comments on the manuscript, and also Ferhat Toprak, Hasan Karakaya and our students for help in collecting of scorpions. We dedicate this study to the memory of the late Kuddusi Ünsal, our friend, research assistant, and student.

References

- BIRULA, A. [BYALYNITSKII-BIRULYA, A.A.], 1917. *Chlenistobryukhie paukoobraznye Kavkazskogo Kraya [Arthrogastric arachnids of Caucasia]. Part I. Scorpiones*. Tiflis: Mémoires du Musée du Caucase, Sér. A 5: 1-253. [English translation: Jerusalem: Israel Program for Scientific Translation, 1964].
- CRUCITTI, P. 1993. Some topics on distribution patterns of the genus *Mesobuthus* in the Near East based on ecological data (Scorpiones: Buthidae). *Biologia Gallo-hellenica*, 20: 69-74.
- CRUCITTI, P. 1999. The scorpions of Anatolia: Biogeographical patterns. *Biogeographica*, 20: 81-94.
- CRUCITTI, P. 2000. Scorpioni e scorpionismo nella Provincia di Adiyaman (Turchia Sud-orientale). *Biologi Italiani*, 6: 17-20.
- CRUCITTI, P. & D. CICUZZA. 2000. Gli Scorpioni del Parco Nazionale del Monte Nemrut (Turchia sud-orientale) (Scorpiones). *Memorie della Società Entomologica Italiana*, 78(2): 275-294.
- CRUCITTI, P. & D. CICUZZA. 2001a. Scorpions of Anatolia: Ecological patterns. Pp. 225-234 in Fet, V. & P.A. Selden (eds.). *Scorpions 2001: In Memoriam Gary A. Polis*. Burnham Beeches, Bucks: British Arachnological Society.
- CRUCITTI, P. & D. CICUZZA. 2001b. Ricerche biologiche su *Mesobuthus eupeus* del Monte Ararat (Turchia orientale) (Scorpiones Buthidae). *Bollettino della Società Entomologica Italiana*, 133(1): 3-11.
- CRUCITTI, P., S. FATTORINI & R. MORELLI. 1998. Rapporto sessi in *Mesobuthus gibbosus* (Scorpiones Buthidae). *Bollettino della Società Entomologica Italiana*, 130(1): 3-12.
- CRUCITTI, P. & V. VIGNOLI. (2001) 2002. Gli Scorpioni (Scorpiones) dell'Anatolia sud-orientale (Turchia). *Bollettino di Museo regionale di Scienze naturali Torino*, 19(2): 433-480
- FET, V. 1989. A catalogue of scorpions (Chelicerata: Scorpiones) of the USSR. *Rivista del Museo Civico di Scienze Naturali "E. Caffi" Bergamo*, 13 (1988): 73-171.
- FET, V. & M.E. BRAUNWALDER. 2000. The scorpions (Arachnida, Scorpiones) of the Aegean area: current problems in taxonomy and biogeography. *Balkan Journal of Zoology*, 130 (Suppl. 1): 17-22.
- FET, V., B.E. HENDRIXON, W.D. SISSOM & G. LEVY. 2000. First record for the genus *Mesobuthus* Vachon, 1950 in Israel: *Mesobuthus nigrocinctus* (Ehrenberg, 1828), n. comb. (Scorpiones: Buthidae) from Mt. Hermon. *Israel Journal of Zoology*, 46: 287-295.
- FET, V. & G. LOWE. 2000. Family Buthidae. Pp. 54-286 in: FET, V., W.D. SISSOM, G. LOWE & M.E. BRAUNWALDER. 2000. *Catalog of the Scorpions of the World (1758-1998)*. New York, NY: The New York Entomological Society, 690 pp.
- GANTENBEIN, B., C. KROPF, C.R. LARGIADER & A. SCHOLL. 2000. Molecular and morphological evidence for the presence of a new Buthid taxon (Scorpiones: Buthidae) on the Island of Cyprus. *Revue suisse de Zoologie*, 107(1): 213-232.
- KARATAŞ, A. & A. KARATAŞ. 2001. First record of *Mesobuthus eupeus* (C.L. Koch, 1839) from central Anatolia (Scorpiones: Buthidae). Pp. 297-299 in Fet, V. & P.A. Selden (eds.). *Scorpions 2001: In Memoriam Gary A. Polis*. Burnham Beeches, Bucks: British Arachnological Society.
- KINZELBACH, R. 1975. Die Skorpione der Ägäis: Beiträge zur Systematik, Phylogenie und Biogeographie. *Zoologische Jahrbücher, Abteilung für Systematik*, 102: 12-50.
- KINZELBACH, R. 1984. Die Skorpionssammlung des Naturhistorischen Museums der Stadt Mainz. Teil II: Vorderasien. *Mainzer Naturwissenschaftliches Archiv*, 22: 97-106.

- KOVAŘÍK, F. 1996. First report of *Compsobuthus matthiesseni* (Scorpionida: Buthidae) from Turkey. *Klapalekiana*, 32: 53-55.
- KOVAŘÍK, F. 1998. *Štíři [Scorpions]*. Jihlava: Madagaskar, 175 pp.
- TERUEL, R. 2002. First record of *Mesobuthus eupeus* (Koch, 1839) from western Turkey (Scorpiones: Buthidae). *Revista Ibérica de Aracnología*, 5: 75-76.
- VACHON, M. 1951. A propos de quelques scorpions de Turquie collectés par M. le Professeur Dr. Curt Kosswig. *Istanbul Üniversitesi Fen Fakültesi Mecmuası*, 16: 341-344.
- VACHON, M. 1966. Liste des scorpions connus en Égypte, Arabie, Israël, Liban, Syrie, Jordanie, Turquie, Irak, Iran. *Toxicon*, 4: 209-218.
- VACHON, M. & R. KINZELBACH. 1987. On the taxonomy and distribution of the scorpions of the Middle East. Pp. 91-103 in Krupp, F., W. Schneider & R. Kinzelbach (eds.). *Proceedings of the Symposium on the Fauna and Zoogeography of the Middle East*, Mainz, 1985.