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The scorpion of Vrachanska Planina

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Abstract. The only species of Scorpiones in Vrachanska Planina Mountains is *Euscorpius deltshevi* (Euscorpiidae), which was undescribed until the last year. This species is found in the study area from the foot of the mountains up to 1000 m altitude. It is a Balkan endemic species, distributed in the northeastern part of the Balkan Peninsula, which represents a Carpathian faunal element according to its centre of origin with a centre of dispersion in Western Stara Planina Range. According to DNA marker data, *Euscorpius deltshevi* has been isolated from its sister species, *Euscorpius carpathicus* from Southwestern Romania, for 3.1 Myr.

Key words: Scorpiones, Euscorpiidae, *Euscorpius*, Western Stara Planina, Bulgaria, distribution, origin.

Introduction

As large and venomous animals, scorpions (Arachnida: Scorpiones) have attracted human attention since prehistorical times, and scholars' attention since the advent of zoology. Often collected by expert zoologists as well as amateurs, they are richly represented in museum collections. Nevertheless, many new species have been described in the recent decades, including many from Europe.

A good example of this explosive species description in the 21st century is *Euscorpius* Thorell, 1876 (family Euscorpiidae), the most diverse European scorpion genus. For over 100 years, only 4 species were identified in Europe, however with numerous subspecies each (Fet & Soleglad 2002). The detailed studies of the last 15 years, both morphological and DNA-based molecular, demonstrated that *Euscorpius* species, and especially those previously addressed as *Euscorpius carpathicus* (Linnaeus, 1767) and *E. germanus* (C. L. Koch, 1837), represent complexes of diverse, cryptic species (Fet *et al.* 2004). Scorpions, a nocturnal group of secretively living predators, have few visible morphological traits that would be useful for humans to easily distinguish related taxa. However, these cryptic forms of *Euscorpius*, isolated for a very long time from each other, fit well definitions of distinct species according to any species concept.

Their intensive speciation took place across the Mediterranean region in the Apennine, Balkan, and Anatolian Peninsulas. As a result of current studies, the number of species in the genus *Euscorpius* increased tenfold and reached now 42 species. In Greece, for instance, only 6 species have been known (4 described in the 19th century, and 2 in

mid-20th); and only within the last 3 years, many more species have been added, up to 21 at this moment; new species were described, old taxa restored from synonymy, or elevated from subspecies rank; many forms still remain undescribed (Kovařík *et al.* 2014, Tropea & Fet 2015).

In Bulgaria, as we know now, the genus *Euscorpius* also is represented by several cryptic species. The first data on Bulgarian scorpions were published by Jurinić (1904) under the Linnean name *Euscorpius carpathicus*. No new information about scorpions of Bulgaria was published for 90 years. Studies by the first author (V.F.) and his colleagues in the 21st century brought the number of scorpion species in Bulgaria currently to 7: these include *Mesobuthus gibbosus* (Brullé, 1832) (family Buthidae) and 6 species of *Euscorpius*, 2 of which have been not yet named (Fet *et al.* 2014, Tropea *et al.* 2015). It became clear that the species that inhabits Vrachanska Planina as well as the entire Stara Planina was undescribed, and it was named only in 2014 in honor of the foremost Bulgarian arachnologist, our good friend Dr. Christo Deltshev.

Abbreviations. The abbreviations used in the list of localities are:

coll. – collection of
juv. - juvenile specimen(s)
leg. – collected by
Ma – million years ago
Myr – million years
NMNH – National Museum of Natural History, Sofia
subad. – subadult specimen(s)

CHACTOIDEA
E u s c o r p i i d a e

***Euscorpius* (*Euscorpius*) *deltshevi* Fet, Graham, Webber & Blagoev, 2014** (Fig. 1)

Euscorpio [sic!] *carpaticus* [sic!] Buresch, Tranteev & Alexandrov 1949: 9 (nec Linnaeus, 1767).

Euscorpius carpathicus Guéorguiev & Beron 1962: 308-309, 367, 368 (nec Linnaeus, 1767).

Euscorpius (*Euscorpius*) sp. ("*carpathicus* complex"), "northern" group of populations: Fet & Soleglad 2007: Fig. 13, 15.

Euscorpius (*Euscorpius*) *deltshevi* Fet, Graham, Webber & Blagoev 2014: 84, 87, 89, 90, Fig. 1, 2A, 2B.

Localities in Vrachanska Planina. Cherniya Izvor Cave near Matnishki Monastery, FN99, 3.4.1999, 1 ♀, leg. B. Petrov, coll. NMNH (Fet *et al.* 2014). Lyutadzhik, FN98, 450 m a.s.l., 1.4.2000, 1 ♀, leg. B. Petrov and V. Beshkov, coll. NMNH (Fet *et al.* 2014). Vartop Cave near Gorna Bela Rechka, FN98, 1 ♀, 7.5.1909 [incorrect year!], coll. NMNH (Fet *et al.* 2014). Between Milanovo and Gorna Bela Rechka, FN97/FN98, May 1911, 4 ♂♂, 2 ♀♀, 1 ♂ juv., leg. P. Drenski, coll. NMNH (Fet *et al.* 2014). Vratsa, GN08, 1.7.1924, 1 ♀ subad., leg. I. Buresch, coll. NMNH; 290 m a.s.l., 8.5.1999, 4 ♀♀, leg. S. Boev, coll. Victor Fet, Huntington; environs of Vratsa, 2.6.1926, 1 ♂ subad., 1 ♀, leg. H. Matrov, coll. NMNH (all after Fet *et al.* 2014). Southern Vrachanska Planina (above Vratsa; see details below), GN08, 880 m, 1.1.2005, 1 ♀, leg. T. Ljubomirov, coll. NMNH (Fet *et al.* 2014). Near Ledenika Cave, GN08, 5.6.1933, 2 ♂♂, leg. D. Papazov and N. Atanassov, coll. NMNH (Fet *et al.* 2014).

Parshevitsa Chalet, GN08, 1000 m a.s.l., 2.5.1994, 1 ♀, leg. P. Stoev, coll. NMNH (Fet *et al.* 2014). Malata Yama Pothole near Chelopek, GN17, 1.7.1929, 1 ♂, leg. N. Radev, coll. NMNH (Fet *et al.* 2014). Lakatnik Railway Station, FN97, 23.3.1930, 1 ♀ paratype, leg. P. Drenski; 6.5.1934, 2 ♂♂ subad. paratypes, leg. J. Zonkov; 20.8.1934, 1 ♀ paratype, leg. G. Stoyanov; 10.7.1948, 1 ♂ subad. paratype, 2 ♀♀ subad. paratypes, 1 ♀ juv. paratype, leg. A. Ivanov and P. Tranteev, all coll. NMNH; 1970, 1 ♂ paratype, 2 ♀♀ paratypes, coll. National Museum, Natural History Museum, Prague, 1 ♂ paratype, coll. František Kovařík, Prague; 15.5.1997, 2 ♀♀ paratypes, leg. B. Petrov, coll. NMNH; N 43°05′10″, E 23°23′01″, 4.5.2005, 6 ♀♀ paratypes, leg. V. Fet and A. Popov, coll. Victor Fet, Huntington (used for DNA barcoding), 1 ♀ paratype, coll. Naturhistorisches Museum Wien (all according to Fet *et al.* 2014). Lakatnik Railway Station, Temnata Dupka Cave, FN97, entrance hall of the cave, under stones, 8.7.1948, 5 specimens (Buresch *et al.* 1949); near Temnata Dupka Cave, 24.7.1988, 1 ♂ paratype, 4 ♀♀ paratypes, leg. P. Mitov, coll. Victor Fet, Huntington (Fet *et al.* 2014). Lakatnik Railway Station, Razhishkata Peshtera Cave (= Gornata Peshtera Cave; = Suhata Peshtera Cave) FN97, entrance of the cave, under stones, 16.2.1958, 1 specimen, V. Guéorguiev observed (Guéorguiev & Beron 1962); near Razhishkata Peshtera Cave, 7.8.1948, 2 ♀♀ paratypes, 1 ♀ juv. paratype, leg. G. Rupev, coll. NMNH (Fet *et al.* 2014). Opletnya, FN97, N 43°06′, E 23°26′, 21.5.1994, 1 ♂ paratype, 2 ♀♀ paratypes, leg. P. Stoev, coll. NMNH (Fet *et al.* 2014). Cherepish Monastery, GN17, 1.5.1959, 1 ♂, leg. A. Popov, coll. NMNH (Fet *et al.* 2014).

The locality mentioned above and published by Fet *et al.* (2014) as Southern Vrachanska Planina is in fact Hizhata v Komplex Vestitelyat (the Chalet in the Herald Complex) south of Vratsa, with coordinates N 43°11′49″, E 23°33′03″, and an unusual date of collection – January 1st (!), is correct (Dr. Toshko Ljubomirov, pers. comm.).

Localities in adjacent areas. Except 32 paratypes from Vrachanska Planina, the rest of the type material, consisting of 7 males and 19 females, originates from the closely located parts of Iskar Gorge (Tserovo, including holotype; Svoge; Tompsan) and the neighbouring to the gorge areas of Ponor Mts. (Zanoge and between Tserovo and Iskrets). Among the other material for the original description, not designated as paratype material, specimens from adjacent areas are included from the remaining further part of Iskar Gorge (Rebrovo and Kurilo), from near areas on the east of Iskar River (Izdremets Peak, Sedemte Prestola Monastery, Lipnitsa) and from the lowland north of Vratsa (Chiren).

Material from adjacent areas is mentioned also in the papers published before the species description. Jurinić (1904) reported scorpions from Svoge and Berkovitsa as *Euscorpius carpathicus* and noted that he has found a lot of specimens near Svoge on a sunny slope. This is the southern slope of Ponor Mts. Jurinić (1904) specified that the specimens from Svoge are the biggest ones (40-42 mm) among his material from Bulgaria. These measurements are obviously overrated because the total length according to the original description of *Euscorpius deltshevi* is 33-35 mm (Fet *et al.* 2014). Fet (2000) placed the material from Zanoge, Tserovo, and Rebrovo in subgroup A2 of *Euscorpius carpathicus* s.l. (= "*Euscorpius carpathicus*" complex; an informal grouping which is now outdated). A large series from Rebrovo was donated to V.F. by Dr. Michail Kwartirnikow (Sofia) in the early 1980s, which triggered the first author's interest in Bulgarian scorpion fauna.

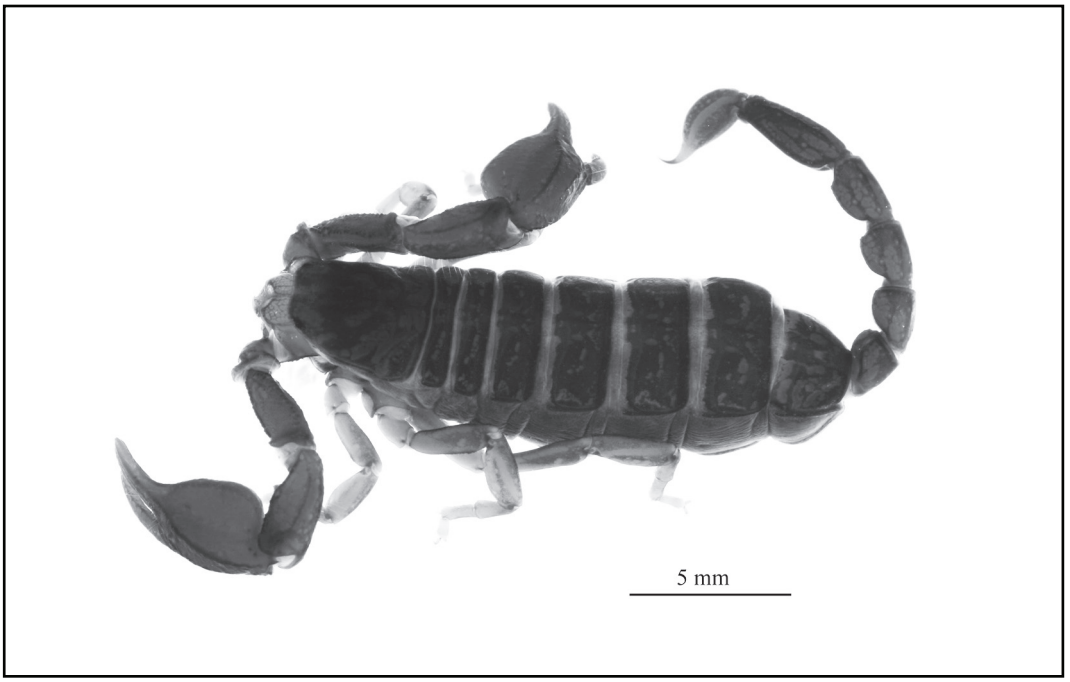

Fig. 1. *Euscorpius deltshevi*, female. Photo: Gergin Blagoev.

Vertical distribution

The only scorpion species in Vrachanska Planina has been found from the lowest parts at the foot of this mountain range (Vratsa, Chelopek, Cherepish, Opletnya, Lakatnik) up to 1000 m altitude below Parshevitsa Chalet. The highest record of *Euscorpius deltshevi* is from Izdremets Peak in Golema Planina, 1400 m (Fet *et al.* 2014). These altitudes seem to be rather high for the latitude of Stara Planina Range as well since scorpions are thermophilic animals occurring in Bulgaria in lowlands, plains and foothills. For karstic regions like Vrachanska Planina and Golema Planina, however, these altitudes are not surprising. The highest occurrence of scorpions in Bulgaria refers also to the genus *Euscorpius* (*E. popovi*) and is registered on Tsarev Vrah Peak in Slavyanka Mts. at 2100 m (Tropea *et al.* 2015).

Range

Distribution of *Euscorpius deltshevi* covers Southeastern Serbia (Nišava Province), North Bulgaria, Stara Planina Range and some areas of South Bulgaria. The localities in North Bulgaria (Danubian Plain) are situated between Deventsi near Cherven Bryag in the west and Svalenik near Tsar Kaloyan and Ruse in the east. In Predbalkan (the northern foothills of Stara Planina), this species is found from Belogradchik and Oreshets near Dimovo in Western Predbalkan to Targovishte and Patleyna near Veliki Preslav in Eastern Predbalkan. In Stara Planina Range, it occurs from Martinovo and Gorna Luka, both near Chiprovtsi, in Western Stara Planina to Kotel and Katunishte in Eastern Stara Planina. The known localities south of Stara Planina are only two: Golo Bardo Mts. in Southwestern Bulgaria and near Yambol in Southeastern Bulgaria.

Origin

Euscorpius deltshevi is an endemic Balkan species. According to its chorotype, it is a Northeastern Balkan species. Stara Planina is the nodal part of its range irrespectively of the species occurrence on the north and south of it. Thus, Stara Planina, and especially Western Stara Planina, is the centre of dispersal of this species. Considering its centre of origin, *E. deltshevi* is most likely a Carpathian faunal element. As related to the border between Eurosiberian and Mediterranean zoogeographical subregions, which lies near the southern border of Bulgaria, the scorpion species of Vrachanska Planina has a northern origin.

Relationships

Phylogenetic position of *Euscorpius deltshevi* in the subgenus *Euscorpius* s.str. is identified on the basis of DNA barcoding analysis by Fet *et al.* (2014). As a result of this analysis, *E. deltshevi* was found to be a sister species of *E. carpathicus*. *E. deltshevi* is the most closely related species to *E. carpathicus*; together they form what could be called *carpathicus*-group of species. Other morphological and molecular studies proved that the distribution of *E. carpathicus* is limited only to the southernmost part of the Southern Carpathians (Transylvanian Alps) in Romania (Fet & Soleglad 2002, Fet *et al.* 2014).

Species age

DNA analysis of certain populations in the range of *E. deltshevi* and their relationship with other species of the subgenus *Euscorpius* s.str. allows to estimate a degree of genetic relationship of the population in investigated area (Fet *et al.* 2014). The population of Vrachanska Planina (Lakatnik) is most closely related to the population of Tserovo, the most closely located among all studied populations for which molecular markers have been studied. Isolation between them has arisen 280 000 years ago. According to DNA divergence estimates, these two populations have been separated from the populations inhabiting regions further to the west (Southeastern Serbia, Beledie Han, Gorna Luka, Oreshets, Belogradchik) for 2.1 Ma. Isolation of the two populations in the Iskar Gorge from those occurring further to the east (Teteven, Sliven) has begun 2.4 Ma. In other words, the time of origin of *Euscorpius deltshevi* is estimated as early as 2.4 Ma, i.e. the Early Pleistocene. The two related species, *E. deltshevi* and *E. carpathicus*, are isolated during the last 3.1 Myr, i.e. from the Late Pliocene. The other distinct clade in subgenus *Euscorpius* includes *Euscorpius sicanus* (C. L. Koch, 1837) from Italy, Malta, Greece, Madeira and North Africa (most likely a complex of species); *Euscorpius hadzii* Di Caporiacco, 1950 from Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Kosovo, Albania, Macedonia and Greece; and a newly described *Euscorpius solegladi* Fet, Graham, Webber & Blagoev, 2014 from Southwestern Bulgaria and Northern Greece. Isolation between *E. deltshevi* and the clade of the three abovementioned species is estimated as 5.6 Myr, i.e. from the Late Miocene.

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Скорпионът на Врачанската планина

ВИКТОР ФЕТ, АЛЕКСИ ПОПОВ

(Резюме)

Единственият вид скорпион във Врачанската планина е *Euscorpius deltshevi* (Scorpiones: Euscorpiidae). Оказа се, че е останал неописан до миналата година. В изследвания район е установен от подножието на планината до 1000 м н.в. Това е балкански ендемичен вид, разпространен в североизточната част на Балканския полуостров, който според центъра на произход е карпатски фаунистичен елемент с център на разселване в Западна Стара планина. *Euscorpius deltshevi* е изолиран от най-близкородствения си вид, *Euscorpius carpathicus* от Югозападна Румъния, от преди 3,1 милиона години.