12 Fauna and Zoogeography of Scorpions (Arachnida: Scorpiones) in Bulgaria

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Abstract: The fauna and zoogeography of scorpions in Bulgaria have not been well researched. At least four species are recorded currently for this country: the Balkan–Anatolian *Mesobuthus gibbosus* (Buthidae), known only from Pirin Mts., and several taxa of the genus *Euscorpius* Thorell (Euscorpiidae). The Balkan species *E. hadzii* inhabits the southwest of Bulgaria, and an undetermined species of the Balkan–Anatolian "*Euscorpius mingrelicus*" complex is known only from Pirin Mts. Remaining Bulgarian populations of *Euscorpius*, widely ranging from north to south (mainly in the mountain areas, up to 1850 m a.s.l.), belong to "*Euscorpius carpathicus*" complex. Their true taxonomic identity is not yet known, but these populations are not homogeneous. A clearly separated cluster of Rhodope populations could represent a different taxon from the Stara Planina (=Balkan) ones (mainly known from the Western Stara Planina) and those from the southwest of Bulgaria. Taxonomic affinities of Bulgarian scorpion taxa are discussed, as well as their geographic and altitudinal distribution

1 Introduction

The scorpion fauna of Bulgaria has been a subject of a very few studies, and the information on this fauna has been rather brief and sometimes unclear. One of the earliest Bulgarian zoologists Stefan Jurinich (1855–1947) was the first to record the scorpion species *Euscorpius carpathicus* (Linnaeus, 1767) from Bulgaria (Jurinich, 1905). Fet (1993) mentioned for Bulgaria the subspecies *Euscorpius germanus croaticus* Caporiacco, 1950, which was described from Croatia. Kovařík (1998) mentioned *Mesobuthus gibbosus* (Brullé, 1832) (Buthidae) and *Euscorpius carpathicus* for Bulgaria but without precise locality records, and a year later he (Kovařík, 1999) added with doubt *Euscorpius germanus* (C.L. Koch, 1837), again without precise locality records. Fet and Lowe (2000) did not list *M. gibbosus* from Bulgaria. Fet and Sissom (2000) recorded the following taxa of *Euscorpius* for this country: *E. carpathicus* (not assigned to subspecies), *E. germanus* (under question, as its enigmatic subspecies *Euscorpius germanus 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 (or *Euscorpius carpathicus* (Linnaeus, 1767) *sensu lato*), which he divided in three "groups" on the basis of trichobothrial pattern, metasomal carination, and coloration. In a recent paper dealing with the

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taxonomy of the "*carpathicus*" complex, Fet and Soleglad (2002) restricted the scope of *E. carpathicus* exclusively to the populations inhabiting southwestern Romania and revalidated as full species its "old" junior synonyms *Euscorpius hadzii* Caporiacco, 1950, *Euscorpius koschewnikowi* Birula, 1900 and *Euscorpius tergestinus* (C.L. Koch, 1837). Among these, *E. hadzii* was recorded from southwestern Bulgaria and corresponded to the "Group B" previously defined by Fet (2000). Most recently, in a note by Teruel et al. (2004) on scorpions collected in Pirin Mts., two additional taxa were recorded for Bulgaria: *Mesobuthus gibbosus* (for the first time confirmed with the exact locality data) and an undetermined *Euscorpius* sp. belonging to the "*mingrelicus*" complex of this genus (Fet, 1993; Fet and Sissom, 2000).

2 Material and Methods

Most of our information on scorpions of Bulgaria is original, and is derived from the analysis of the magnificent collection of the National Museum of Natural History at Sofia, Bulgaria (NMNHS). Spanning over 600 specimens from Bulgaria, this collection was accumulated over last 100 years. As in any large zoological museum, we can see that, being exotic and dangerous animals, scorpions attracted the attention of many professional zoologists and amateur naturalists alike. The NMNHS labels include many famous names of classical Bulgarian zoologists such as Ivan Buresch and Pencho Drenski (1930s); modern zoologists of all generations, especially Petar Beron; local amateur naturalists such as the late Dimitar Raichev of Chepelare who first collected unusual Western Rhodope *Euscorpius* in early 1980s; and even members of the royal family, Tsar Ferdinand I (1901) and Prince Kiril (1939–1940). The fact that important discoveries still are possible is illustrated by the recent findings of Teruel et al. (2004) who reported two new species of scorpions for Bulgaria from Pirin Mts.

Trichobothrial designations follow Fet and Soleglad (2002). Detailed label data are available from the authors.

3 Fauna and Zoogeography

Family Euscorpiidae Laurie, 1896
Genus *Euscorpius* Thorell, 1876
Subgenus *Euscorpius* Thorell, 1876
Euscorpius hadzii Caporiacco, 1950

In Bulgaria, *E. hadzii* is found only in the southwestern corner of the country (Fig. 1). We analyzed 93 specimens (29 males and 64 females).

E. hadzii is common in the southwest (along valleys of Struma and Mesta to the Rila Mountains). It is found along the Macedonian border from Belasitsa in the southwest to Ograzhden Mts. and Maleshevska Mts. and as far toward

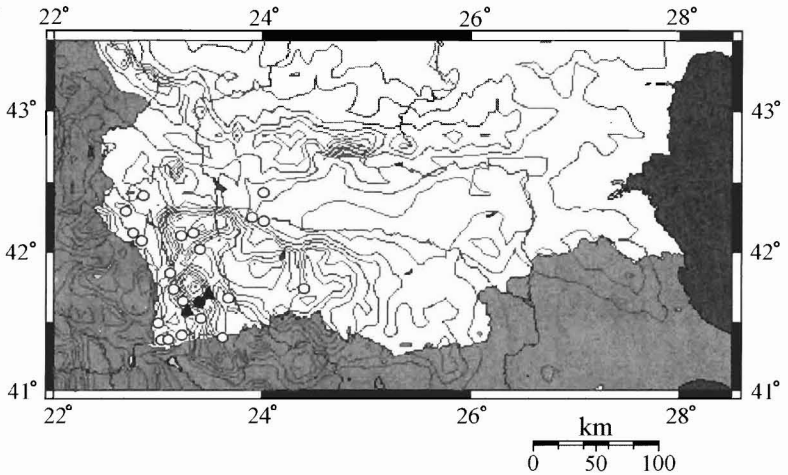

Fig. 1 Distribution of *Euscorpius hadzii* (circle), *Euscorpius* (*Alpiscorpius*) sp. (closed circle), and *Mesobuthus gibbosus* (triangle) in Bulgaria.

north as Konyavska Mts. (Baikalsko) and Osogovo Mts. The Kyustendil record of *E. hadzii* is the westernmost for scorpions in Bulgaria. In the southeastern direction it reaches Slavyanka (=Alibotush) Mts. but only a single record comes from the Western Rhodopes (Devin). Three other disjunct records show that *E. hadzii* is also found in Maritsa Valley. The sole record from Pirin is undoubtedly due to poor representation of this area in collections (Teruel et al., 2004). Outside of Bulgaria, *E. hadzii* is found in Albania, Bosnia and Herzegovina, Croatia, Greece, Serbia and Montenegro, and Macedonia.

The highest altitudes at which *E. hadzii* is found in Bulgaria (1600 m, Western Pirin; 1500 m, Ograzhden; 1450 m, Rila) match its record in Albania (Boga, Maya Tchardakut) at the 1400–1600 m (Fet, 2000, as "Group B, Subgroup B2" of *E. carpathicus*). This, however, is not a record altitude for scorpions in Bulgaria (see below).

For detailed description and discussion of this species see Fet and Soleglad (2002: 24–30) who redescribed *E. hadzii* and designated a neotype from Albania (Prokletije). A typical trichobothrial pattern of *E. hadzii* from Bulgaria is shown in Fig. 2.

Our statistical analysis of morphology of this species in Bulgaria uncovered, when compared to the populations from the Western Balkans, differences in the numbers of accessory trichobothria on the pedipalp, and also some subtle differences in key morphometric ratios.

Trichobothria: We see a *reduction* in all variable patellar trichobothria series in the Bulgarian population of *E. hadzii*, specifically the ventral and external series eb_a, *em*, and *et* (see Table 1). The populations exhibiting the largest counts in these series center in Croatia and Serbia and Montenegro where we see reductions in

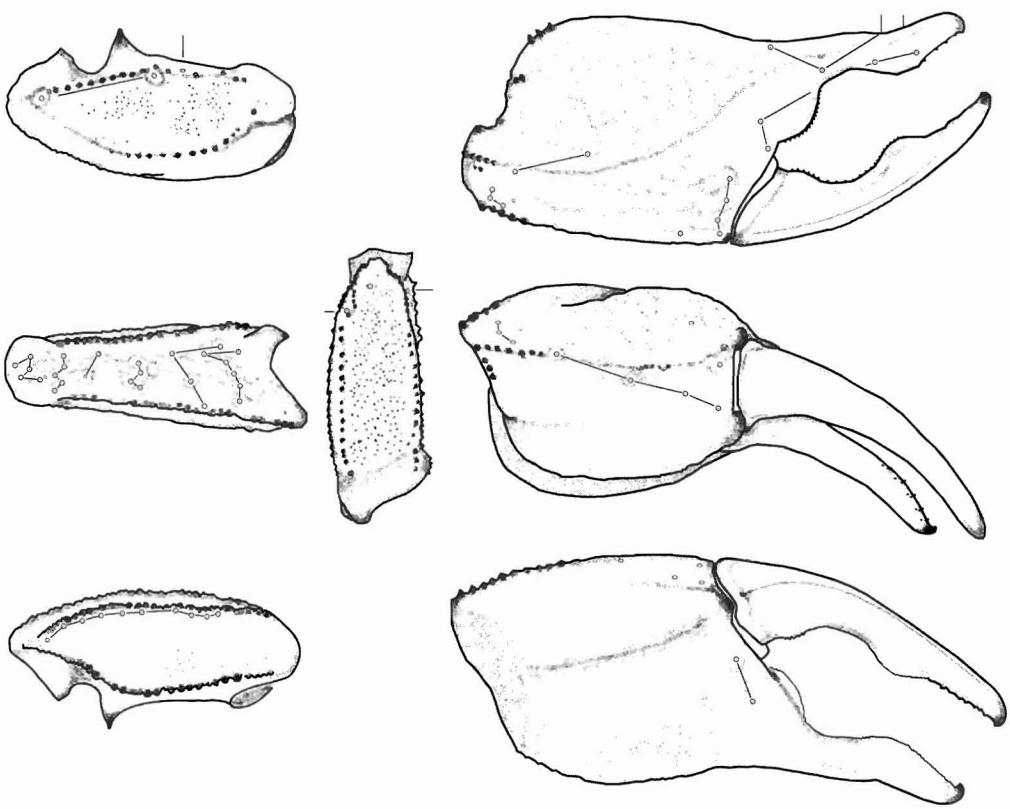

Fig. 2 Trichobothrial pattern of *Euscorpius hadzii*, male from Rila Mts., Bulgaria.

these counts as the species radiates southward to Albania and eastward to Bulgaria (Fig. 3 histogram). The Bulgarian populations show statistically the lowest counts in these trichobothrial series. Interestingly, in the eb_a series we see a reduction of over 1.5 trichobothria, averaging a little over five in this series, where the other populations exhibit counts averaging seven (see Figs. 4–9 showing diagrams of the external aspect of pedipalp patella). In the other series, we find that the Albanian population is intermediate between the Bulgarian and the Croatia and Serbia and Montenegro populations.

Table 1 Statistical distribution of diagnostic pedipalp patella trichobothria series for *Euscorpius hadzii*. The data for each group of populations are presented as: **min–max(mean)**(±**SD**)[**n**]{**cmin–cmax**}, where min = minimum value, max = maximum value, SD = standard deviation, n = number of samples, cmin = corrected minimum (mean-SD), cmax = corrected maximum (mean+SD)

	Ventral	eb_a
Bulgaria	8–11 (9.567) (±0.540) [178] {9.027–10.108}	4–8 (5.449) (±0.621) [176] {4.828–6.070}
Albania	9–13 (10.617) (±0.764) [094] {9.854–11.381}	5–8 (6.860) (±0.457) [093] {6.404–7.317}
Croatia	10–13 (11.923)(±0.845) [026] {11.078–12.768}	6–8 (6.962) (±0.720) [026] {6.241–7.682}
Serbia & Montenegro	10–13 (11.686) (±0.678)[051] {11.008–12.364}	6–8 (7.000) (±0.566) [051] {6.434–7.566}
All populations	8–13 (10.335) (±1.096) [349] {9.240–11.431}	4–8 (6.171)(±0.937) [346] {5.233–7.108}
	em	*et*
Bulgaria	3–5 (4.000) (±0.150) [178] {3.850–4.150}	6–8 (6.949) (±0.514)[177] {6.435–7.463}
Albania	3–5 (4.073) (±0.332) [096] {3.741–4.405}	6–9 (7.432) (±0.630)[095] {6.802–8.062}
Croatia	4–5 (4.885) (±0.326) [026] {4.559–5.210}	6–9 (7.500) (±0.906)[026] {6.594–8.406}
Serbia & Montenegro	4–5 (4.902) (±0.300) [051] {4.602–5.202}	6–9 (7.725) (±0.750)[051] {6.975–8.476}
All populations	3–5 (4.217) (±0.439) [351] {3.777–4.656}	6–9 (7.235) (±0.688) [349] {6.547–7.923}

Note: Bulgarian populations exhibit the lowest counts for each series, and Croatian and Serbian/Montenegrin populations have the highest counts. Compare this table to the histograms presented in Fig. 3. See Material and Methods section for definition of statistical data group. eb_a = external basal-a series; *em* = external median series; *et* = external terminal series.

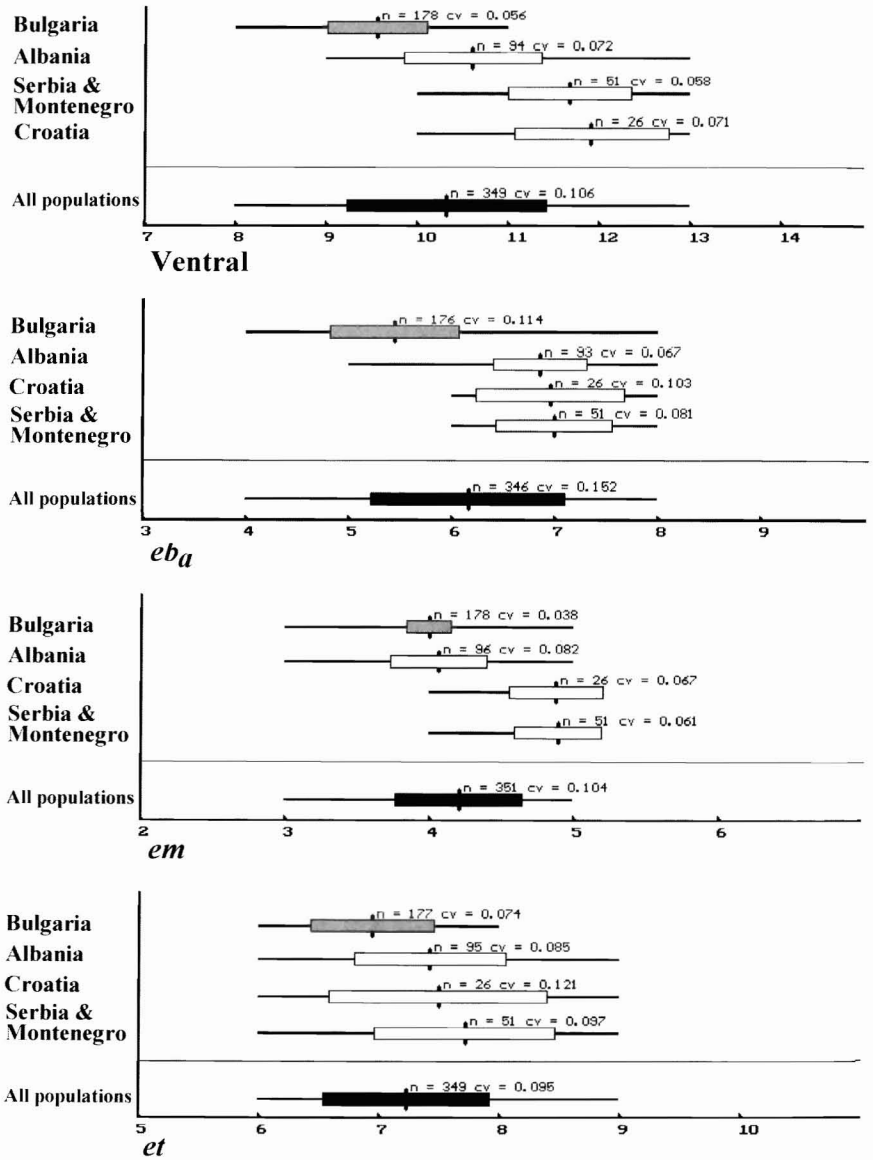

Fig. 3 Trichobothria counts for *Euscorpius hadzii* distributed by populations. Bulgarian populations depicted with grey bar, all populations depicted with black bar.

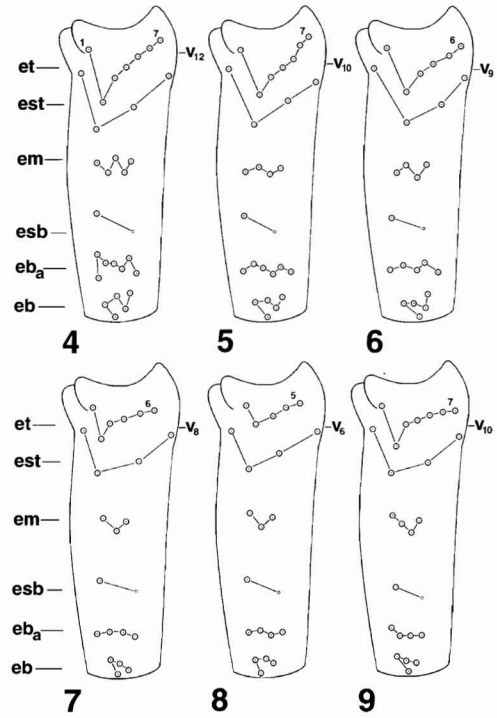

Fig. 4–9 Diagrammatic trichobothrial pattern of external aspect of pedipalp patella; 4, *Euscorpius hadzii*, Croatia; 5 and 6, *E. hadzii*, Bulgaria; 7, *E. carpathicus*, Romania; 8 and 9, *Euscorpius* sp. ("*carpathicus*" complex), Bulgaria (8, Trigrad; 9, Plovdiv District).

Morphometric ratios: Fet and Soleglad (2002) established several ratios that provided good diagnostic characters for separation of several species of the "*carpathicus*" complex. We investigated two of these ratio, the Dorsal Patellar Spur (DPS) ratio and metasoma (length/width) ratios. In Fig. 10, we contrast the DPS ratio (see Fet and Soleglad, 2002: Fig. 69, for details on this ratio) for Bulgarian *E. hadzii* populations with other species described in Fet and Soleglad (2002). The species *E. mingrelicus* (subgenus *Alpiscorpius*) is also included in this comparison to illustrate its considerably blunted DPS, typical of this subgenus. As indicated in Fig. 10, we see that the Bulgarian population DPS is slightly less elongated than the other *E. hadzii* populations, but the SD ranges overlap considerably. In Figs. 11–12, which show histograms for metasomal segments I, III, and V (female and male), we see, except for metasomal segment I of females, that the Bulgarian population SD range considerably overlaps with other *E. hadzii* populations. In these figures we also see that *E. koschewnikowi* exhibits by far the thinnest metasoma and that *E. mingrelicus* and *E. carpathicus* have more stout metasomas. In general, subgenus *Alpiscorpius* species have the stoutest metasoma in *Euscorpius*, whereas *E. carpathicus* has the stoutest metasoma in the "*carpathicus*" complex.

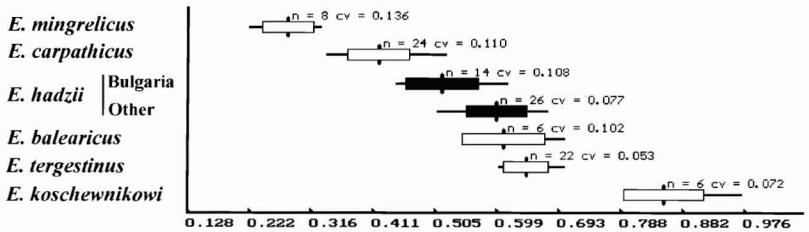

Fig. 10 Morphometric ratio for Dorsal Patellar Spur (DPS) contrasting Bulgarian and other populations of *E. hadzii* (black bars) with other *Euscorpius* species.

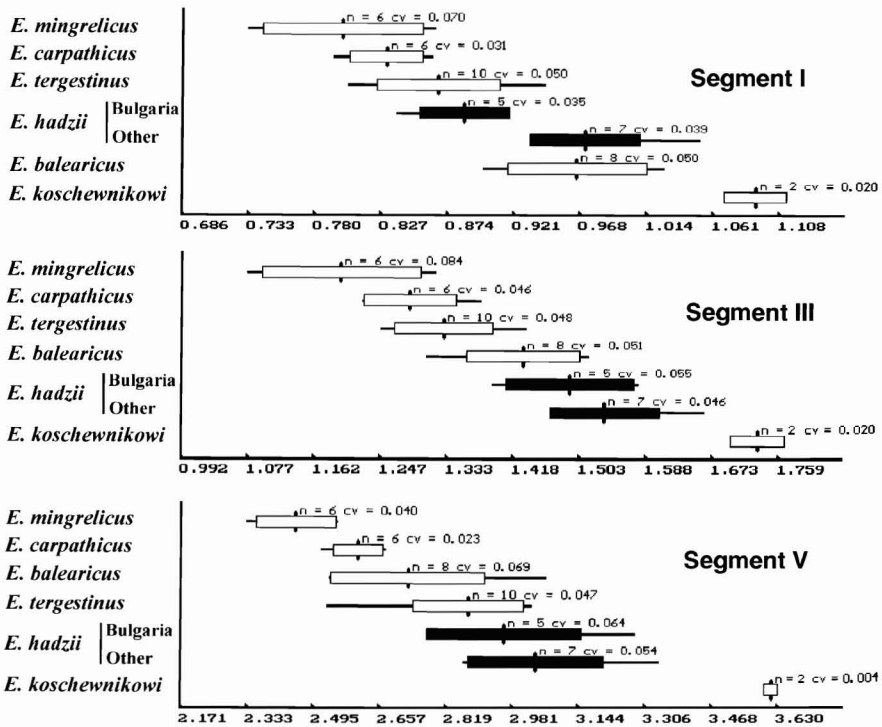

Fig. 11 Morphometric ratio for metasomal segments I, III, and V (length/width) in females, contrasting Bulgarian and other populations of *E. hadzii* (black bars) with other *Euscorpius* species.

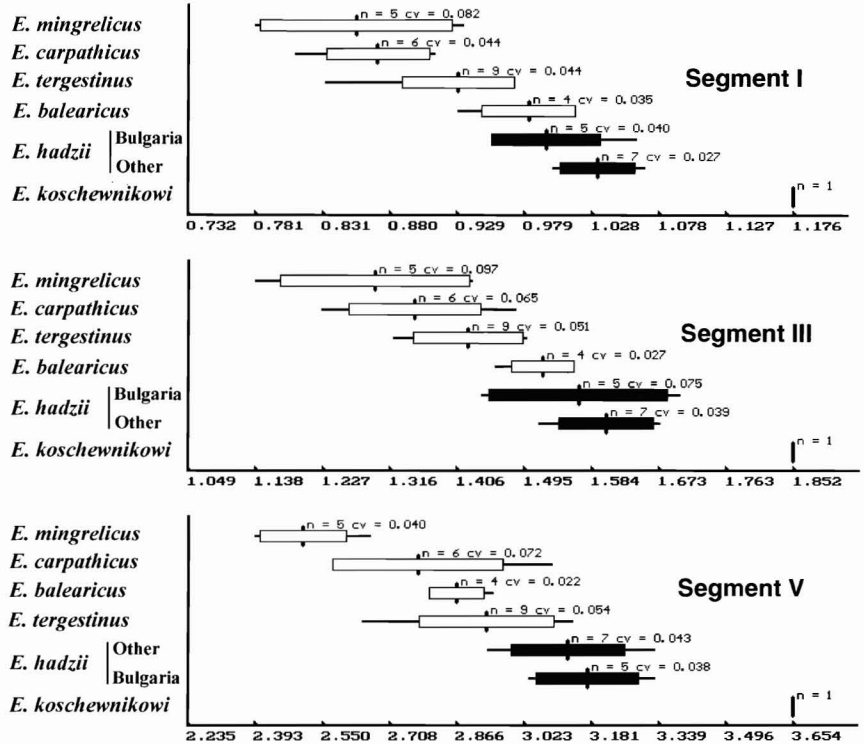

Fig. 12 Morphometric ratio for metasomal segments I, III, and V (length/width) in males, contrasting Bulgarian and other populations of *E. hadzii* (black bars) with other *Euscorpius* species.

Euscorpius sp. (*"carpathicus"* complex)

The populations, which are listed here as belonging to "*carpathicus*" complex (but which exclude *E. hadzii*), are the most widespread in Bulgaria. We analyzed 510 specimens (155 males and 355 females) from various localities, mostly from Western Stara Planina and South Bulgaria. Scorpions of this complex were clearly more commonly collected in the mountains than in the lowlands (Fig. 13). However, collection localities are not evenly distributed and could be biased toward better studied, popular mountain sites (e.g. valleys of Iskar and Struma).

A preliminary analysis of morphology (first of all trichobothrial numbers on external and ventral aspects of a pedipalp, as well as some morphometric ratios; Figs. 7–9) allows us to separate at least three groups (clusters) of populations, which geographically roughly represent North Bulgaria, Southwest Bulgaria, and the Rhodope Mountains.

(1) The "northern" group of populations is widespread across the Stara Planina (=Balkan) mountain system and some adjacent areas (Fig. 13). It is found

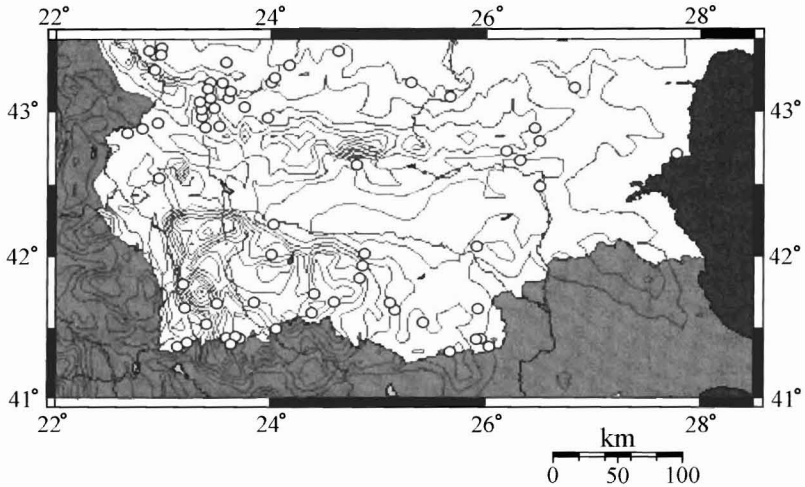

Fig. 13 Distribution of "*Euscorpius carpathicus*" complex populations in Bulgaria.

in the northwestern corner of the country in the mountains bordering Serbia (the northernmost record of scorpions for Bulgaria is in Belogradchik) as far southwest as Tran in Kraishte, and in numerous localities of Western Stara Planina (especially Iskar Gorge). Data from Central North Bulgaria (Pleven, Veliko Tarnovo) and Central Stara Planina (Karlovo, Sliven) are scarce, most likely due to insufficient collecting.

Scorpions were not collected on the lowlands of Danubian Plain, thus there is no evidence that the current Bulgarian range of *Euscorpius* comes close to that of the Romanian *E. carpathicus*. Very few scorpions were recorded from the east and northeast of Bulgaria: populations near Sliven, Yambol, and Shumen are known. A single record exists from the Black Sea Coast (Sveti Vlas near Cape Emine, the easternmost record of scorpions for Bulgaria). In our analysis, data on all these populations were pooled with those of the Western Stara Planina. We also include in the "northern" populations those from the northern foothills of Central Rhodopes (Bachkovo, Asenovgrad) since they show high morphological similarity to Stara Planina specimens but not to ones from the inner valleys of the Rhodope Mts. The highest altitude at which the "northern" group was found is 1400 m at Mt. Izdremets (above Bov village, Sofia District) in the Iskar watershed.

(2) The "southwestern" group of "*carpathicus*" complex populations is geographically separated from the "northern" group, and concentrated around Struma River valley, flanked in the south by Belasitsa and Slavyanka (=Alibotush) mountain massifs along the Bulgarian–Greek border (Fig. 13). The Belasitsa record is the southernmost for scorpions in Bulgaria.

In its morphology, this group is intermediate between "northern" populations and the Rhodope ones. It is unclear if the range of "southwestern" populations is continuous with the "northern" populations. In the east, its range borders that of

Rhodope populations. Groups (1) and (2) were listed by Fet (2000) as Bulgarian populations of Group A. The highest altitude at which the "southwestern" group was found is 1850 m (Tsarev Vrah summit, Slavyanka Mts.). This is so far the highest altitude for scorpions in Bulgaria (compare *E. hadzii* above). We should notice here that the highest altitudinal records for the subgenus *Euscorpius* is from Crete (Lefka Ori Mt., 2200 m, P. Beron coll.; Fet, 2000).

(3) The Rhodope populations of "*carpathicus*" complex in this treatment are limited by Pirin Mts. in the west, and Arda River in the east. In the "Rhodope" cluster we include all populations found east from Mesta River valley in the Western Rhodopes (Kovachevitsa, Devin, Trigrad, Smolyan, Rozhen, Shiroka Laka) and also a few known populations from the Eastern Rhodopes (Kardjali, Krumovgrad, and Ivailovgrad Districts). Morphology of "Rhodope" populations is clearly different from the "northern" ones (Figs. 4–9, 14). Statistical analysis shows that ventral and external median series of patellar trichobothria (Fig. 14) do not overlap in Rhodope and "northern" group within SD ranges. Part of group (3) was listed by Fet (2000) as Group C. The highest altitude at which the "Rhodope" group was found is 1500 m (Rozhen Pass, Smolyan District).

Interestingly, by both of these characters the Rhodope group falls in the same range with a form from Western Croatia (Mali Halam, Velebit Mts.) currently known as *E. carpathicus croaticus* Caporiacco, 1950. This Croatian form is known from

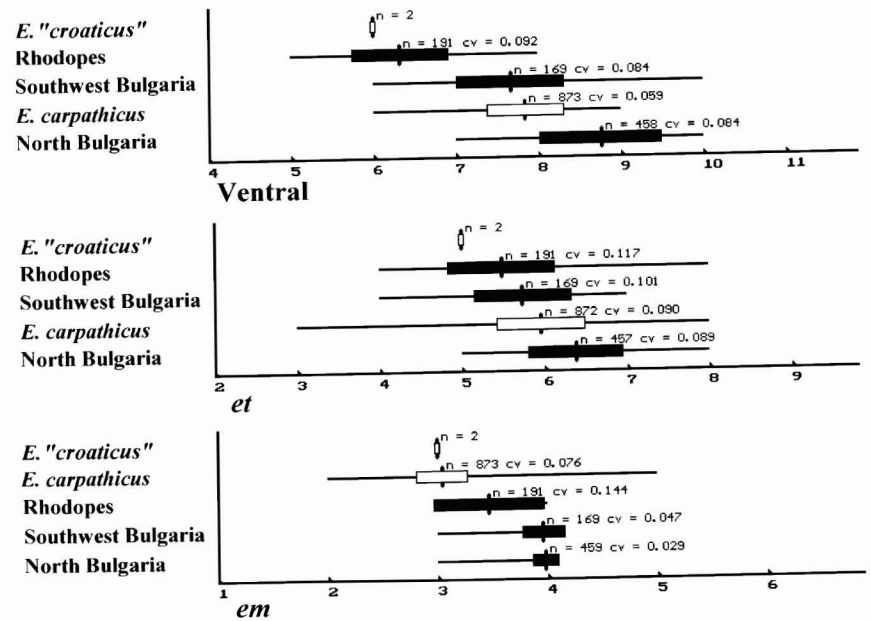

Fig. 14 Trichobothria counts for Bulgarian "*carpathicus*" complex populations (black bars). *E. carpathicus* (Romania) and type specimen of *E. "croaticus"* (Croatia) (white bars) are shown for comparison.

a single specimen (analyzed by the authors; deposited in the Museo Zoologico "La Specola" dell'Universita de Firenze, Florence, Italy); its validity and status are currently unclear as populations of the "*carpathicus*" complex from inland Croatia and neighboring areas of the western Balkans are not studied. In Fig. 14, this form, shown for comparison to the Bulgarian populations, is designated as *E. "croaticus"*. A certain similarity of the western Croatian form to the Rhodope populations (and especially those from Trigrad area which exhibit $em = 3$) is the reason for Fet (1993) mentioning this subspecies (as *Euscorpius germanus croaticus* Caporiacco, 1950) for Bulgaria. Fet and Braunwalder (2000) commented that this taxon does not belong to *Euscorpius germanus*, and Gantenbein et al. (2000a) transferred it to the "*carpathicus*" complex (=subgenus *Euscorpius*). It does not, however, belong to *E. carpathicus* (L., 1767), which is restricted to Romania by Fet and Soleglad (2002), although the Romanian species also exhibits $em = 3$ character.

Fig. 15 shows the composite index of trichobothria (external terminal series et+ventral series v) plotted for all Bulgarian populations of "*carpathicus*" complex (excluding *E. hadzii*). It is clear that a heterogeneity is observed: the Rhodope group does not overlap with the "northern" group at all. This division has to be analyzed further; at this moment, we refrain from any taxonomic decisions. It is possible that some of the observed clusters will be either described as new species or assigned to the existing Balkan species.

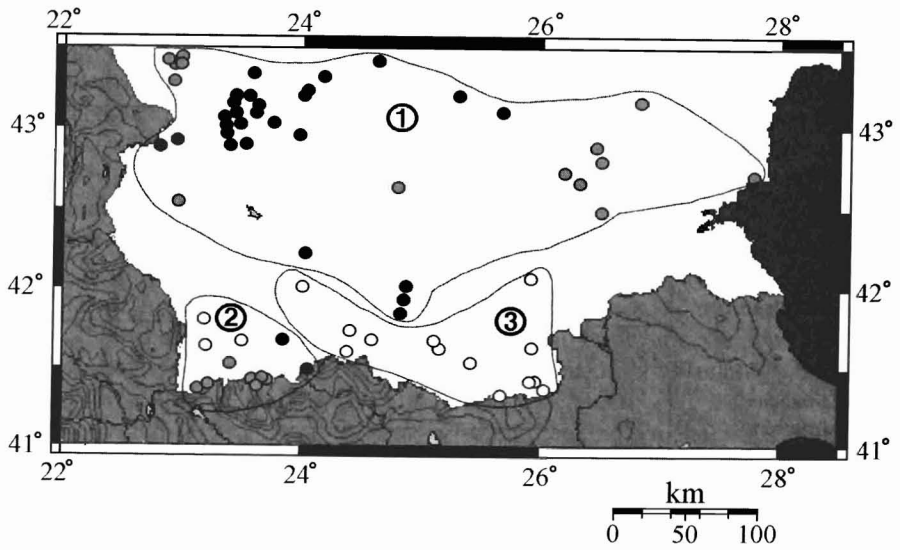

Fig. 15 Distribution of trichobothria counts for Bulgarian *"carpathicus"* complex populations. Index ($et + v$) (total sum of patellar trichobothria in external terminal series and ventral series) was scored as follows: below 13, white circles; 13 to 15, grey circles; 15 and higher, black circles. Populations: 1, northern; 2, southwestern; 3, Rhodope.

Currently, Bulgarian populations of *Euscorpius* belonging to "*carpathicus*" complex do not have a taxonomic name; no scorpion taxa have been ever named and described from Bulgarian territory. The name *Euscorpius carpathicus* (L., 1767) has been restricted to Romanian populations (Fet and Soleglad, 2002), and we see no reason to expand it including geographically adjacent but rather morphologically different populations from Bulgaria.

Subgenus *Alpiscorpius* Gantenbein, Fet, Largiadèr et Scholl, 1999 *Euscorpius* sp. (*"mingrelicus"* complex)

Only one specimen, a unique subadult male of this unidentified species, is known from Pirin Mountains in Bulgaria (Teruel et al., 2004), collected at 1200–1300 m a.s.l. This specimen clearly showed all characters defining the "*mingrelicus*" complex of the genus (obsolescence of metasomal carination, *est-et/dsb-est* ratio ≥ 1.5).

Members of this complex (which is a part of subgenus *Alpiscorpius* Gantenbein, Fet, Largiadèr et Scholl, 1999) are widely distributed over the western part of the Balkan Peninsula (Fet, 2000; Fet and Sissom, 2000). Fet (1993) reviewed all known distribution and taxonomic composition of the species (*sensu lato*) *Euscorpius mingrelicus* (Kessler, 1874) which was originally described from Georgia (Caucasus) but later redefined (Bonacina, 1980) as a part of the former species *Euscorpius germanus* (C.L. Koch, 1837). The latter species is in fact limited to the Alpine zone of Europe (Gantenbein et al., 2000a). Treated earlier as one species widespread from the Alps to Caucasus (Bonacina, 1980; see Fet and Sissom, 2000 for the taxonomic history), "*E. mingrelicus*" complex appears to be a group of species, which are currently under revision using both morphological and molecular techniques (Fet, 2000; Gantenbein et al., 1999, 2000a; Scherabon et al., 2000; Fet et al., 2003). Currently, three species are recognized in this complex, with *E. mingrelicus* (Kessler, 1874) *sensu stricto* ranging from Bosnia to Caucasus (Fet and Sissom, 2000); however, this division is clearly not satisfactory. Fet (2000) described *E. beroni* from the high mountains of Albania (Prokletije Mts.), 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). 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. We should notice here that the highest altitudinal records for the subgenus *Alpiscorpius* is from Anatolia (type series of *E. ciliciensis* Birula, 1898; Bulghar Dagh, 2600 m, M. Holtz coll., Fet, 1986).

Family Buthidae C. L. Koch, 1837
Genus *Mesobuthus* Vachon, 1950
***Mesobuthus gibbosus* (Brullé, 1832)**

Only one specimen, a juvenile female of this species is known from Pirin Mountains, collected at 1200–1300 m a.s.l. This is the first precise record of *M. gibbosus* from Bulgaria (Teruel et al., 2004). This Bulgarian specimen was identical in morphology to other examined specimens of the same species from Greece and European Turkey (Teruel et al., 2004).

M. gibbosus was described from the Peloponnesus, Greece; it is found in Albania, Bulgaria, Greece, Macedonia, Montenegro, and Turkey (both European and Asian). Its formerly reported (Fet and Lowe, 2000: 177) populations from Cyprus, Israel, Lebanon, and Syria belong to different species: *M. cyprius* Gantenbein et Kropf, 2000 on Cyprus (Gantenbein et al., 2000b) and *M. nigrocinctus* Ehrenberg, 1828 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). It is very possible that *M. gibbosus* could reach Pirin Mountains directly from the south via the Struma or Mesta river valleys, as mentioned above for *E. hadzii*. These two biogeographic routes are common avenues of penetration of Submediterranean elements into Bulgaria (Fet, 2000). Such a dispersal could be a recent postglacial event, or alternatively could happen during the Pleistocene interglacial periods. Mountain habitats are normally occupied by various species of *Mesobuthus* from Greece to Central Asia; the highest recorded altitude was that for *M. eupeus* (C. L. Koch, 1838) at southeastern Caucasus (Marayurt, Zuvant) at 8033 ft (ca. 2680 m) (Birula, 1917).

4 Further Research

Taxonomy (and, consequently, zoogeography) of Bulgarian and, in general, Balkan *Euscorpius* species at this moment is not settled, for both subgenera *Euscorpius* and *Alpiscorpius*.

Traditionally treated as one species widespread in Europe (from Baleares to Crimea; Hadži, 1930, 1931; Caporiacco, 1950; Ćurčič, 1972; Valle, 1975; Vachon, 1975; Vachon and Jaques, 1977; Fet, 1986; Crucitti, 1993; etc.; see Fet and 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, 2003; Fet and Soleglad, 2002; Fet et al., 2003b; Gantenbein et al., 2001, 2003). Kinzelbach (1975) divided *E. carpathicus* into two species, designating the second one as "*E. mesotrichus* Hadži, 1929". This name, listed by Fet and Sissom (2000) as *E. tergestinus* (C.L. Koch, 1837) was later demonstrated to belong to the species (or possibly a complex of species) *E. sicanus* (C.L. Koch, 1837), which has a relict distribution in Italy, Malta, and Greece (Fet et al., 2003b). Other morphologically distinct species, recently separated from "*carpathicus*" complex are *E. balearicus* Caporiacco, 1950 (Balearic Islands), *E. concinnus* (C.L. Koch, 1837) (France, Italy), *E. hadzii* Caporiacco, 1950 (Balkans), *E. koschewnikowi* Birula, 1900 (Northeastern Greece), *E. tauricus* (C.L. Koch, 1837) (Crimea), and *E. tergestinus* (C.L. Koch, 1837) (Italy, Slovenia, Croatia, Austria) (Fet and Soleglad, 2002; Fet, 2003; Fet et al., 2004; Vignoli et al., 2005). *E. carpathicus* (L., 1767) *sensu stricto* is currently restricted to Southwestern Romania (Fet and Soleglad, 2002). However, within Bulgaria, as well as for the large portion of the geographic range of "*carpathicus*" complex in the Balkans, the taxonomy is not defined or is defined only partially. The status of the following five taxonomic entities remains to be clarified: *E. carpathicus croaticus* Caporiacco, 1950 (transferred from *E. germanus* subspecies by Gantenbein et al., 2000a; type locality: Velebit Mts., Croatia); *E. c. scaber* Birula, 1900 (type locality: Mt. Athos, Northeastern Greece); *E. c. candiota* Birula, 1903 (type locality: Crete); *E. c. ossae* Caporiacco, 1950 (type locality: Mt. Ossa, Thessaly, Greece); and *E. c. aegaeus* Caporiacco, 1950 (type locality: Antiparos, Aegean Sea). For large territory of Croatia (except Dalmatian coast), Bosnia and Herzegovina, Serbia, Montenegro, Greece (including Aegean islands), Bulgaria, and Turkey, the taxonomy of the "*E. carpathicus*" complex remains to be established.

For the large part of the "*mingrelicus*" complex of the subgenus *Alpiscorpius*, the taxonomy is also currrently not defined or is defined partially. There are formally seven valid subspecies of *E. mingrelicus* from Balkans to Anatolia (Fet and Sissom, 2000), and status of these forms is still unclear. The neotype for *E. mingrelicus* (Kessler, 1874) was designated from Georgia by Gantenbein et al. (2000a). The status of the following eight taxonomic entities remains to be clarified: *Scorpius bosnensis* von Möllendorf, 1873 (type locality: Bosnia); *E. m. ciliciensis* Birula, 1898 (Cilician Taurus, Anatolia, Turkey); *E. m. dinaricus* Caporiacco, 1950 (type locality: Bosnia); *E. m. caporiaccoi* Bonacina, 1980 (type locality: Bosnia); and four subspecies described from NW Anatolia, Turkey: *E. m. phrygius* Bonacina, 1980; *E. m. legrandi* Lacroix, 1995; *E. m. ollivieri* Lacroix, 1995; and *E. m. uludagensis* Lacroix, 1995. 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 both "*carpathicus*" complex (=subgenus *Euscorpius*) and the "*mingrelicus*" complex of the subgenus *Alpiscorpius* from Bulgaria, Greece, and other Balkan areas (Fet and Soleglad, in progress) will shed more light at the species structure of these groups. 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.

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