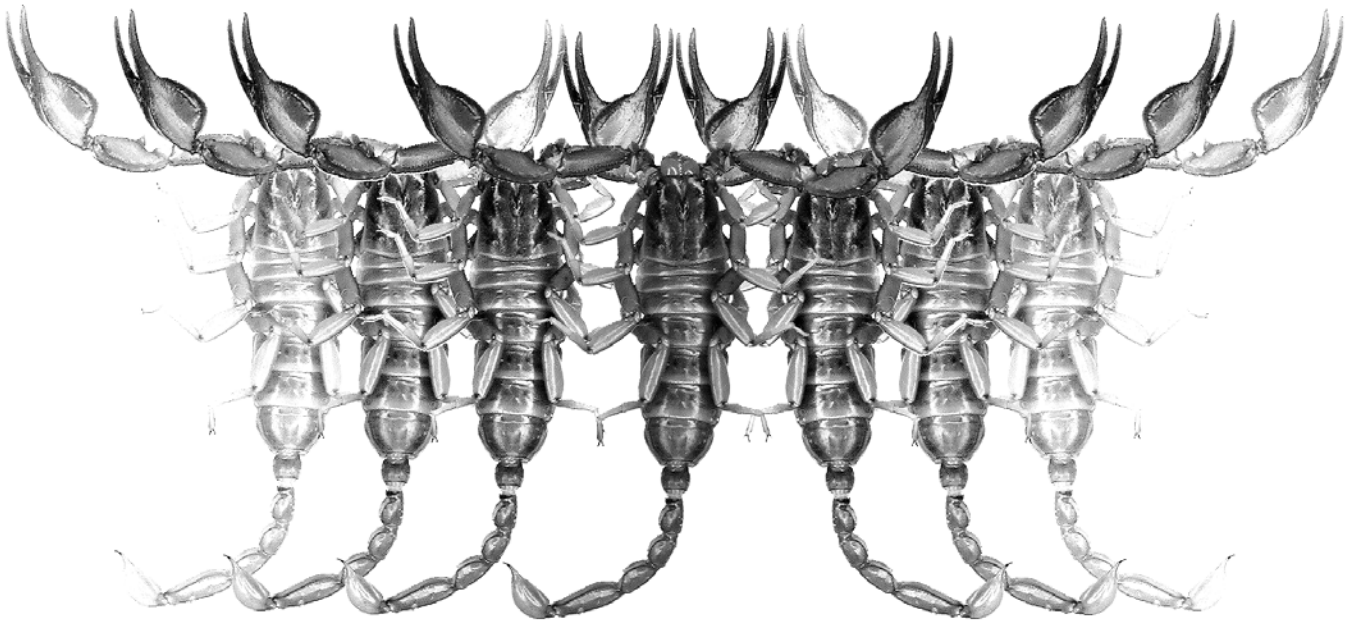


Euscorpius

Occasional Publications in Scorpiology



A Note on the Scorpions from the Pirin Mountains, Southwestern Bulgaria (Scorpiones: Buthidae, Euscorpiidae)

Rolando Teruel, Victor Fet and Luis F. de Armas

October 2004 — No. 14

Euscorpius

Occasional Publications in Scorpiology

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

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

Euscorpius is the first research publication completely devoted to scorpions (Arachnida: Scorpiones). *Euscorpius* 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). *Euscorpius* 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 *Euscorpius* Thorell, 1876 refers to the most common genus of scorpions in the Mediterranean region and southern Europe (family Euscorpiidae).

Euscorpius is located on Website '<http://www.science.marshall.edu/fet/euscorpius/>' 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). *Euscorpius* is produced in two *identical* versions: online (ISSN 1536-9307) and CD-ROM (ISSN 1536-9293). Only copies distributed on a CD-ROM from *Euscorpius* are considered published work in compliance with the ICZN, i.e. for the purposes of new names and new nomenclatural acts. All *Euscorpius* publications are distributed on a CD-ROM medium to the following museums/libraries:

- **ZR**, Zoological Record, York, UK
- **LC**, Library of Congress, Washington, DC, USA
- **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

A note on the scorpions from the Pirin Mountains, southwestern Bulgaria (Scorpiones: Buthidae, Euscorpiidae)

Rolando Teruel¹, Victor Fet² and Luis F. de Armas³

¹ Centro Oriental de Ecosistemas y Biodiversidad (BIOECO), Museo de Historia Natural “Tomás Romay”, José A. Saco # 601, esquina a Barnada, Santiago de Cuba 90100, Cuba

² Department of Biological Sciences, Marshall University, Huntington, West Virginia 25755-2510, USA

³ Apartado Postal # 4327, San Antonio de Los Baños, La Habana 32500, Cuba

Summary

In the present note, four scorpion species are recorded from the Pirin Mountains in southwestern Bulgaria, including the first records for Bulgaria of both *Mesobuthus gibbosus* (Brullé, 1832) (Buthidae) and the “*mingrelicus* complex” of the genus *Euscorpius* Thorell, 1876 (Euscorpiidae) (the latter based upon an undetermined species). Also, *E. hadzii* Caporiacco, 1950 and another undetermined species of *Euscorpius* belonging to the “*carpathicus* complex” are recorded from Pirin. The taxonomic affinities of the taxa are discussed, as well as some biogeographical considerations about the scorpions of this poorly studied mountainous area.

Introduction

In spite of its key geographical location in the northern part of the Balkan Peninsula, the scorpion fauna of Bulgaria has been subject of a very few studies. One of the earliest Bulgarian zoologists Stefan Yurinich (1855–1947) was the first to record the scorpion species *Euscorpius carpathicus* (Linnaeus, 1767) (now Euscorpiidae) from Bulgaria (Yurinich, 1904). Fet (1993) mentioned for Bulgaria the enigmatic subspecies *Euscorpius germanus croaticus* Caporiacco, 1950. Kovařík (1998) mentioned *Mesobuthus gibbosus* (Brullé, 1832) (Buthidae) and *Euscorpius carpathicus* for Bulgaria but without precise locality records, and a year later (Kovařík, 1999) he added with doubt *Euscorpius germanus* (C. L. Koch, 1837), again without precise locality records. Fet & Lowe (2000) did not list *M. gibbosus* from Bulgaria. Fet & Sissom (2000) recorded the following taxa of *Euscorpius* for this country: *E. carpathicus* (not assigned to subspecies), *E. germanus* (under question, as *E. g. croaticus* Caporiacco, 1950), and also with doubt *Euscorpius mingrelicus* (Kessler, 1874). In a detailed paper on the Balkan scorpions, Fet (2000) listed as confirmed for Bulgaria only scorpions of the “*carpathicus* complex” (as *Euscorpius carpathicus* (Linnaeus, 1767) *sensu lato*), which he divided in three “groups” on the basis of trichobothrial pattern, metasomal carination, and coloration. Most recently, in a paper dealing with the taxonomy of the “*carpathicus* complex”, Fet & Soleglad (2002) restricted the scope of *E. carpathicus* exclusively

to the populations inhabiting southwestern Romania and revalidated as full species its three former subspecies *Euscorpius hadzii* Caporiacco, 1950, *Euscorpius koschewnikowi* Birula, 1900 and *Euscorpius tergestinus* (C. L. Koch, 1837). Among these, *E. hadzii* was recorded from Bulgaria and corresponded to the “Group B” previously defined by Fet (2000). Thus, the only confirmed records of scorpions for Bulgaria are members of *Euscorpius* Thorell, 1876: *E. hadzii* and at least two undetermined forms belonging to the “*carpathicus*” complex of this genus (Fet, 2000).

Most of the Bulgarian scorpion material studied by Fet (2000) and Fet & Soleglad (2002) was collected in the north of this country (Stara Planina, or Balkan Mountains), its south (Rhodope Mountains), or the very southwestern corner (Struma valley). The Pirin mountains are the highest in Bulgaria, Alpine-like massif (up to 2,914 m asl, Mt. Vihren; over 100 summits above 2,000 m asl), located in the southwest of this country close to the Greek border, between the latitudes 41°53'N and 42°35'N and longitudes and 23°14'E and 23°44'E. Pirin is bordered by the Rila Mountains massif on the north and the river valleys of Struma (=Strymonas in Greece) and Mesta (=Nestos in Greece) from the west and east, respectively (Fig. 1). No scorpions have been recorded from the Pirin Mountains in the literature.

Recently, limited scorpion material from this mountain massif became available and its detailed study has revealed important additional taxa for Bulgaria. Below, a detailed discussion of this material is provided.



Figure 1: Geographical location of the Pirin Mountains.

Methods and Materials

Scorpions were studied under a MSB-9 dissecting microscope, equipped with both grid and linear scale eyepieces for drawing and measuring the specimens, respectively. The diagnosis of each species is based exclusively upon the material examined. Trichobothrial designations follow Soleglad & Sissom (2001). Abbreviations: Instituto de Ecología y Sistemática, Havana, Cuba (IES); private collection of Rolando Teruel, Santiago de Cuba, Cuba (RTO); and private collection of Victor Fet, West Virginia, USA (VF).

Systematics

Family Buthidae C. L. Koch, 1837

Genus *Mesobuthus* Vachon, 1950

***Mesobuthus gibbosus* (Brullé, 1832)**

Figs. 2–15

Material examined. BULGARIA: Pirin Mountains; under stones in open areas, 1,200–1,300 m asl, July 1972 (coll. Gallia), 1 juvenile ♀ (IES).

Morphology. Body light yellowish orange, prosoma densely spotted with blackish brown coloration (mainly over all carinae and furrows), tergites with five blackish longitudinal stripes, legs almost entirely dark to blackish brown, chelicerae, pedipalps and metasoma

with some small blackish spots. Carapace with central median and posterior median carinae joined, forming a continuous linear series of granules to posterior margin; anterior margin with 12 short, stout setae. Tergites with three strong longitudinal carinae moderately projecting beyond posterior margin, but not as spiniform processes. Metasomal segments I–IV with 10 carinae, ventrolateral carinae of segment V with posterior granules conspicuously enlarged and lobated. Chelicerae ventrally with two well-pigmented denticles in both fingers. Pedipalps with trichobothrial pattern A-β, fixed finger of chela with trichobothrium *db* basal to *est*; fingers with 12 principal rows of granules; tip of movable finger with four accessory granules just proximal to terminal denticle. Legs III–IV with a strong tibial spur; tarsi and basitarsi of all legs with two submedian rows of short, spiniform setae. Pectinal tooth count 24–22.

Comments. The Bulgarian specimen is a small juvenile less than 35 mm long, possibly a third or fourth instar. Its color pattern is identical to other examined specimens of the same species from Lesvos Island (Aegean Sea, Greece) and Kirklareli (European Turkey), all in RTO collection, and its pectinal tooth count is diagnostic for females (Crucitti & Marini, 1987; Crucitti & Ciczuzza, 2000). The structure of the prosomal carinae in this specimen does not match the definition of the genus *Mesobuthus* Vachon, 1950 as given by Sissom (1990), but it is otherwise typical for *M. gibbosus* (R. Teruel, unpublished data).

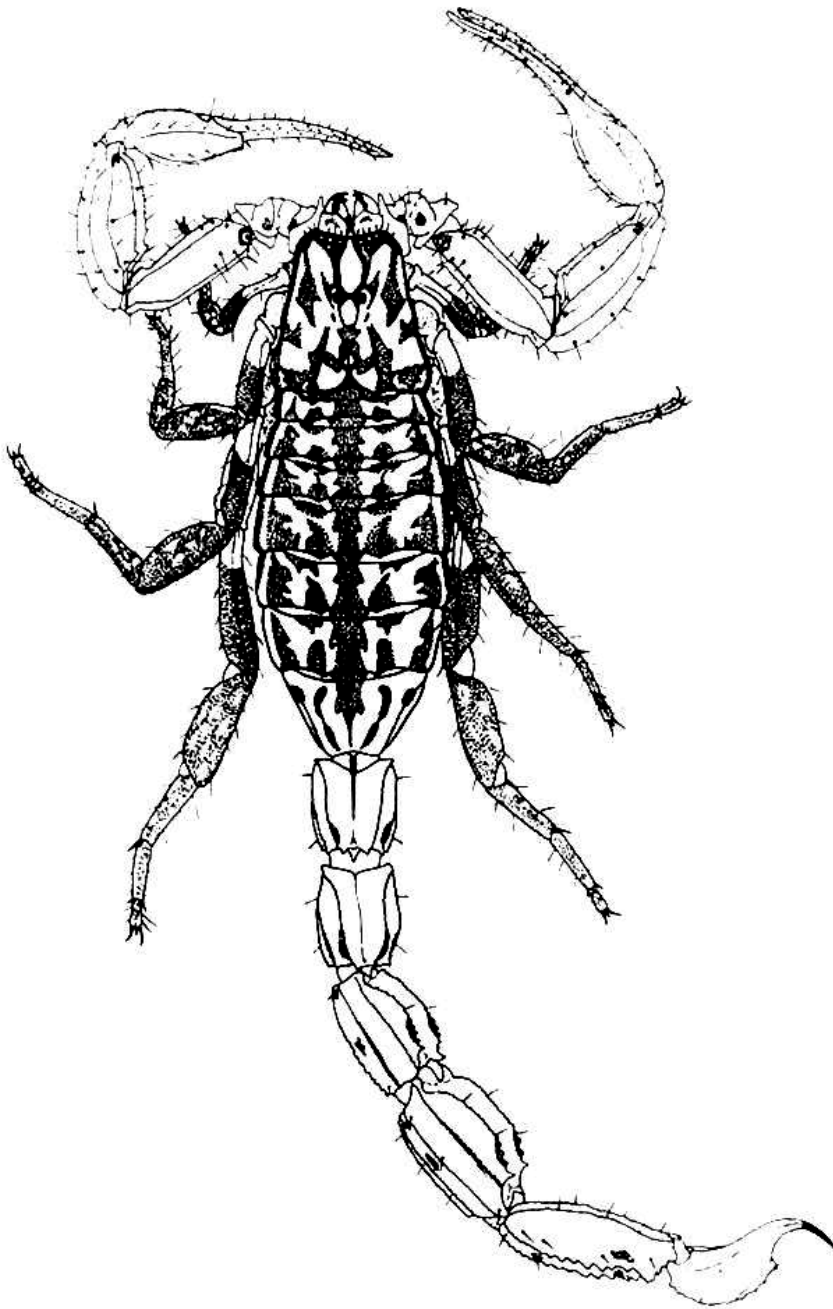
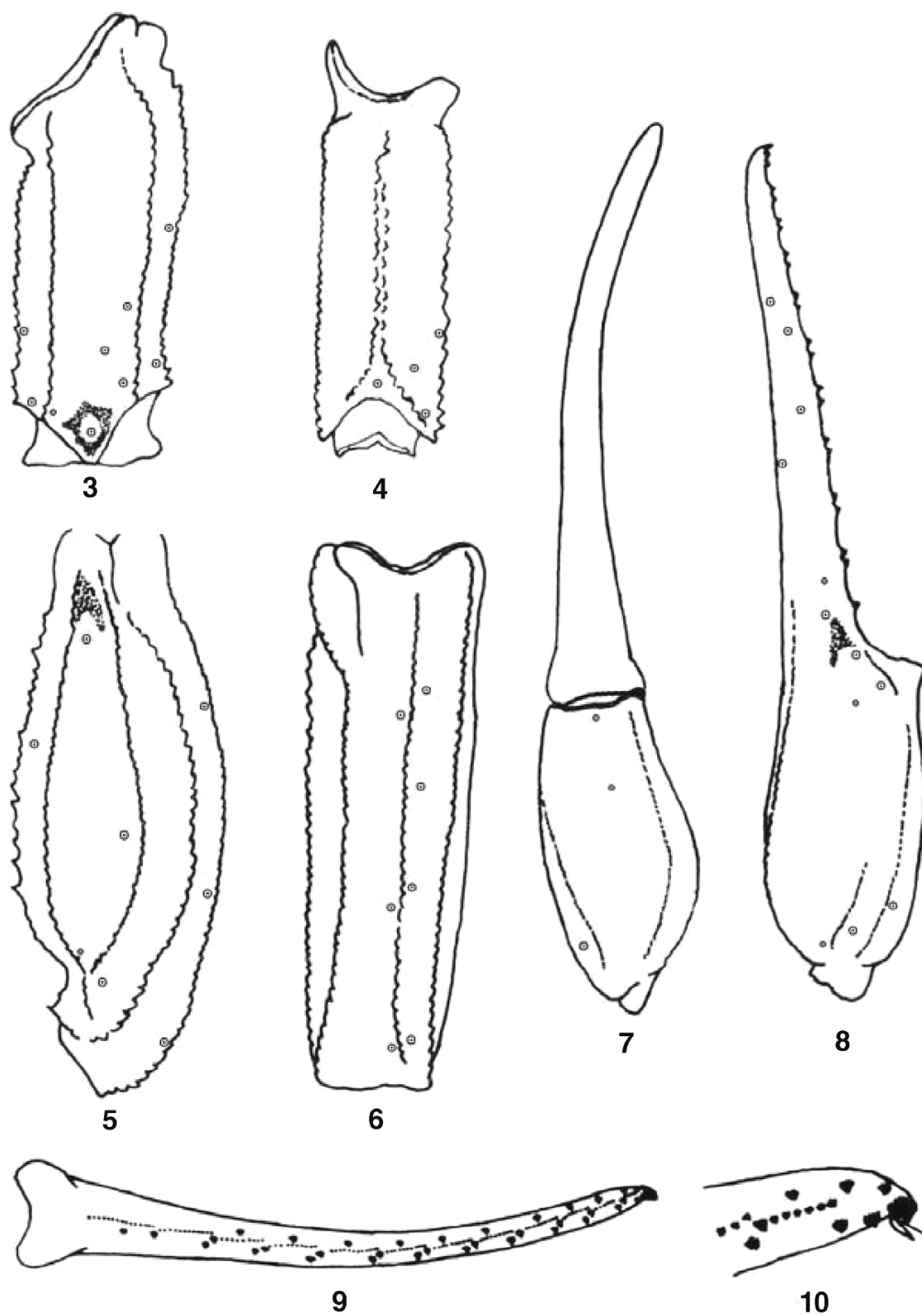


Figure 2: Juvenile female *Mesobuthus gibbosus* from Pirin Mountains.

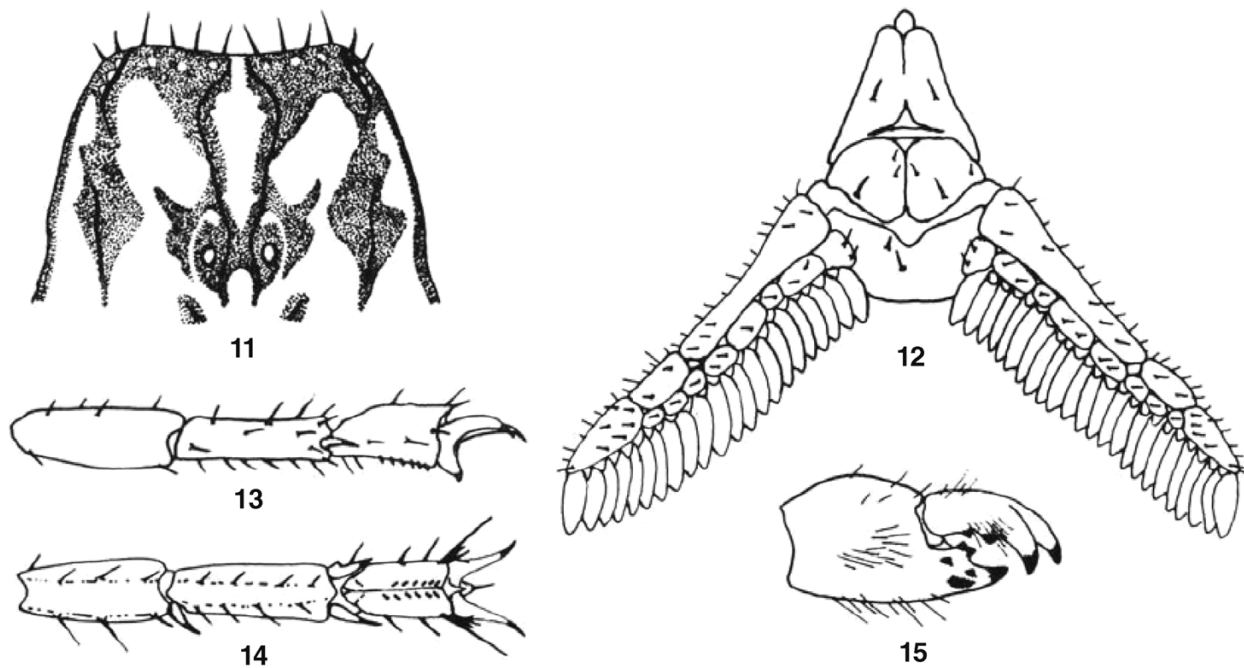
This represents the first precise record of *M. gibbosus* from Bulgaria. Its occurrence here is not surprising, as the altitude and habitat where it was collected are typical of this species (Crucitti & Marini, 1987; Crucitti & Cicuzza, 2000), and it is known to occur at the same latitude in neighboring Macedonia (Kovářík, 1998, 1999) and European Turkey (R. Teruel, unpublished data). It is very possible *M. gibbosus* could reach Pirin Mountains directly from the south via the Struma or Mesta river basins. These two biogeographic routes are common avenues of penetration of sub-Mediterranean elements into Bulgaria (Fet, 2000). The similar dispersal strategy was mentioned for two other species of the

same genus, *M. caucasicus* (Nordmann, 1840) and *M. eupeus* (C.L. Koch, 1839) in the Caucasus (Birula, 1917). Such a dispersal could be a recent postglacial event, or alternatively could happen during the Pleistocene interglacial periods.

The species *M. gibbosus* was described from the Peloponnesus, Greece; is found in Albania, Bulgaria, Greece, Macedonia, Montenegro, and Turkey (both European and Asian). Its formerly reported (Fet & Lowe, 2000: 177) populations from Cyprus, Israel, Lebanon, and Syria belong to different species: *M. cyprius* Gantenbein & Kropf, 2000 on Cyprus (Gantenbein et al. 2000b) and *M. nigrocinctus* Ehrenberg, 1828



Figures 3-10: Same specimen as in Fig. 2. 3. Right pedipalp femur, dorsal view. 4. Internal view. 5. Right pedipalp patella, dorsal view. 6. External view. 7. Right pedipalp chela, ventral view. 8. External view. 9. Right movable finger, dorsal view. 10. Close-up of tip of movable finger.



Figures 11-15: Same specimen as in Fig. 2. **11.** Anterior half of carapace. **12.** Sternopectinal region. **13.** Leg IV tibia, basitarsus and tarsus, external view. **14.** Ventral view. **15.** Right chelicera, ventral view.

in Israel, Lebanon, and Syria (Fet et al., 2000). The genus *Mesobuthus* has an Asian center of diversity, and most likely the Asian origin, and *M. gibbosus* is its westernmost species (Gantenbein et al., 2003).

Family Euscorpiidae Laurie, 1896
Genus Euscorpius Thorell, 1876
Subgenus Euscorpius Thorell, 1876

***Euscorpius hadzii* Caporiacco, 1950**

Material examined. BULGARIA: Pirin Mountains, western part (Sandanski District), above village Ilindentsi near entrance of Sharaliiskata Peshtera cave, 1,600 m asl, 3 May 1999 (coll. B. Petrov), 1 ♂ (VF).

Comments. For detailed description and discussion of this species see Fet & Soleglad (2002: 24–30) who elevated *E. hadzii* to species level, redescribed it, and designated a neotype from Albania (Prokletije Mts.). Further statistical analysis of morphology of this species in Bulgaria is provided by Fet & Soleglad (in press). The species is found in Albania, Bosnia & Herzegovina, Bulgaria, Croatia, Greece, Serbia & Montenegro, and Macedonia. In Bulgaria, *E. hadzii* is common in the southwest (along valleys of Struma and Mesta to the Rila Mountains), as far toward northwest as Kyustendil area (Osogovska Planina Mts.), with single records from Western Rhodopes (Fet & Soleglad, 2002; Fet & Soleglad, in press). *E. hadzii* evidently used the same route for dispersal into Bulgaria as mentioned above for *M.*

gibbosus (Struma and Mesta valleys). The sole record from Pirin is undoubtedly due to poor representation of this area in collections. The high altitude at which *E. hadzii* is found in Pirin matches its record in Albania (Boga, Maya Tchardakut) at the 1,400–1,600 m (Fet, 2000, as “Group B, Subgroup B2”).

***Euscorpius* sp. 1 (“carpathicus complex”)**
Figs. 16–17, Table 1

Material examined. BULGARIA: Pirin Mountains; under stones in open areas, 1,200–1,300 m asl, July 1972 (coll. Gallia), 1 ♂, 3 ♀♀, 1 juvenile ♂ (IES). Pirin Mountains, southern part, 900 m asl, 14 April 1996 (coll. B. Petrov), 1 ♀ (VF). Pirin Mountains, northern part, Pirin National Park, ca. 9 km south of Bansko; under stones, 1,200 m asl, 9 May 1990 (coll. P. Ganev), 1 ♂, 1 ♀ (RTO).

Morphology. A medium-sized scorpion (adults 30–35 mm long). Body orange brown, with subtle infuscation on the anterior half of prosoma; pedipalps reddish with all carinae blackish and fingertips yellowish; legs, venter and telson yellowish brown. Metasoma moderately slender and with strongly reduced carination, particularly in females; segments I–IV with dorsolateral carinae very weak, finely but irregularly granulose, all other carinae smooth and obsolete to absent; segment V with ventromedian and ventrolateral carinae very weak and irregularly granulose; telson vesicle conspicuously enlarged in adult males, oval slender in females. Cutting edges of pedipalp fingers with a very strong basal scal-



Figure 16: Adult male (left) and female *Euscorpius* sp. 1 (“*carpathicus* complex”) from Pirin Mountains.

lop in adult males, contiguous in females; movable finger with a well developed median lobe in adults of both sexes, but much stronger in males. Modal trichobothrial pattern of patella: $eb = 4$, $eba = 4$, $esb = 2$, $em = 4$, $est = 4$, $et = 5$, $v = 7$. Pectinal tooth count 8–8 in males, 7–7 in females.

Comments. The trichobothrial counts of pedipalp patella among the nine examined specimens were as follows (in parenthesis, number of scored pedipalps): external: $eb = 3$ (1), 4 (17), $eba = 4$ (18), $esb = 2$ (18), $em = 4$ (18), $est = 4$ (18), $et = 5$ (17) and 6 (1), $v = 6$ (5), 7 (13). Patellar trichobothrial series eba , esb , em , and est showed fixed counts. The value for et series was predominantly 5, which is the lowest recorded number for the “*carpathicus* complex”. The ventral series, as is usual in the “*carpathicus* complex”, showed the highest variation with individual counts as follows: $v = 7$ –7 (5 specimens), $v = 7$ –6 (2), $v = 6$ –7 (1) and $v = 6$ –6 (1). There are some minor differences in configurations of

some trichobothrial external series (Fig. 4), but this is a common trend among species of *Euscorpius* (see Scherabon, 1987; Fet & Soleglad, 2002; Gantenbein et al., 2003; Kovařík & Fet, 2003).

Traditionally treated as one species widespread in Europe (from Balears to Crimea; Caporiacco, 1950; Čurčič, 1972; Valle, 1975; see Fet & Sissom, 2000 for the detailed if convoluted taxonomic history), “*E. carpathicus* complex” is a complicated group of species currently under revision using both morphological and molecular techniques (Fet & Soleglad, 2002; Fet et al., 2003b; Gantenbein et al., 2001, 2002). Currently, seven species are recognized in this complex, with *E. carpathicus* (L., 1767) *sensu stricto* restricted to southwestern Romania (Fet & Soleglad, 2002). Within Bulgaria, populations of this complex are widespread both in the northern and southern parts of the country, with a considerable morphological variation (Fet, 2000) For the large portion of the complex range in the Balkans, how-

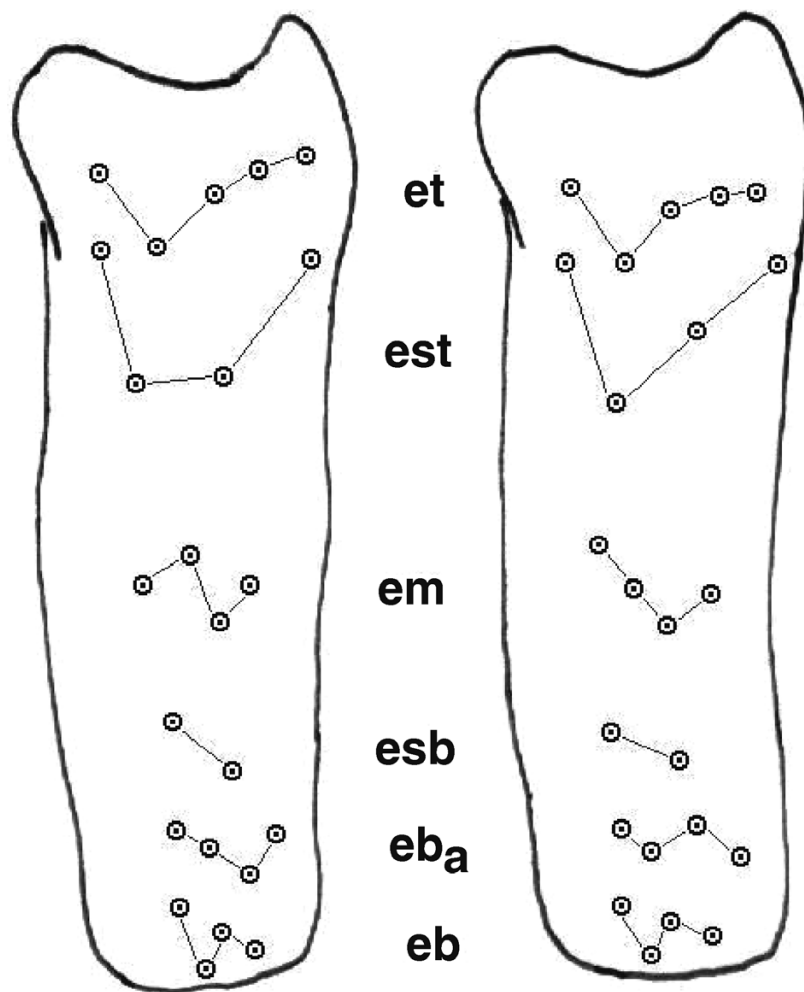


Figure 17: Trichobothrial pattern of the external aspect of right pedipalp patella, same specimens as in Fig. 16 (male left), showing minor differences in configuration.

ever, the taxonomy is not defined or is defined only partially. Further investigation of “*carpathicus* complex” from Bulgaria (Fet & Soleglad, in press) as well as Greece and other Balkan areas (Fet & Soleglad, in progress) will shed more light at the species structure of this complex. The Pirin specimens fall into the area of the Balkans for which taxonomic identity and geographic patterns of taxa and their populations are not yet determined. It is likely that a number of new species will be described in future to accommodate a considerable diversity of this complex in the Balkans.

Subgenus *Alpiscorpius* Gantenbein et al., 1999

Euscorpis sp. 2 (“*mingrelicus* complex”) Figs. 18–19, Table 1

Material examined. BULGARIA: Pirin Mountains, under stones in open areas, 1,200–1,300 m asl, July 1972 (coll. Gallia), 1 subadult ♂ (IES).

Morphology. Small scorpion (subadult male about 23 mm long, adults probably under 30 mm). Body light orange brown, with prosoma, tergites, metasoma and

legs strongly marbled with dark brown; pedipalps reddish with carinae conspicuously darker; chelicerae, legs and telson yellowish. Metasoma short, slender and cylindrical in shape, with all carinae obsolete to absent; telson vesicle moderately enlarged. Trichobothrial patellar pattern: $eb = 4$, $eba = 4$, $esb = 2$, $em = 3$, $est = 3-4$, $et = 4$, $v = 6$; fixed finger $et-est / est-dsb$ ratio = 2.17. Pectinal tooth count 7–7.

Comments. Even though the studied specimen is not an adult, it clearly shows all characters defining the “*mingrelicus* complex” of the subgenus *Alpiscorpius* (obsolescence of metasomal carination, $et-est / est-dsb$ ratio ≥ 1.5), which otherwise are not age correlated. This represents the first record of this species complex and subgenus from Bulgaria. Its presence in this country is not surprising, however, as members of this complex are widely distributed over the western Balkan Peninsula (Fet, 2000; Fet & Sissom, 2000).

Fet (1993) reviewed all known distribution and taxonomic composition of the species (*sensu lato*) *Euscorpis mingrelicus* (Kessler, 1874) which was originally described from Georgia (Caucasus) but later redefined (Bonacina, 1980) as a part of the former species

	<i>Euscorpius</i> sp. 1, “ <i>carpathicus</i> complex”		<i>Euscorpius</i> sp. 2, “ <i>mingrelicus</i> complex”
	adult male	adult female	subadult male
Prosoma (L/W)	4.7 / 4.0	5.0 / 5.0	3.4 / 3.5
Mesosoma	9.0	12.0	8.7
Tergite VII (L/W)	2.1 / 3.7	2.4 / 4.4	1.8 / 3.9
Metasoma	17.9	17.2	10.6
Segment I (L/W)	1.8 / 1.6	1.8 / 1.9	1.0 / 1.3
Segment II	2.1 / 1.5	2.1 / 1.6	1.3 / 1.3
Segment III	2.3 / 1.5	2.2 / 1.5	1.4 / 1.2
Segment IV	2.8 / 1.4	2.7 / 1.4	1.4 / 1.2
Segment V	4.3 / 1.4	4.2 / 1.4	2.7 / 1.1
Telson	4.6	4.2	2.8
Vesicle (L/W/D)	3.5 / 1.8 / 2.0	2.8 / 1.4 / 1.4	2.0 / 1.1 / 0.9
Aculeus	1.1	1.4	0.8
Pedipalp	17.1	18.0	11.2
Femur (L/W)	4.1 / 1.5	4.4 / 1.7	2.6 / 1.0
Patela	4.1 / 2.1	4.3 / 2.2	3.2 / 1.2
Chela	8.9	9.3	5.4
Palm (L/D/W)	4.1 / 3.3 / 3.1	4.4 / 3.2 / 2.7	2.7 / 2.0 / 1.4
Movable finger	4.8	4.9	2.7
Total Length	31.6	34.4	22.7

Table 1: Measurements (in mm) of two undetermined species of *Euscorpius* from Pirin Mts. L = length, W = width, D = depth.

Euscorpius germanus (C. L. Koch, 1837). The latter species is in fact limited to the Alpine zone of Europe (Gantenbein et al., 2000a). Traditionally treated as one species widespread from the Alps to Caucasus (Bonacina, 1980; see Fet & Sissom, 2000 for the taxonomic history), “*E. mingrelicus* complex” is currently under revision using both morphological and molecular techniques (Fet, 2000; Gantenbein et al., 2000a; Sherabon et al., 2000; Fet et al., 2003; etc.). Currently, three species are recognized in this complex, with *E. mingrelicus* (Kessler, 1874) *sensu stricto* ranging from Bosnia to Caucasus (Fet, 1993; Fet & Sissom, 2000); however, this division is clearly not satisfactory. Fet (2000) described *E. beroni* from the high mountains of Albania (Prokletije), and Scherabon et al. (2000) demonstrated a separate status of *E. gamma* Caporiacco from the northeastern part of the geographic range of this complex (northeastern Italy, Slovenia, Croatia, and Austria). For ecology and distribution of *E. gamma* in Slovenia and Austria, see also Scherabon (1987), Fet et al. (2001), and Komposch et al. (2001). Together with “*germanus* complex”, the “*mingrelicus* complex” comprises the subgenus *Alpiscorpius* Gantenbein et al., 1999.

For the large part of the “*mingrelicus* complex”, the taxonomy is not defined or is defined partially. There are formally seven valid subspecies of *E. mingrelicus* from Balkans to Anatolia (Fet & Sissom, 2000), and status of these forms is still unclear. The high genetic diversity of populations within Turkey (Fet et al., 2003a) indicates a

possibility of cryptic species as recently discovered in the related Alpine “*germanus* complex” (Gantenbein et al., 2000a). Further investigation of the “*mingrelicus* complex” from the Balkans and Anatolia will be needed to establish into the species structure of this complex. The Pirin specimen falls into the range of “*mingrelicus* complex” for which taxonomic identity of populations is not yet determined. It is an important biogeographic find—the first specimen of this complex from Bulgaria, and most likely a glacial relict.

General Remarks

Even though the examined material is scarce (only 12 specimens), it demonstrates a rather high species diversity (four species) for a single locality in the Pirin Mountains of Bulgaria. While it is not unusual to find two or three different species of *Euscorpius* sympatrically in Europe (Fet, 2000; Fet & Braunwalder, 2000), their precise cohabitation depends on ecological heterogeneity of the area, and the Alpine-like Pirin massif in southwestern Bulgaria indeed provides such diversity of habitats. In addition, *Mesobuthus gibbosus* record from Pirin represents the most peripheral record of this species in the northern part of its geographic range. Combination of *Mesobuthus* and *Euscorpius* scorpion faunal elements is a typical Aegean-Anatolian feature, as representatives of these two genera are very common and



Figure 18: Subadult male of *Euscorpis* sp. 2 (“*mingrelicus* complex”) from Pirin Mountains. Telson and metasomal segments IV-V, ventral view, showing partially developed ventral median and ventral lateral carinae on segment V.

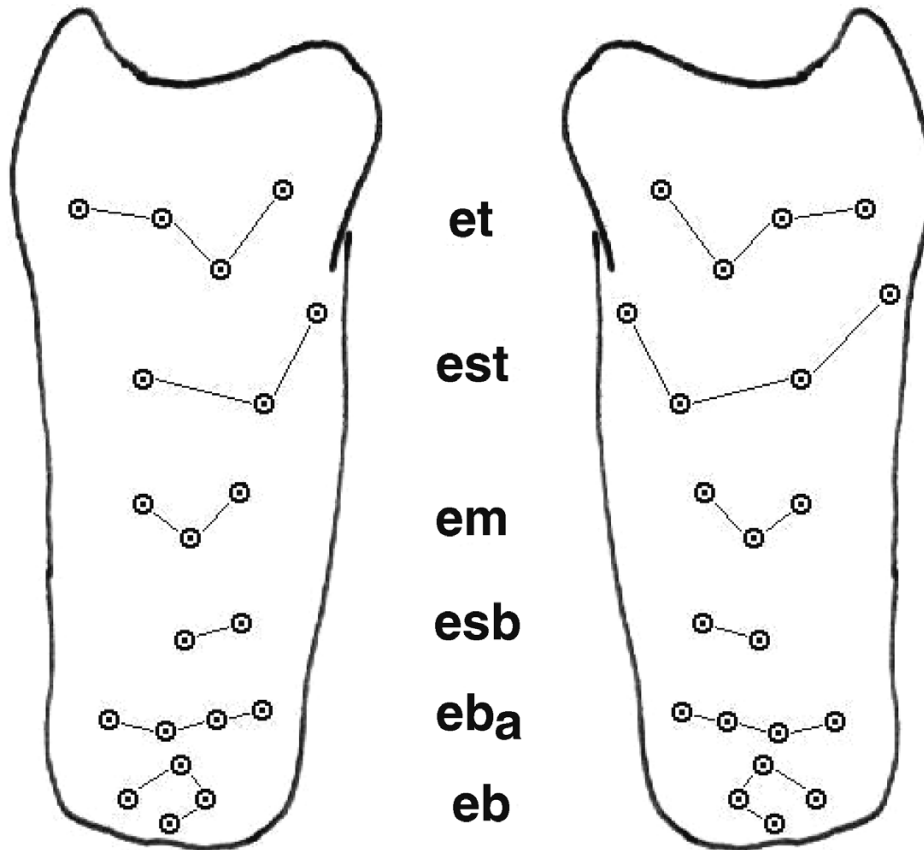


Figure 19: Trichobothrial patterns of the external aspect of left and right pedipalp patellae of the same specimen as in Fig. 18.

sympatric all over Greece and Turkey, including most islands of the Aegean Sea.

Acknowledgements

We thank Dr. Petar Beron (National Museum of Natural History, Sofia, Bulgaria) for providing the loan of this Museum’s rich scorpion collections from Bulgaria. For years, many other colleagues and friends have supplied the authors with very important literature and specimens through personal loans and/or donations. Among them, we wish to thank Matt E. Braunwalder (Zurich, Switzerland), Pierangelo Crucitti (Rome, Italy), Benjamin Gantenbein (Cambridge, UK), Jürgen Gruber (Vienna, Austria), Dietmar Huber (Goefis, Austria), František Kovařík (Prague, Czech Republic), Victor

Krivochatsky (St. Petersburg, Russia), Ayşegül and Ahmet Karataş (Nigde, Turkey), Kirill Mikhailov (Moscow, Russia), Jan Ove Rein (Trondheim, Norway), Boris Sket (Ljubljana, Slovenia), W. David Sissom (Canyon, Texas, USA), Michael E. Soleglad (California, USA). Enthusiastic help of Michael E. Soleglad, Benjamin Gantenbein, and Matt E. Braunwalder in the investigations of *Euscorpis* is gladly acknowledged.

References

- BIRULA, A. (BYALYNITSKY-BIRULA, A. A.) 1917. Arachnoidea Arthrogastra Caucasica. Pars I. Scorpiones. *Mémoires du Musée du Caucase*, Tiflis: Imprimerie de la Chancellerie du Comité pour la Transcaucasie, A(5), 253 pp. (in Russian). English

- translation: 1964. Arthrogastric Arachnids of Caucasasia. 1. *Scorpions*. Jerusalem: Israel Program for Scientific Translations, 170 pp.
- BONACINA, A. 1980. Sistematica specifica e sottospecifica del complesso “*Euscorpius germanus*” (Scorpiones, Chactidae). *Rivista del Museo Civico di Scienze Naturali “Enrico Caffi”* (Bergamo), 2: 47–100.
- CAPORIACCO, L. DI. 1950. Le specie e sottospecie del genere „*Euscorpius*“ viventi in Italia ed in alcune zone confinanti. *Memorie/Accademia nazionale dei Lincei* (ser. 8), 2: 159–230.
- CRUCITTI, P. & D. CICUZZA. 2000. Gli scorpioni del Parco Nazionale del Monte Nemrut (Turchia sud-orientale) (Scorpiones). *Memorie Società entomologica italiana*, 78(2): 275–294.
- CRUCITTI, P. & F. MARINI. 1987. Ecologia di *Mesobuthus gibbosus* (Brullé, 1832) nel Pindo (Epiro e Tessaglia, Grecia) (Scorpiones: Buthidae). *Giornale Italiano di Entomologia*, 3: 291–303.
- ĆURČIĆ, B. P. M. 1972. Considerations upon the geographic distribution and origin of some populations in the genus *Euscorpius* Thorell (Chactidae, Scorpiones). *Rapport de la Commission Internationale de la Mer Méditerranée*, Monaco, 21(3): 83–88.
- FET, V. 1993. Notes on *Euscorpius mingrelicus* (Kessler, 1874) from the Caucasus. *Rivista del Museo Civico di Scienze Naturali “Enrico Caffi”* (Bergamo), 16: 1–8.
- FET, V. 2000. Scorpions (Arachnida: Scorpiones) from the Balkan Peninsula in the collection of the National Museum of Natural History, Sofia. *Historia naturalis bulgarica*, 11: 47–60.
- FET, V. & M. E. BRAUNWALDER. 2000. The scorpions (Arachnida, Scorpiones) of the Aegean area: current problems in taxonomy and biogeography. *Belgian Journal of Zoology*, 130 (Suppl. 1): 17–22.
- FET, V., B. GANTENBEIN, E. V. FET & V. POPA. 2002. *Euscorpius carpathicus* (Linnaeus, 1767) from Romania (Scorpiones: Euscorpiidae): mitochondrial DNA data. *Biogeographica* (Paris), 78(4): 141–147.
- FET, V., B. E. HENDRIXSON, W. D. SISSOM & G. LEVY. 2000. First record for the genus *Mesobuthus* Vachon, 1950 in Israel: *Mesobuthus nigrocinctus* (Ehrenberg, 1828), comb. n. (Scorpiones: Buthidae) from Mt. Hermon. *Israel Journal of Zoology*, 46: 287–295.
- FET, V., Ay. KARATAŞ, E. V. FET & A. KARATAŞ. 2003a. [First data on the molecular phylogeny of *Euscorpius* (Scorpiones: Euscorpiidae) from Turkey]. *Zoologicheskii Zhurnal*, 82 (12): 1518–1521 (Moscow, Russia) (in Russian; English summary).
- FET, V., M. KUNTNER & B. SKET. 2001. Scorpions of Slovenia: a faunistic and biogeographical survey. Pp. 255–256 in: Fet, V. & P. A. Selden (eds.). *Scorpions 2001. In memoriam Gary A. Polis*. Burnham Beeches, Bucks: British Arachnological Society.
- FET, V. & G. LOWE. 2000. Family Buthidae. Pp. 54–286 in: Fet, V., W. D. Sissom, G. Lowe & M. E. Braunwalder (eds.). *Catalog of the Scorpions of the World (1758–1998)*. New York Entomological Society, New York, 690 pp.
- FET, V. & W. D. SISSOM. 2000. Family Euscorpiidae. Pp. 355–381. In: Fet, V., W. D. Sissom, G. Lowe & M. E. Braunwalder (eds.). *Catalog of the Scorpions of the World (1758–1998)*. New York Entomological Society, New York, 690 pp.
- FET, V. & M. E. SOLEGLAD. 2002. Morphology analysis supports presence of more than one species in the “*Euscorpius carpathicus*” complex (Scorpiones: Euscorpiidae). *Euscorpius*, 3: 1–51.
- FET, V. & M. E. SOLEGLAD (in press). Fauna and zoogeography of scorpions (Arachnida: Scorpiones) in Bulgaria. In: Fet, V. & A. Popov. *Biogeography and Ecology of Bulgaria*. Kluwer Academic Publishers, Dordrecht.
- FET, V., M. E. SOLEGLAD, B. GANTENBEIN, V. VIGNOLI, N. SALOMONE, E. V. FET & P. J. SCHEMBRI. 2003b. New molecular and morphological data on the “*Euscorpius carpathicus*” species complex (Scorpiones: Euscorpiidae) from Italy, Malta, and Greece justify the elevation of *E. c. sicamus* (C.L. Koch, 1837) to the species level. *Revue Suisse de Zoologie*, 110(2): 355–379.
- GANTENBEIN, B., V. FET, M. BARKER & A. SCHOLL. 2000a. Nuclear and mitochondrial markers reveal the existence of two parapatric scorpion species in the Alps: *Euscorpius germanus* (C. L. Koch, 1837) and *E. alpha* Caporiacco, 1950, stat. nov. (Scorpiones, Euscorpiidae). *Revue Suisse de Zoologie*, 107(4): 843–869.

- GANTENBEIN, B., V. FET & A. V. GROMOV. 2003. The first DNA phylogeny of four species of *Mesobuthus* Vachon, 1950 (Scorpiones: Buthidae) from Eurasia. *Journal of Arachnology*, 31(3): 412–420.
- GANTENBEIN, B., C. KROPF, C. R. LARGIADÈR, C. R. & A. SCHOLL. 2000b. 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.
- GANTENBEIN, B., M. E. SOLEGLAD & V. FET. 2001. *Euscorpius balearicus* Caporiacco, 1950, stat. nov. (Scorpiones: Euscorpiidae): molecular (allozymes and mtDNA) and morphological evidence for an endemic Balearic Islands species. *Organisms, Diversity & Evolution*, 1(4): 301–320.
- GANTENBEIN, B., M. E. SOLEGLAD, V. FET, P. CRUCITTI & E. V. FET. 2002. *Euscorpius naupliensis* (C. L. Koch, 1837) (Scorpiones: Euscorpiidae) from Greece: elevation to the species level justified by molecular and morphological data. *Revista Ibérica de Aracnología*, 6: 13–43.
- KOMPOSCH, C., B. SCHERABON & V. FET. 2001. Scorpions of Austria. Pp. 267–272 in: Fet, V. & P. A. Selden (eds.). *Scorpions 2001. In Memoriam Gary A. Polis*. Burnham Beeches, Bucks: British Arachnological Society.
- KOVAŘÍK, F. 1998. *Scorpions*. Madagaskar, Jihlava, 175 pp. (in Czech).
- KOVAŘÍK, F. 1999. Revision of European scorpions, with a key to species. *Serket*, 6(2): 38–44.
- KOVAŘÍK, F. & V. FET. 2003. Scorpion *Euscorpius* (*Euscorpius*) *tergestinus* (C. L. Koch, 1837) (Scorpiones: Euscorpiidae) in central Bohemia. *Acta Societatis Zoologicae Bohemicae* (Prague, Czech Republic), 67: 189–192.
- SCHERABON, B., 1987. Die Skorpione Österreichs in vergleichender Sicht unter besonderer Berücksichtigung Kärntens. *Carinthia II. / Naturwiss. Beiträge zur Heimatkunde Kärntens / Mitteilungen des Naturwissenschaftlichen Vereins für Kärnten. Klagenfurt, Verlag des Naturwissenschaftlichen Vereins für Kärnten*, 45: 78–158.
- SCHERABON, B., B. GANTENBEIN, V. FET, M. BARKER, M. KUNTNER, C. KROPF & D. HUBER. 2000. A new species of scorpion from Austria, Italy, Slovenia and Croatia: *Euscorpius gamma* Caporiacco, 1950, stat. nov. (Scorpiones: Euscorpiidae). In: Gajdoš P. & Pekár S. (eds): *Proceedings of the 18th European Colloquium of Arachnology, Stará Lesná, 1999. Ekológia (Bratislava)*, 19, Supplement 3: 253–262.
- SISSOM, W. D. 1990. Systematics, biogeography and paleontology. Pp. 64–160 in: Polis, G. A. (ed.). *The biology of scorpions*. Stanford University Press, Stanford, California, 587 pp.
- SOLEGLAD, M. E. & W. D. SISSOM. 2001. Phylogeny of the family Euscorpiidae Laurie, 1896: a major revision. Pp. 25–111 in V. Fet & P. A. Selden (eds.). *Scorpions 2001. In Memoriam Gary A. Polis*. Burnham Beeches, Bucks: British Arachnological Society.
- VALLE, A. 1975. Considerazioni intorno alle sottospecie di *Euscorpius carpathicus* (L.) (Scorpiones, Chactidae). *L'Ateneo Parmense, Acta Naturalia*, 11(1): 209–234.
- YURINICH, S. 1904. [The genus *Euscorpius* in Bulgaria]. *Periodichesko spisanie [Periodical Journal]* 95: 1–7 (in Bulgarian).