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Original paper

Concerning some Balkan Euscorpiidae populations (Scorpiones: Euscorpiidae)

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Summary. Some Euscorpiinae populations with the trichobothrial series *em* = 3 from the Balkans, mainly from Serbia and Bosnia-Herzegovina, are examined, resulting in the description of two new subgenera, *Balkanscorpius* subgen. n. and *Hadzius* subgen. n., three new species, *Alpiscorpius* (*Hadzius* subg. n.) *karamani* sp. n., *A*. (*Balkanscorpius* subg. n.) *pavicevici* sp. n. and *A*. (*Balkanscorpius* subg. n.) *zloporubovici* sp. n., and elevation to species status in the genus *Alpiscorpius* Gantenbein et al., 1999 and subgenus *Balkanscorpius* subgen. n. of *A*. (*Balkanscorpius* subg. n.) *dinaricus* (Di Caporiacco, 1950) stat. n. et comb. n. and *A*. (*Balkanscorpius* subg. n.) *caporiaccoi* (Bonacina, 1980) stat. n. et comb. n. *A. beroni* (Fet, 2000) has been synonymized with *A*. (*Balkanscorpius* subg. n.) *dinaricus* stat. n. et comb. n. The lectotype for *A*. (*Balkanscorpius* subg. n.) *caporiaccoi* stat. n. et comb. n. is designated. The forgotten species *Scorpius bosnensis* Mollendorf, 1873 is considered *nomen dubium*.

Keywords: *Alpiscorpius*, Balkans, Bosnia-Herzegovina, Euscorpiidae, Euscorpiinae, Serbia, Scorpiones, sp. n., subgen. n., taxonomy.

INTRODUCTION

The scorpion species of the Euscorpiinae subfamily have long been believed to only be part of the *Euscorpius* genus. However, Birula (1917) previously highlighted trichobothrial differences considered of importance at the above specific level, and divided the species of this genus into three subgenera; *Euscorpius* Thorell, 1876, *Tetratrichobothrius* Birula, 1917 and *Polytrichobothrius* Birula, 1917. Much later, Gantenbein et al. (1999) further divided the nominal subgenus in *Euscorpius* and *Alpiscorpius*, on a phylogenetic basis. In the latter subgenus, only "*E. germanus* (C.L. Koch, 1837)" subspecies were included, although in the following years most of the species related with trichobothrial series of patella *em* = 3 were treated unofficially as belonging to this subgenus. Since then, no reports suggested a need for further subgeneric or generic divisions of this group of scorpions, until Tropea (2013), who stated that the subgeneric composition of the genus *Euscorpius* is not sufficient to explain the revealed phylogenetic position of some populations, and that it appears to be paraphyletic. Recently Kovařík et al. (2019) raised the subgenus *Alpiscorpius* to the genus level and included in it most of the species that in the past have been addressed as "*E. germanus* complex" and "*E. mingrelicus* complex". In the present study, new and old populations from the Balkans, groupable into the genus *Alpiscorpius*, are examined, resulting in the description of two new subgenera in the genus *Alpiscorpius*, i.e. *Balkanscorpius* subgen. n. and *Hadzius* subgen. n., three new species, *Alpiscorpius* (*Hadzius* subg. n.) *karamani* sp. n., *A*. (*Balkanscorpius* subg. n.) *pavicevici* sp. n. and *A*. (*Balkanscorpius* subg. n.) *zloporubovici* sp. n., and elevation to species status in the genus *Alpiscorpius* and

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subgenus *Balkanscorpius* subgen. n. of *A.* (*Balkanscorpius* subg. n.) *dinaricus* stat. n. et comb. n. and *A.* (*Balkanscorpius* subg. n.) *caporiaccoi* stat. n. et comb. n. With these taxonomic modifications, the genus *Alpiscorpius* is composed of three subgenera and 20 species.

MATERIAL AND METHODS

The trichobothrial notation follows Vachon (1974). Morphological measurements are given in millimetres (mm) following Tropea et al. (2014), although we use *Wchel* = *Wchel-A*. Morphological nomenclature follows Stahnke (1971), Hjelle (1990), and Sissom (1990); the chela carinae and dentition follows Soleglad and Sissom (2001), however we united *ID+IAD*; hemispermatophore nomenclature follow Molteni et al. (1983) and Fet et Soleglad (2002) and this document; sternum terminology follows Soleglad and Fet (2003).

Depositories: GTC: private collection of Gioele Tropea, Rome, Italy; HNHM: Hungarian Natural History Museum, Budapest, Hungary; MSNB: Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy; NHMW: Naturhistorisches Museum Wien, Vienna, Austria; PASW: Polish Academy of Sciences, Warsaw, Poland; SC: Šarić collection, Serbia. Material studied is listed in detail in the type specimens' section.

SYSTEMATICS

Family Euscorpiidae Laurie, 1896
Subfamily Euscorpiinae Laurie, 1896
Genus *Alpiscorpius* Gantenbein et al., 1999
Subgenus *Alpiscorpius* Gantenbein et al., 1999

Type species: *Alpiscorpius* (*Alpiscorpius*) *germanus* (C.L. Koch, 1837)

Composition: *Alpiscorpius* (*Alpiscorpius*) *alpha* (Di Caporiacco, 1950), *A.* (*Alpiscorpius*) *beta* (Di Caporiacco, 1950), *A.* (*Alpiscorpius*) *delta* Kovařík et al., 2019, *A.* (*Alpiscorpius*) *germanus* (C. L. Koch, 1837), *A.* (*Alpiscorpius*) *kappa* Kovařík et al., 2019, *A.* (*Alpiscorpius*) *lambda* Kovařík et al., 2019.

Note: *Alpiscorpius* species from Turkey, Georgia and Russia are currently considered to be subgenus incertus.

Known geographic range: Austria, Italy, Switzerland, and Slovenia.

Diagnosis. Small Euscorpiinae, usually total length <31 mm. Colour in adults is brown-reddish with darker marbling, more or less along the whole body. The number of trichobothria on the pedipalp manus ventral surface is 4 (V_{1-3}+Et_1). Trichobothrium on fixed finger *est* is located distally to the centre of the notch of the fixed finger. *et-est*/*est-dsb* ratio is near to 1, with an average of 1.16 and usually <1.40. The number of trichobothria on the pedipalp patella ventral surface is 5 and 6. The number of trichobothria on pedipalp patella external surface usually is: *eb* = 4, eb_a = 3-4, *esb* = 2, *em* = 3, *est* = 4, *et* = 4. Spinules on legs ending with a decentralized spinule. V segment smooth without evident carinae. Metasomal segment II longer than wide. Telson wider than high.

Subgenus *Hadzius* subgen. n.

Type species: *Alpiscorpius* (*Hadzius* subg. n.) *karamani* sp. n.

Etymology: The epithet is in honour of Jovan Hadži (22 November 1884 - 11 December 1972), zoologist who in the past has studied several Balkan scorpion populations.

Composition: *Alpiscorpius karamani* sp. n.

Known geographic range: Serbia (Fig. 81).

Diagnosis. See the diagnosis of *A.* (*Hadzius* subg. n.) *karamani* sp. n.

Alpiscorpius (*Hadzius* subgen. n.) *karamani* sp. n.
(Figs 1-16, Table 1, 4 and 5)

Type material. Serbia: Mt. Tara, Rastište, 29 May 2020, leg. I. Karaman, ♀ Holotype (GTC); Mt. Tara, Rastište, Kremića potok, 19 July 2021, leg. I. Karaman et al., 2 ♂ (of which 1 imm.), 5 ♀ paratypes (GTC); Mt. Tara, Road Perućac - Mitrovac [43°57'25.5"N 19°24'07.9"E], 18 August 2020, leg. M. Zloporubović, 1 ♀ Paratype (GTC); Mt. Tara, Zmajevski potok, 19 July 2021, leg. M. Zloporubović, 1 ♂ Paratype (GTC); Mt. Tara, Derventa Canyon, 19 July 2021, leg. I. Karaman et al., 1 ♀ imm. paratype (GTC).

Other examined specimens (not included in type series). Serbia: Mt. Tara, Derventa River canyon, 5 June 2015, leg. Šarić, 2 ♀ (SC).

Etymology: The species epithet is in honour of Ivo Karaman, Biospeleologist from Novi Sad, who collected the holotype specimen and has kindly provided me with the other specimens.

Known geographic range: Centre-west Serbia (Fig. 81).

Diagnosis. A medium Euscorpiinae species, total length 31.5-36.5 mm. Colour in adults is brown with darker marbling, more or less along the whole body except on chelicerae and telson, which are yellow. The number of trichobothria on the pedipalp manus ventral surface is 4 (V_{1-3}+Et_1). Trichobothrium on fixed finger *est* is located distally to the centre of the notch of the fixed finger. *et-est*/*est-dsb* ratio is <1.60. The number of trichobothria on the pedipalp patella ventral surface mostly is 7 (7-8). The number of trichobothria on pedipalp patella external surface usually

is: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 3, *est* = 4, *et* = 5 and 6. The pectinal teeth number in males usually is 8 (8-9) and in females usually is 7 (7-8). Dorsal patellar spur well-developed. Femur more or less as long as patella, but usually slightly longer. Carapace more or less as long as wide. Carinae V_1 follows a direction towards the trichobothria Et_1, to form a "Y" formation. Spinules on legs ending with a decentralized spinule. On the ventral surface of the segment V are present little granules without delimitation of the ventral carinae. Metasomal segment II longer than wide. Telson from higher than wide to as high as wide in males and from slightly wider than high to as wide as high in the females. Hemispermatophore of type A, it has a well-developed lamina very tapered distally, ending in a pointed hook, well-developed basal constriction present, truncal flexure present, median projection with *lde*, *ldi* and *lb,* and internal projection distally with tines in its crown.

Trichobothrial and pectinal teeth count variation

The variation observed in 13 examined specimens (3 ♂ and 10 ♀) is given below (left/right asymmetry not specified).

Pectinal teeth in males (n = 3): 8/8 (2), 8/9 (1); in total, 8 in 83.33% (5) and 9 in 16.67% (1); average = 8.17, SD = 0.41.

Pectinal teeth in females (n = 10): ?/7): ?/7/7 (6), 7/8 (2), 8/8 (1); in total, 7 in 78.95% (15) and 8 in 21.05% (4); average = 7.21, SD = 0.42.

Pedipalp patella trichobothria *Pv* (n = 8): 7/7 (3), 8/7 (1); in total, 7 in 76.92% (20), and 8 in 23.08% (6); average = 7.23, SD = 0.43.

Pedipalp patella trichobothria *Pe* (n = 8): *et* = 5/5 (7), 5/6 (5), 6/6 (1); in total, 5 in 73.08% (19), and 6 in 26.92% (7); average = 5.27, SD = 0.52;

est = 4/3 (1), 4/4 (12); *em* = 2/3 (1), 3/3 (12); *esb* = 2/2 (13); eb_a = 4/3 (1), 4/4 (12); *eb* = 4/4 (13).

Description of the female holotype

Colouration: Brown-reddish with darker marbling, more or less along the whole body except on chelicerae and telson, which are yellow; legs are yellowish, gradually lighter and without, or with a few marbling, to darker with marked marbling, from distal to proximal; pectines and genital operculum whitish/ivory, the sternites are very light brownish.

Carapace: With granulation especially on dark marbling and laterally; anterior edge with a few granules and more or less straight; posterior lateral, anterior median and posterior median furrows are present; two pairs of lateral eyes and a pair of median eyes, situated distally of the middle, are present; distance from centre of median eyes to anterior margin is 39% of the carapace length.

Mesosoma: Tergites with a few granules laterally and punctated on remaining areas; sternites are smooth or punctated. Spiracles small, oval shaped and inclined approximately 45° downward towards outside.

Metasoma: Dorsal carinae on segments I–IV granulated; ventrolateral carinae on segment I and II absent, on segment III and IV obsolete and smooth; ventromedian carina on segments I–IV absent; small and serrulated granules are present on the ventral surface of segment V on most of the darker marbling surface without delimitation of the ventral carinae; intercarinal spaces on segments I-IV are mostly smooth, on V segment are granulated ventrally and from smooth to with a few granules on remaining surfaces.

Telson: Slightly wider than high. Vesicle rough, with ventral setae of different sizes, especially around the vesicle/aculeus juncture.

Pectines: Teeth number 7/7; middle lamellae 4/4; several microsetae on marginal lamellae, middle lamellae and fulcra.

Genital operculum: The genital operculum is formed by two longitudinally separated subtriangular sclerites.

Sternum: Pentagonal shape, type 2; wider than long, deep posterior emargination.

Pedipalps: Coxa and trochanter with tuberculated carinae. Femur: dorsal and ventral internal carinae and dorsal external carinae tuberculated; ventral external carinae irregular, present mostly in the proximal 1/3; external median carinae serrulated; anterior median formed by big, spaced and conical tubercles, of which three bear a macroseta each; intercarinal spaces with granules of different size. Patella: dorsal and ventral internal carinae tuberculated; dorsal external carinae from rough and rounded to slightly crenulated; ventral external carinae crenulated; intercarinal surface ventrally almost smooth, but with minute granules near the ventral internal carina, dorsal surface with granules forming a reticulated pattern, frontal surfaces with minute granules uniformly positioned. Dorsal patellar spur well-developed. Chela: carina *D1* from undulated to slightly crenulated; *D4* formed by dark, very low and small marked tubercles; *V1* is distinctly strong, dark and mostly crenulated, with a few tubercles proximally; *V3* is rounded, dark, with a few small and scattered granules; intercarinal internal tegument granulated, ventral mostly smooth, external and dorsal with very minute granules forming a reticulated pattern; fixed-movable fingers lock with small but well-evident notch and lobe. Finger dentition: in the most distal part is present a *DD* on the tip; *MD* is formed by very small denticles closely spaced forming a more or less straight line, discontinued at level of the *OD*; fixed finger has 5/6 *OD* and 12/12 *ID*; movable finger has 6/6 *OD* and 15/14 *ID*.

Trichobothria: Chela: trichobothria on the pedipalp manus ventral surface $V = 3/3$ (V_{1-3}) + $Et_1 = 1/1$; the trichobothrium V_4 is situated on the external surface on the carina V_1; both the trichobothria *et* and *est* on fixed finger is located distally to the notch of the fixed finger; *et-est/est-dsb* ratio is about 1.33/1.23. Patella: ventral (*Pv*): 7/7; patella external (*Pe*): *et* = 5/5, *est* = 4/4, *em* = 3/3, *esb* = 2/2, eb_a = 4/4, *eb* = 4/4. Femur: trichobothrium *d* on femur is slightly proximal to *i,* while the trichobothrium *e* is distal to both, situated on the dorsal external carina.

Legs: Legs with two pedal spurs; no tarsal spur; ventral row of tarsus III with a total of 10/11 spinules of increasing size from proximal to distal, ending with a decentralized spinule; 3 larger flanking pairs of tarsal setae adjacent to the ventral spinules row are present. Tubercles present on the ventral and dorsal surface of all leg femora, they are very more marked and dark ventrally.

Chelicerae: Typical of the subfamily Euscorpiinae.

Hemispermatophore of type A; It has a well-developed lamina that is highly tapered distally, ending in a pointed hook; a well-developed basal constriction present; truncal flexure present; median projection with *lde*, *ldi* and *lb*; internal projection distally with 9–10 tines in its crown. The number and shape of tines in the crown varied between specimens and between the right and the left hemispermatophores.

Comments

Alpiscorpius (*Hadzius* subg. n.) *karamani* sp. n. is an ambiguous taxon, with features that clearly distinguish it from the *Balkanscorpius* subg. n. species, such as size (31-36.5 mm vs usually a size <30), trichobothrial number (*Pv* 7 and 8, *Pe-et* 5 and 6 vs *Pv* 5 and 6, *Pe-et* usually 4 (<6)) and the proportion between the trichobothria of the fixed finger *et-est/est-dsb* (1.20-130 vs usually >2). In addition, it is easily distinguishable from species of the subg. *Alpiscorpius* Gantenbein et al., 1999 s. str. (i.e. the Western European species) by size (31-36.5 mm), trichobothrial number (*Pv* 7 and 8, *Pe-et* 5 and 6 vs *Pv* normally 5 and 6, *Pe-et* 4) and geographic disjunction (known from centre-west of Serbia, while the western limit of *Alpiscorpius* s. str. is Western Slovenia). On the other hand, some characteristics such as the tarsal spines, the shape and proportions of the telson, as well as the trichobothrial series *em* = 3 (known in only one species of the genus *Euscorpius* s. str. (*E. carpathicus* (Linnaeus, 1767)), separate it from the genus *Euscorpius* s. str. Thus the generic position of this taxon is somewhat doubtful, so, for the moment, we place it in the genus *Alpiscorpius*, but in a new subgenus, *Hadzius* subg. n. which likely will be raised to the genus level in the near future. All eastern *Alpiscorpius* species (i.e. from Turkey, Georgia and Russia) are excluded from the nominal subgenus, which will be discussed in a separate manuscript (in preparation).

For these reasons, its distinction from other species is quite evident. In fact, with few exceptions, all other Balkan species with the trichobothrial patellar series *em* = 3 usually have the number of trichobothria of the patella *Pv* <7 and *et* <5. In fact, the only Balkan populations with *em* = 3 that have *et* = 5 are *Euscorpius croaticus* Di Caporiacco, 1950 and *A. caporiaccoi* (Bonacina, 1980) stat. n. et comb. n. However, these latter normally have *Pv* = 6.

Note: Hadži (1929) reported populations of *"E. germanus"* with trichobothrial numbers that fall within the values of *A. karamani* sp. n., referring to them as "polytrichus". However, these were not as explicitly described as other species that were the main subject of the article. Note that these populations also fall within the values of some populations considered by Hadži (1929) as *"Euscorpius carpathicus oligotrichus"*. Furthermore, Hadži (1930) presented a map showing some locations where *"E. germanus polytrichus"* was present, which were also in Serbia. In the same areas the author also reports *"E. carpathicus oligotrichus"*, and according to my unpublished data, there are several populations in Serbia that may have trichobothrial numbers corresponding to *"E. g. polytrichus"* or *"E. c. oligotrichus"*. In the absence of type specimens or, at least, a precise type locality, it is not possible to determine which population could have been *"E. g. polytrichus"*. Furthermore, and above all, according to the ICZN (art. 53 and 57), *"E. g. polytrichus"*, like the other "races" or subspecies proposed by Hadži (1929), are primary homonyms, since they were originally proposed in combination with the same genus, and are therefore perennially invalid.

Subgenus *Balkanscorpius* subgen. n.

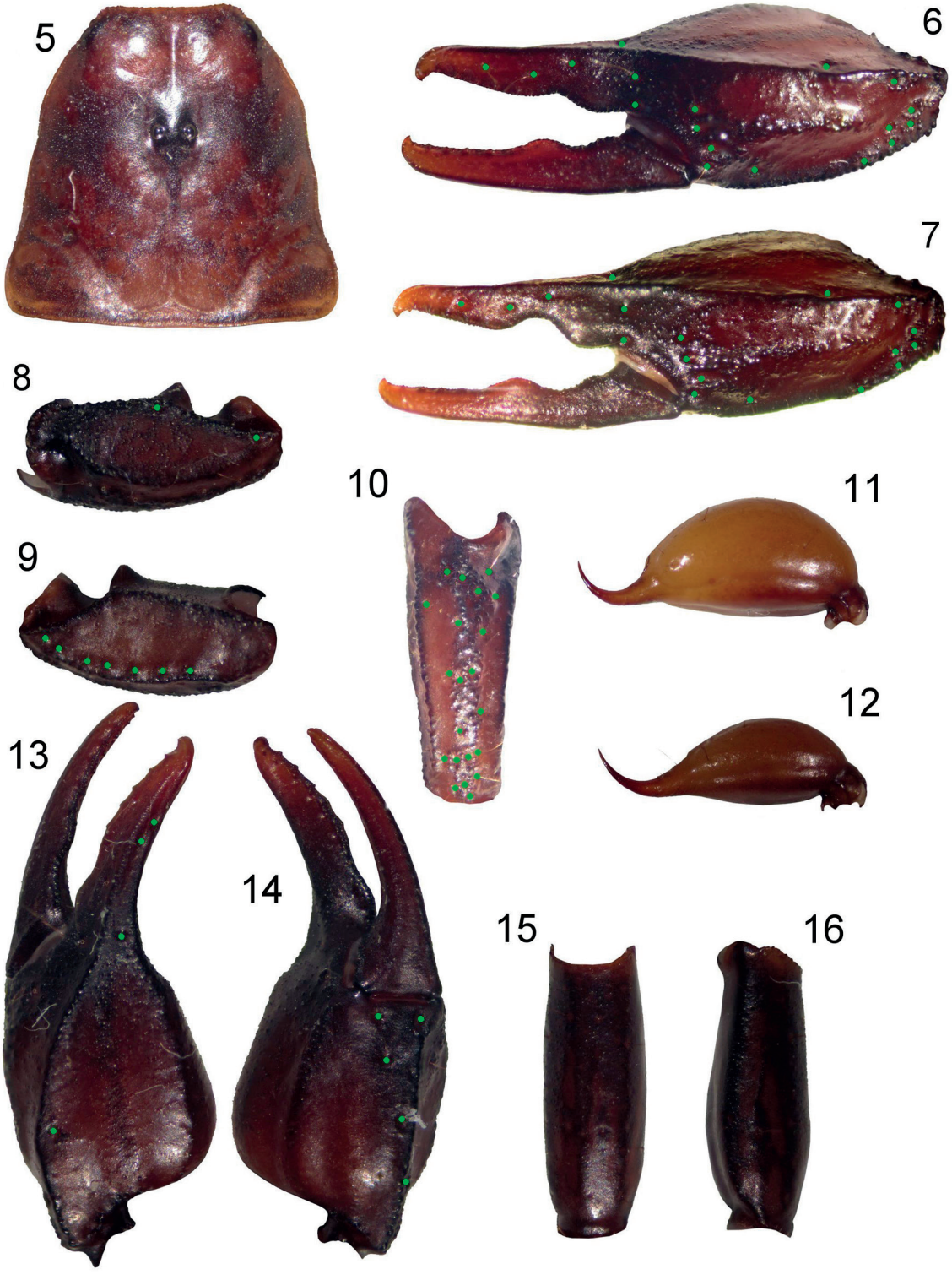
Type species: *Alpiscorpius zloporubovici* sp. n., designated herein.

Etymology: The name is formed from the words "Balkan", which means "inhabitant of the Balkans", and "scorpius", which means scorpion.

Composition: *A.* (*Balkanscorpius* subg. n.) *caporiaccoi* (Bonacina, 1980) comb. n. et stat. n., *A.* (*Balkanscorpius* subg. n.) *dinaricus* (Di Caporiacco, 1950) comb. n. et stat. n., *A.* (*Balkanscorpius* subg. n.) *gamma* (Di Caporiacco, 1950) comb. n., *A.* (*Balkanscorpius* subg. n.) *omega* Kovařík et al., 2019 comb. n., *A.* (*Balkanscorpius* subg. n.) *omikron* Kovařík et al., 2019 comb. n., *A.* (*Balkanscorpius* subg. n.) *pavicevici* sp. n., *A.* (*Balkanscorpius* subg. n.) *sigma* Kovařík et al., 2019 comb. n., *A.* (*Balkanscorpius* subg. n.) *ypsilon* Kovařík et al.,

Figs 1-2. Dorsal and ventral view of *Alpiscorpius* (*Hadzius* subgen. n.) *karamani* **sp. n.** female holotype.

Figs 3-4. Dorsal and ventral view of *Alpiscorpius* (*Hadzius* subgen. n.) *karamani* **sp. n.** male paratype.



Figs 5-16. *Alpiscorpius* (*Hadzius subgen. n.*) *karamani* **sp. n.** female holotype except Figs 7 and 11 which are of a male paratype. **5.** Carapace. **6.** External view of chela of adult female. **7.** External view of chela of adult male. **8.** Dorsal view of pedipalp patella. **9.** Ventral view of pedipalp patella. **10.** External view of pedipalp patella. **11.** Telson of adult male. **12.** Telson of adult female. **13.** Dorsal view of chela. **14.** Ventral view of chela. **15.** Ventral view of metasomal segment V. **16.** Lateral view of metasomal segment V.

2019 comb. n., *A.* (*Balkanscorpius* subg. n.) *zloporubovici* sp. n.

Known geographic range: Albania, Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Italy, Montenegro, Serbia, Kosovo*[1], Slovenia.

Diagnosis. Small Euscorpiinae, total length 18-29 mm. Adults coloured brown to blackish, with darker variegation or marbling on chelicerae, carapace, mesosoma, metasoma and legs almost always present. The number of trichobothria on the pedipalp manus ventral surface is 4 ($V_{1\text{-}3}$+Et_1). Trichobothrium on fixed finger *est* is located proximally to the centre of the notch of the fixed finger. *et-est*/*est-dsb* ratio is >1.90. The number of trichobothria on the pedipalp patella ventral surface usually is 5 and 6. The number of trichobothria on pedipalp patella external surface usually is: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 3, *est* = 4, *et* = 4, rarely 5 (to see *A. caporiaccoi* stat. n.). The number of pectinal teeth in males is usually 8 and 9 (7-10), and in females is 6-8. Poorly developed dorsal patellar spur. Pedipalp femur shorter than patella. Carapace range from wider than long to as long as wide, or slightly longer than wide. Carinae V_1 follows a direction towards the trichobothria Et_1, to form a "Y" formation. Spinules on legs ending with a decentralized spinule. Segment V may or may not have traces of carinae and may range from slightly granulated, almost smooth, to granulated with no trace of carinae. Metasomal segment II from wider than long to slightly longer than wide. Stocky metasoma, *Lmet*/*Wmet* ratio <1.51 (usually <1.40). Telson wider than high in both males and females, telson profile pitched on the anterior side. Hemispermatophore of type B; lamina distally squat and wide, ending in a rounded, weakly-marked and large, sometime trunked, hook; well-developed basal constriction present; truncal flexure present; median projection with *lde*, *ldi* and *lb*; internal projection distally with tines in its crown.

Comments

The new subgenus *Balkanscorpius* subg. n. includes populations previously considered to be part of the *"Euscorpius mingrelicus* complex" of the Balkans. It is easily recognizable by the position and proportions of the trichobothria on the fixed finger *et*, *est* and *dsb*. In fact the *et-est*/*est-dsb* proportion in *Balkanscorpius* subg. n. usually is considerably higher than 1.90 (very rarely a minor number), while in subgenus *Alpiscorpius* s. str. this proportion is closer to 1, or in any case <1.40. This can be seen more easily with the *est* trichobothrium position, which is located at the level of the centre of the notch of the fixed finger or proximal to the centre of it in *Balkanscorpius* subg. n., while in *Alpiscorpius* s. str. it is distal to the centre of the notch. Furthermore, the fifth metasoma segment in *Balkanscorpius* subg. n. may have traces of carinae and range from slightly granulated, almost smooth, to granulated with no trace of carinae. While in *Alpiscorpius* s. str. the fifth metasomal segment is mostly smooth and rounded. The distribution is also different and almost completely divided, with the exception of some overlapping areas at the boundary of the ranges. The new subgenus has an almost completely Balkan range, with some populations that just cross the Italian and Austrian borders, while the genus *Alpiscorpius* s. str. has a mostly Italian range, with some populations just beyond the border in Slovenia, Austria and Switzerland.

Even for the various phylogenies published over the past years, the division between species here considered to be part of these two subgenera has been clear. For example, Scherabon et al. (2000) previously reported phylogenetic analyses based on *16S mtDNA* of some members of these subgenera (at that time species of the genus *Euscorpius*): *A. germanus* (the type species of the genus *Alpiscorpius*) and *A.* (*Balkanscorpius* subg. n.) *ypsilon* (at that time considered *E. gamma*). The results showed two well-separated and supported clades, with a genetic divergence up to 7.5%. This is a very high value, which is higher, or equal, to that found between other scorpion genera or subgenera. E.g. *E. italicus* (type species of the subgenus *Polytrichobothrius,* which will likely be raised to the genus level in the near future) and *E. carpathicus* (type species of the genus/subgenus *Euscorpius*) have a divergence of 5.9% (Tropea 2013). The same high level of divergence is observed between a number of species recently removed from the subgenus *Euscorpius* s. str. but not yet assigned to any subgenus (see Tropea 2013; Tropea et al. 2015). The genera *Iurus* Thorell, 1876 and *Protoiurus* Soleglad et al., 2012 have a divergence from 6.5% to 7% (Parmakelis et al. 2006). Thus all of these examples have lower divergence values.

Graham et al. (2012) published a phylogeny based on *COI mtDNA* that included *A. germanus, A. alpha, A. ypsilon* (at that time considered to be *E. gamma*), *A. lambda* (at that time considered to be *E. germanus*), *A. mingrelicus* from Georgia (Abkhazia), two Balkan populations of "*E. mingrelicus*" from Serbia and Bosnia and Herzegovina (which probably are *A. dinaricus* comb. n. et stat. n. and *A. zloporubovici* sp. n.*)*, and *E. croaticus* Di Caporiacco, 1950. Whereas the position and identity of the latter species remains controversial, it is clear that *A. germanus* + *A. alpha* represents a supported clade well-separated from *A. ypsilon* + the two Balkan populations from Serbia and Bosnia and Herzegovina, in agreement with data reported by Scherabon et al. (2000)

[1] This designation is without prejudice to positions on status, and is in line with UNSCR 1244(1999) and the ICJ Opinion on the Kosovo declaration of independence.

and division to the supra-specific level herein proposed. Fet et al. (2016) also showed a multi-marker phylogeny, where *A. germanus* is well-divided by the Balkan populations, as well as the eastern species. More recently, Štundlová et al. (2019) showed a multi-marker phylogeny, where the clade "*E. gamma*" (here subgenus *Balkanscorpius* subg. n.) is well divided from the clade "*E. germanus*" + "*E. alpha*" (here subgenus *Alpiscorpius*), dating their division to about 11 Ma ago.

So, the picture that emerges from analysis of these phylogenies, is in agreement with division at the genus level. However, although it seems clear that *Balkanscorpius* is a valid genus, in the present work it will be considered to be a subgenus, to avoid creating paraphilia in the genus *Alpiscorpius*, with consequent taxonomic confusion, while waiting for the situation at the supraspecific level to be resolved for the eastern populations. The latter mentioned populations will be the subject of another manuscript (in preparation).

***Alpiscorpius* (*Balkanscorpius* subg. n.) *zloporubovici* sp. n.**
(Figs 17-32, Table 1, 4 and 5)

Examined specimens (20 specimens: 6 ♂ and 14 ♀).

Type series. Serbia: Mt. Tara, Mitrovac, 18 August 2020, leg. M. Zloporubović, 1 ♂ (GTC holotype); same data but 2 ♂, 12 ♀ (which 1 imm.) (GTC paratypes); Mt. Tara, Banjska Stena, 18 August 2020, leg. M. Zloporubović, 1 ♂, 1 ♀ (GTC paratypes); Mt. Tara, Konjska reka, 43.89994 N 19.41716 E, 18 August 2020, leg. M. Zloporubović, 2 ♂, 1 ♀ (GTC paratypes).

Etymology: The species epithet is in honour of Matija Zloporubović, student of biology from Novi Sad, who collected the specimens of the new species.

Known geographic range: Centre-west Serbia, Bosnia-Herzegovina? (Fig. 81).

Diagnosis. A small Euscorpiinae species, total length 22-26 mm. Adults are coloured mostly dark brown with darker marbling on whole body. The number of trichobothria on the pedipalp manus ventral surface is 4 (V_{1-3}+Et_1). Trichobothrium *est* on fixed finger is located proximally to the centre of the notch of the fixed finger. The number of trichobothria on the pedipalp patella ventral surface is usually 6 (6 and 5). The number of trichobothria on pedipalp patella external surface is usually: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 3, *est* = 4, *et* = 4. The number of pectinal teeth in males is usually 9 and in females is usually 7 (6-8). Dorsal patellar spur poorly developed. Pedipalp femur is shorter than the patella. Carapace tends to be slightly wider than long. Carinae V_1 follows an internal direction to the trichobothria Et_1, to form a "Y" formation. Spinules on legs ending with a decentralized spinule. The metasomal segment V may have slight edging, because a trace of the ventral carinae without particular granulation is more evident on them; intercarinal spaces on the V segment may be very finely granulated to almost smooth. Metasomal segment II usually is as long as wide in males and usually is slightly wider than long in females.

Hemispermatophore of type B; Lamina are distally squat and wide, ending in a rounded and large hook; a well-developed basal constriction is present; truncal flexure present; median projection with *lde*, *ldi* and *lb*; internal projection distally with 9–11 tines in its crown. The number and shape of tines on the crown varied between specimens and between the right and the left hemispermatophores.

Trichobothrial and pectinal teeth count variation

The variation observed in 20 examined specimens (6 ♂ and 14 ♀) is given below (left/right asymmetry not specified).

Pectinal teeth in males (n = 12): 8/9 (1), 9/9 (4), 9/10 (1); in total, 8 in 8.33% (1), 9 in 83.33% (10), and 10 in 8.33% (1); average = 9, SD = 0.43.

Pectinal teeth in females (n = 28): 6/6 (1), 6/7 (2), 7/7 (7), 8/8 (4); in total, 6 in 14.29% (4), 7 in 57.14% (16), and 8 in 28.57% (8); average = 7.14, SD = 0.65.

Pedipalp patella trichobothria *Pv* (n = 40): 5/6 (8), 6/6 (11), 7/6 (1); in total, 5 in 20% (8), 6 in 77.50% (31), and 7 in 2.50% (1); mean = 5.82, SD = 0.45.

Pedipalp patella trichobothria *Pe* (n = 40): *et* = 4/3 (1), 4/4 (17), 5/4 (1), 5/5 (1); in total, 3 in 2.50% (1), 4 in 90% (36), and 5 in 7.50% (3); average = 4.05, SD = 0.32;

est = 3/4 (2), 4/4 (18); *em* = 3/3 (40); *esb* = 2/2 (40); eb_a = 4/4 (40); *eb* = 4/4 (40).

Description of the male holotype

Colouration: Brown, brown-reddish, with darker marbling more or less on the whole body, but weak or absent on pedipalp chelae, patella and leg tarsi and metatarsi; chelicerae, telson and legs have a light brown-orangish basal colouration with dark brown or blackish marbling; pectines and genital operculum whitish/ivory; the sternites are very light brownish, except the most distal, which is darker, with a similar colouration for metasoma.

Carapace: With granulation especially on dark marbling; anterior edge with a few granules and straight; posterior lateral, anterior median and posterior median furrows are presents; two pairs of lateral eyes and a pair of median eyes, situated distally of the middle, are present; distance from centre of median eyes to anterior margin is 40.83 % of

carapace length.

Mesosoma: Tergites with a few minute granules laterally and mostly smooth on the remaining areas. Spiracles small, oval shaped and inclined about 45° downward towards outside.

Metasoma: Dorsal carinae on segments I–IV granulated; ventrolateral carinae on segment I and II absent, on segment III and IV obsolete and smooth; ventromedian carina on segments I–IV absent; segment V has slight edging as a trace of the ventral carinae without any particular granulation evident on them; intercarinal spaces on segments I-IV are mostly smooth, but with a few very small granules dorsally, the V segment is very finely granulated.

Telson: Wider than high. Vesicle rough, with ventral setae of different sizes, especially around the vesicle/aculeus juncture.

Pectines: Teeth number 9/9; middle lamellae 5/5; several microsetae on marginal lamellae, middle lamellae and fulcra.

Genital operculum: Formed by two subtriangular sclerites partially divided with genital papillae protruding; a few microsetae are present.

Sternum: Pentagonal shape, type 2; wider than long, deep posterior emargination.

Pedipalps: Coxa and trochanter with tuberculated carinae. Femur: dorsal and ventral internal carinae and dorsal external carinae tuberculated; ventral external carinae irregular, present mostly in the proximal 1/3; external median carinae serrulated; anterior median carinae formed by large, spaced and conical tubercles, of which three bear a macroseta each; intercarinal spaces with granules of different size. Patella: dorsal and ventral internal carinae tuberculated; dorsal external carinae from rough and rounded to smooth; ventral external carinae from smooth to roughly crenulated; intercarinal surface ventrally almost smooth, but with a few minute granules near the ventral internal carina, dorsal surface with granules to form like a reticulation, frontal surfaces with minute granules positioned in a uniform way. Dorsal patellar spur poorly developed. Chela: carina *D1* smooth and slightly undulated; *D4* formed by dark, flattened tubercles; *V1* is distinctly strong, dark and mostly smooth and slightly undulated, but with about six tubercles proximally; *V3* is rounded, dark, with a few small and scattered granules; intercarinal internal tegument granulated, ventral mostly smooth, external and dorsal mostly smooth; fixed-movable fingers lock with well evident notch and lobe. Finger dentition: in the most distal part is present a *DD* on the tip; *MD* is formed by very small denticles closely spaced forming a more or less straight line, discontinued at level of the *OD*; fixed finger has 5/5 *OD* and 11/11 *ID*; movable finger has 6/6 *OD* and 12/12 *ID* (broken finger tip).

Trichobothria: Chela: trichobothria on the pedipalp manus ventral surface $V = 3/3$ ($V_{1\text{-}3}$) + $Et_1 = 1/1$; the trichobothrium V_4 is situated on the external surface on the carina V_1; the trichobothrium *et* on fixed finger is located distally to the notch of the fixed finger; *est* is located on proximally half to the notch; *et-est*/*est-dsb* ratio is about 2.40. Patella: ventral (*Pv*): 6/6; patella external (*Pe*): *et* = 4/4, *est* = 4/4, *em* = 3/3, *esb* = 2/2, eb_a = 4/4, *eb* = 4/4. Femur: trichobothrium *d* on femur is slightly proximal to *i,* while the trichobothrium *e* is distal to both, situated on dorsal external carina.

Legs: Legs with two pedal spurs; no tarsal spur; ventral row of tarsus III with a total of 8/10 spinules of increasing size from proximal to distal, ending with a decentralized spinule; 3 larger flanking pairs of tarsal setae adjacent to the ventral spinules row are presents. Tubercles present on the ventral and dorsal surface of all leg femora, they are very more marked and dark ventrally.

Chelicerae: Typical of the subfamily Euscorpiinae.

Comparison with geographically close species

Alpiscorpius zloporubovici sp. n. is mainly distinguishable from *A. dinaricus* stat. et comb. n. by having *Pv* 6 versus *Pv* 5 in the latter species. Furthermore, Graham et al. (2012) showed sequences from southern Bosnia and Herzegovina, which are most likely *A. dinaricus* sp. n., and a sequence from Serbia that most likely is *A. zloporubovici* sp. n., which are well-differentiated from each other, confirming their division.

Alpiscorpius zloporubovici sp. n. is mainly distinguishable from *A. gamma* by having *Pv* 6 vs *Pv* 5 and 6, and *Dp* 9 vs *Dp* 8 in males.

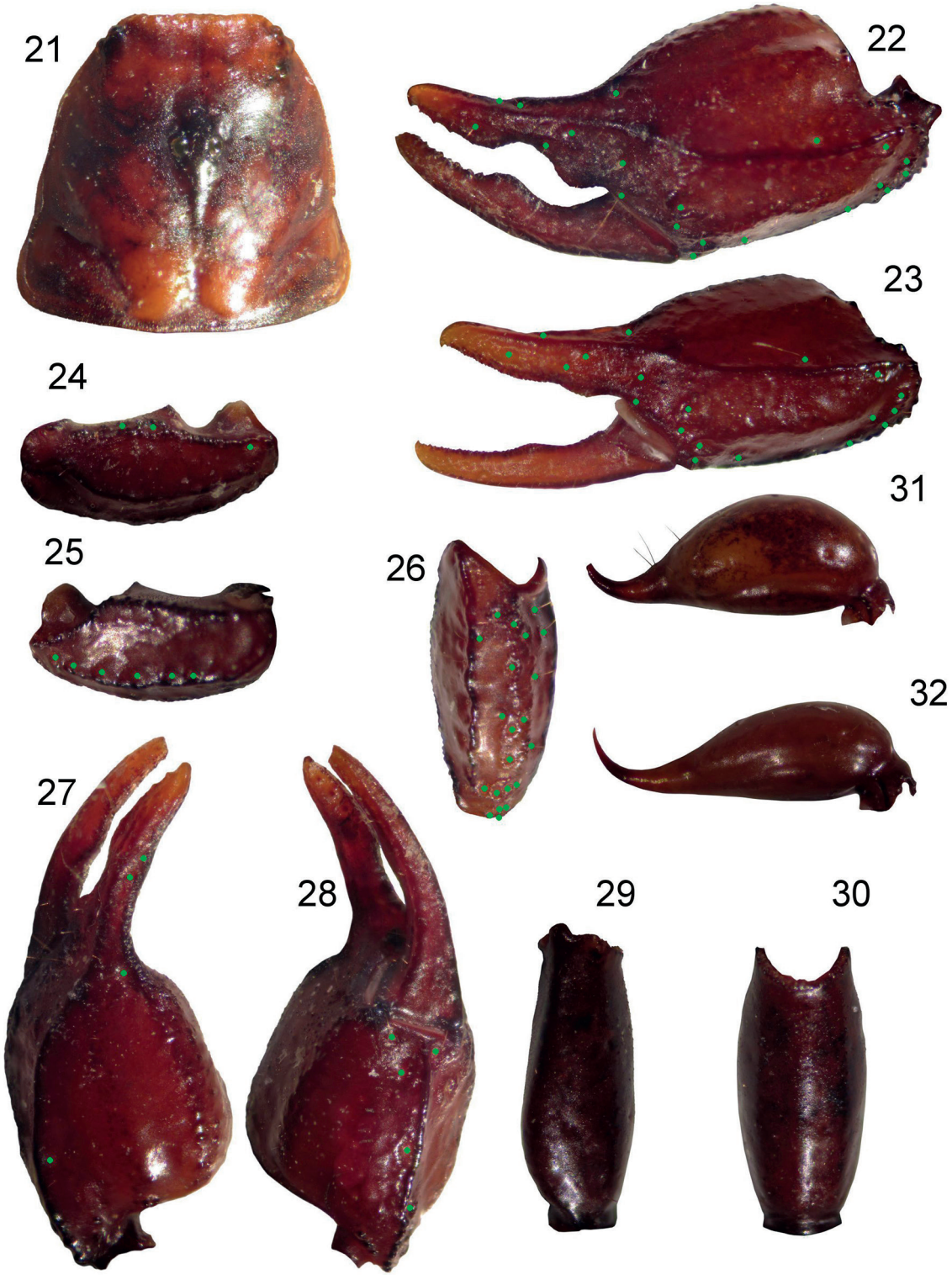
Alpiscorpius zloporubovici sp. n. is mainly distinguishable from *A. caporiaccoi* stat. et comb. n. by *et* 4 vs *et* 5 and 4, and by the almost smooth fifth metasomal segment without carinae in *A. zloporubovici* sp. n. versus a fifth segment ranging from highly to moderately granulated ventral carinae.

Alpiscorpius zloporubovici sp. n. is mainly distinguishable from *A. pavicevici* sp. n. for males with *Dp* 7 and 8 in the latter vs *Dp* 9 in *A. zloporubovici* sp. n. Furthermore, *A. pavicevici* sp. n. is on average smaller than *A. zloporubovici* sp. n.

In addition, using phylogenetic analysis, Graham et al. (2012) shows a population from the type locality of *A. zloporubovici* sp. n. (HM418278), which cluster with the other species of the subgenus *Balkanscorpius* subg. n., and thus cannot be *A.* (*Hadzius* subg. n.) *karamani* sp. n., but instead *A. zloporubovici* sp. n. The divergence of this population in *COI* marker ranges from 5.8% with *A. omega* Kovařík et al., 2019 to 7.0% with *A. omikron* Kovařík et al., 2019, confirming the validity of *A.* (*Balkanscorpius* subg. n.) *zloporubovici* sp. n.

Figs 17-18. Dorsal and ventral view of *Alpiscorpius* (*Balkanscorpius* subgen. n.) *zloporubovici* **sp. n.** male holotype.

Figs 19-20. Dorsal and ventral view of *Alpiscorpius* (*Balkanscorpius* subgen. n.) *zloporubovici* **sp. n.** female paratype.



Figs 21-32. *Alpiscorpius* (*Balkanscorpius* subgen. n.) *zloporubovici* **sp. n.** male holotype except Figs 23 and 32 that are of a female paratype. **21.** Carapace. **22.** External view of chela of adult male. **23.** External view of chela of adult female. **24.** Dorsal view of pedipalp patella. **25.** Ventral view of pedipalp patella. **26.** External view of pedipalp patella. **27.** Dorsal view of chela. **28.** Ventral view of chela. **29.** Lateral view of metasomal segment V. **30.** Ventral view of metasomal segment V. **31.** Telson of adult male. **32.** Telson of adult female.

***Alpiscorpius* (*Balkanscorpius* subg. n.) *pavicevici* sp. n.**
(Figs 33-48, Table 2, 4 and 5)

Examined specimens (27 specimens: 13 ♂ and 14 ♀).

Type series. Serbia: Suva planina Mt., Košutina dupka Cave, 1800m asl, [43.206865° N, 22.237138° E], from traps in the small cave, 10 August 2002, leg. D. Pavićević, 1 ♂ (GTC holotype); same data but 12 ♂, 5 ♀ (GTC paratypes); Kopaonik Mt., Brzeće, Duboka, [43.284223° N, 20.846175° E] 27 May 2007, leg. M. Horvatović, 9 ♀ (GTC paratypes).

Etymology: The species epithet is in honour of Dragan Pavićević, an entomologist from Belgrade who collected the specimens of the new species.

Known geographic range: Southern Serbia, south-west Bulgaria? (Fig. 81).

Diagnosis. A very small Euscorpiinae species, total length 19-21 mm. Colour of adults mostly dark brown with darker marbling on chelicerae, carapace, mesosoma and metasoma. The number of trichobothria on the pedipalp manus ventral surface is 4 (V_{1-3}+Et_1). Trichobothrium *est* on fixed finger is located proximally to the centre of the notch of the fixed finger. The number of trichobothria on the pedipalp patella ventral surface is usually 6. The number of trichobothria on the pedipalp patella external surface usually is: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 3, *est* = 4, *et* = 4. The pectinal teeth number in males is usually 8 (7-8) and in females is usually 7 (6-7). Dorsal patellar spur poorly developed. Pedipalp femur is shorter than the patella. Carapace tends to be slightly wider than long or as long as wide. Carinae V_1 follows an internal direction to the trichobothria Et_1, to form a "Y" formation. Spinules on legs ending with a decentralized spinule. The segment V is smooth with carinae absents or just with a very slight edging as a trace of the ventrolateral carina and without granulation. Metasomal segment II is wider than long in both males and females.

Hemispermatophore of type B; lamina distally squat and wide, ending in a rounded and trunked hook; well-developed basal constriction present; truncal flexure present; median projection with *lde*, *ldi* and *lb*; internal projection distally with 8–10 tines in its crown. The number and shape of tines on the crown varied between specimens and between the right and the left hemispermatophores.

Trichobothrial and pectinal teeth count variation

The variation observed in 27 examined specimens (13 ♂ and 14 ♀) is given below (left/right asymmetry not specified).

Pectinal teeth in males (n = 25): 7/7 (2), 7/8 (2), 8/? (1), 8/6 (1), 8/8 (7); in total, 6 in 4% (1), 7 in 24% (6), and 8 in 72% (18); average = 7.68, SD = 0.56.

Pectinal teeth in females (n = 28): 6/5 (1), 6/6 (1), 7/6 (3), 7/7 (9); in total, 5 in 3.57% (1), 6 in 21.43% (6), and 7 in 75% (21); average = 6.71, SD = 0.53.

Pedipalp patella trichobothria *Pv* (n = 54):5/5 (1), 5/6 (3), 6/6 (21), 7/6 (2); in total, 5 in 9.26% (5), 6 in 87.04% (47), and 7 in 3.70% (2); mean = 5.94, SD = 0.36.

Pedipalp patella trichobothria *Pe* (n = 54): *et* = 4/4 (23), 5/4 (4); in total, 4 in 92.59% (50), and 5 in 7.41% (4); average = 4.07, SD = 0.26;

est = 2/3 (1), 2/4 (1), 3/3 (1), 3/4 (2), 4/4 (21), 4/5 (1); *em* = 3/3 (25), 3/4 (2); *esb* = 2/2 (26), 2/3 (1); eb_a = 3/4 (1), 4/4 (26); *eb* = 4/4 (27).

Description of the male holotype

Colouration: Due to dry storage of the specimen, reliable determination of its colour is not possible. Light brown, with darker marbling, more or less, along the whole body; chelicerae with darker marbling; pectines and genital operculum whitish/ivory; the sternites are very light brownish.

Carapace: With few very fine granules; anterior edge smooth and more or less straight; posterior lateral, anterior median and posterior median furrows are present; two pairs of lateral eyes and a pair of median eyes, situated distally of the middle, are present; distance from the centre of median eyes to anterior margin is 39% of carapace length.

Mesosoma: Tergites and sternites smooth. Spiracles small, oval shaped and inclined about 45° downward towards outside.

Metasoma: Dorsal carinae almost completely smooth, with just a few spaced, flattened and hardly visible on segment IV; ventrolateral carinae absent or obsolete; ventromedian carina on segments I–V absent; the segment V has a very slight edging as a trace of the ventrolateral carina and without granulation; all intercarinal spaces are smooth.

Telson: Wider than high. Vesicle mostly smooth, with ventral setae of different sizes, especially around the vesicle/aculeus juncture.

Pectines: Teeth number 8/7; middle lamellae 5/5; several microsetae on marginal lamellae, middle lamellae and fulcra.

Genital operculum: Formed by two subtriangular sclerites partially divided with protruding genital papillae; a few microsetae are present.

Sternum: Pentagonal shape, type 2; wider than long, deep posterior emargination.

Pedipalps: Coxa and trochanter with tuberculated carinae. Femur: dorsal and ventral internal carinae and dorsal external carinae tuberculated; ventral external carinae ir-

regular, present mostly in the proximal 1/3; external median carinae serrulated; anterior median carinae formed by large, spaced and conical tubercles. Patella: dorsal and ventral internal carinae tuberculated; dorsal external carinae from rough and rounded to smooth; ventral external carinae from smooth to roughly crenulated; intercarinal surface ventrally mostly smooth, dorsal surface with fine granulation, frontal surfaces with minute granules positioned in a uniform way. Dorsal patellar spur poorly developed. Chela: carina *D1* smooth and slightly undulated; *D4* formed by flattened tubercles; *V1* is distinctly strong, dark, smooth and partially undulated, with about five tubercles proximally; *V3* is rounded, dark, with a few small and scattered granules; intercarinal internal tegument granulated, ventral mostly smooth, external and dorsal mostly smooth; fixed-movable fingers lock with well evident notch and lobe. Finger dentition: in the most distal part is present a *DD* on the tip; *MD* is formed by very small denticles closely spaced, forming a more or less straight line, discontinued at level of the *OD*; fixed finger has 5/5 *OD* and 10/11 *ID*; movable finger has 7/7 *OD* and 12/12 *ID*.

Trichobothria: Chela: trichobothria on the pedipalp manus ventral surface $V = 3/3$ ($V_{1\text{-}3}$) + $Et_1 = 1/1$; the trichobothrium V_4 is situated on the external surface on the carina V_1; the trichobothrium *et* on fixed finger is located distally to the notch of the fixed finger; *est* is located on proximally half to the notch; *et-est*/*est-dsb* ratio is about 1.91. Patella: ventral (*Pv*): 6/6; patella external (*Pe*): *et* = 4/4, *est* = 4/4, *em* = 3/3, *esb* = 2/2, eb_a = 4/4, *eb* = 4/4. Femur: trichobothrium *d* on femur is slightly proximal to *i,* while the trichobothrium *e* is distal to both, situated on dorsal external carina.

Legs: Legs with two pedal spurs; no tarsal spur; ventral row of tarsus III with a total of 8/8 spinules of increasing size from proximal to distal, ending with a decentralized spinule; 3 larger flanking pairs of tarsal setae adjacent to the ventral spinules row are present. Tubercles present on ventral and dorsal surface of all leg femora, they are much more marked and dark ventrally.

Chelicerae: Typical of the subfamily Euscorpiinae.

Comparison with geographically close species

Alpiscorpius pavicevici sp. n. is mainly distinguishable from *A. dinaricus* stat. et comb. n. by having *Pv* 6 versus *Pv* 5 in the latter species, and an average *Dp* of 7.68 in males and 6.71 in females versus 9.05 in males and 7.45 in females in *A. dinaricus* stat. et comb. n.

Alpiscorpius pavicevici sp. n. is mainly distinguishable from *A. zloporubovici* sp. n. for males with *Dp* 7 and 8 vs *Dp* 9 in *A. zloporubovici* sp. n. Furthermore, *A. pavicevici* sp. n. is on average smaller than *A. zloporubovici* sp. n.

Alpiscorpius pavicevici sp. n. is mainly distinguishable from *A. gamma* for having *Pv* 6 vs mostly *Pv* 5 and for having almost completely smooth segments of the metasoma, while in *A. gamma* they are grainy, at least dorsally. *A. pavicevici* sp. n. is on average smaller.

Alpiscorpius pavicevici sp. n. is mainly distinguishable from *A. caporiaccoi* stat. et comb. n. for males with *Dp* 7 and 8 vs *Dp* 9 in *A. caporiaccoi* stat. et comb. n. and for having almost completely smooth metasoma segments, while in *A. caporiaccoi* stat. et comb. n. segment V has ventrolateral carina with serrulated tubercles and ventromedian carina with a few granules. Furthermore, *A. pavicevici* sp. n. is geographically well-separated from all of these species, being the most south-eastern species of *Balkanscorpius* subg. n. (from south-eastern Serbia probably to the Pirin Mountains).

Note: Teruel et al. (2004) report the presence of a specimen belonging to the "*mingrelicus complex*" in the Pirin Mountains, in southwestern Bulgaria. The data reported by the authors are in line with those of *A. pavicevici* sp. n., especially the fact that it has a *Dp* = 7 despite being a male. This could mean that *A. pavicevici* sp. n. is also present in Bulgaria, but to confirm this registration it will be necessary to examine a large number of specimens and possibly perform molecular analyses.

***Alpiscorpius* (*Balkanscorpius* subg. n.) *caporiaccoi* (Bonacina, 1980) stat. et comb. n.**

(Figs 49-64, Table 3, 4 and 5)

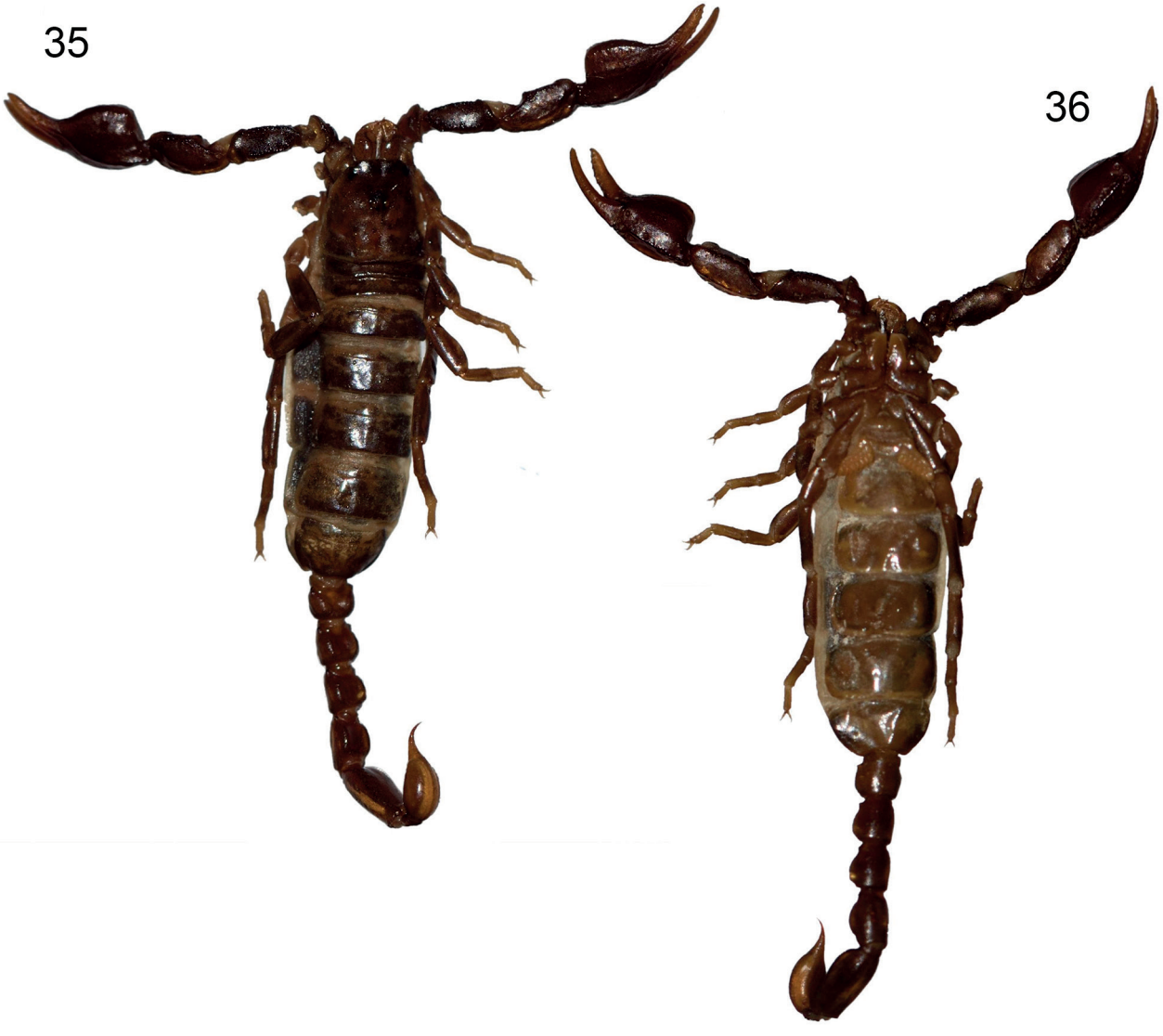
Examined specimens (10 specimens: 4 ♂ and 6 ♀).

Type series. Bosnia-Herzegovina: Barevo, 12 August 1971, leg. A. Valle, R. Bianchi, 1 ♀ (MSNB 8772, lectotype designed herein); same data but 2 ♂, 2 ♀ (GTC, paralectotypes); same data but 56 unsexed specimens (MSNB, paralectotypes).

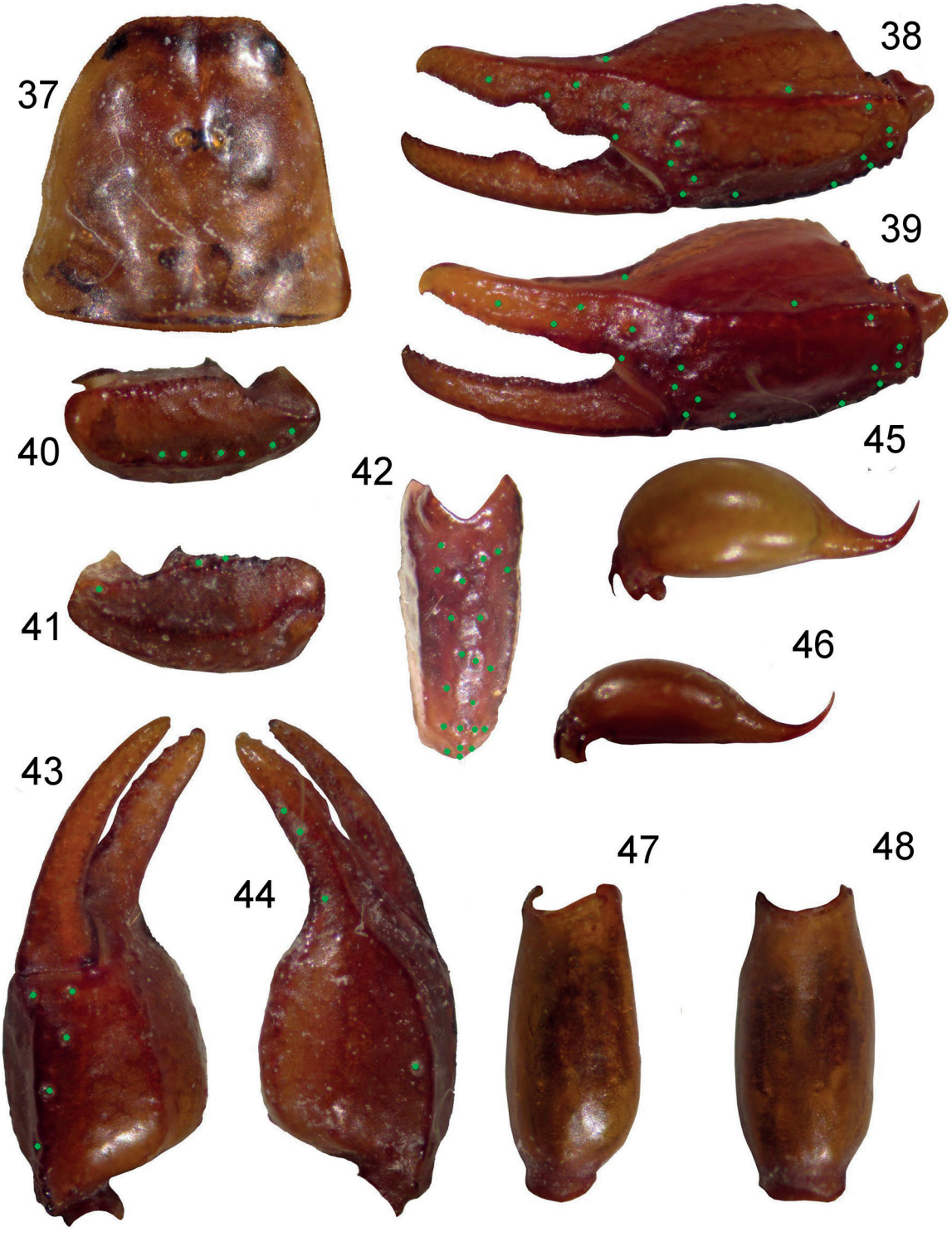
Known geographic range: Bosnia-Herzegovina (Fig. 81).

Diagnosis. A small Euscorpiinae species, total length 24-29 mm. Colour of adults mostly dark brown with darker marbling on whole body. The number of trichobothria on the pedipalp manus ventral surface is 4 ($V_{1\text{-}3}$+Et_1). Trichobothrium *est* on fixed finger is located proximally to the centre of the notch on the fixed finger. The number of trichobothria on the pedipalp patella ventral surface is usually 6 (6 and 5). The number of trichobothria on pedipalp patella external surface is usually: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 3, *est* = 4, *et* = 4 and 5. The number of pectinal teeth in males is usually 9 and in females is usually 7. Dorsal patellar spur is moderately developed. Pedipalp femur is slightly shorter than the patella.

Figs 33-34. Dorsal and ventral view of *Alpiscorpius* (*Balkanscorpius* subgen. n.) *pavicevici* **sp. n.** male holotype.



Figs 35-36. Dorsal and ventral view of *Alpiscorpius* (*Balkanscorpius* subgen. n.) *pavicevici* **sp. n.** female paratype.



Figs 37-48. *Alpiscorpius* (*Balkanscorpius* subgen. n.) *pavicevici* **sp. n.** male holotype except Figs 39 and 46 that are of a female paratype. **37.** Carapace. **38.** External view of chela of adult male. **39.** External view of chela of adult female. **40.** Ventral view of pedipalp patella. **41.** Dorsal view of pedipalp patella. **42.** External view of pedipalp patella. **43.** Ventral view of chela. **44.** Dorsal view of chela. **45.** Telson of adult male. **46.** Telson of adult female. **47.** Lateral view of metasomal segment V. **48.** Ventral view of metasomal segment V.

Carinae V_1 follows an internal direction to the trichobothria Et_1, to form a "Y" formation. Spinules on legs ending with a decentralized spinule. The metasomal segment V has ventrolateral carina with serrulated tubercles and ventromedian carina with a few granules, but in fewer numbers and less marked than in the ventrolateral carina. Metasomal segment II may be slightly longer than wide or as long as wide.

Trichobothrial and pectinal teeth count variation

The variation observed in 10 examined specimens (4 ♂ and 6 ♀) is given below (left/right asymmetry not specified).

Pectinal teeth in males (n = 8): 9/9 (4); in total, 9 in 100% (8); average = 9, SD = 0.00.

Pectinal teeth in females (n = 12): 6/7 (1), 7/7 (4), 8/7 (1); in total, 6 in 8.33% (1), 7 in 83.33% (10), and 8 in 8.33% (1); average = 7, SD = 0.45.

Pedipalp patella trichobothria *Pv* (n = 20): 5/6 (3), 6/6 (7); in total, 5 in 15% (3), 6 in 85% (17); average = 5.85, SD = 0.37.

Pedipalp patella trichobothria *Pe* (n = 20): *et* = 4/4 (2), 5/4 (3), 5/5 (5); in total, 4 in 35% (7), and 5 in 65% (13); average = 4.65, SD = 0.49;

est = 4/4 (20); *em* = 2/3 (1), 3/3 (19); *esb* = 2/2 (20); eb_a = 4/4 (20); *eb* = 4/4 (20).

Description of the female lectotype (MSNB 8772)

Colouration: Brown, brown-reddish, with slightly darker marbling more or less along the whole body, but weak or absent on pedipalp chelae, telson, patella and leg tarsi and metatarsi; chelicerae, telson and legs have a light brown-orangish basal colouration, but only chelicerae and legs have marbling; pectines and genital operculum whitish/ivory; sternites are very light brownish, except the most distal, which is darker.

Carapace: With fine granulation especially on dark marbling; anterior edge with a few granules and more or less straight; posterior lateral, anterior median and posterior median furrows are present; two pairs of lateral eyes and a pair of median eyes, situated distally of the middle, are present; distance from centre of median eyes to anterior margin is 39% of carapace length.

Mesosoma: Tergites mostly smooth, with just a few minute granules laterally and on the distal part of the VII tergite; sternites are smooth. Spiracles small, oval shaped and inclined about 45° downward towards outside.

Metasoma: Dorsal carinae on segments I–IV well-granulated; ventrolateral carinae on segment I and III absent or obsolete, on segment IV a few very small and spaced granules are present; ventromedian carina on segments I–IV are absent; segment V has ventrolateral carina with serrulated tubercles and ventromedian carina with serrulated granules, smaller than the tubercles of the ventrolateral carina.

Telson: Wider than high. Vesicle mostly smooth, with ventral setae of different sizes, especially around the vesicle/aculeus juncture.

Pectines: Teeth number 8/7; middle lamellae 5/5; several microsetae on marginal lamellae, middle lamellae and fulcra.

Genital operculum: Formed by two subtriangular sclerites; a few microsetae are present.

Sternum: Pentagonal shape, type 2; wider than long, deep posterior emargination.

Pedipalps: Coxa and trochanter with tuberculated carinae. Femur: dorsal and ventral internal carinae and dorsal external carinae tuberculated; ventral external carinae irregular, present mostly in the proximal 1/3; external median carinae serrulated; anterior median carinae formed by large, spaced and conical tubercles, of which two bear a macroseta each; intercarinal spaces with granules of different size. Patella: dorsal and ventral internal carinae tuberculated; dorsal external carinae rounded and smooth; ventral external carinae from smooth and undulated to roughly crenulated; intercarinal surface ventrally almost smooth, but with a few minute granules near the ventral internal carina, dorsal surface with granules forming a reticulated pattern, frontal surfaces with minute granules positioned in a uniform way. Dorsal patellar spur moderately developed. Chela: carina *D1* distinctly strong, dark, smooth and slightly undulated; *D4* formed by dark, flattened tubercles; *V1* is distinctly strong, dark and mostly smooth, but slightly crenulated, with about six tubercles proximally; *V3* is rounded, dark, with a few small and scattered granules; intercarinal internal tegument granulated, ventral mostly smooth, external and dorsal mostly smooth; fixed-movable fingers lock with well-evident notch and lobe. Finger dentition: in the most distal part is present a *DD* on the tip; *MD* is formed by very small closely-spaced denticles, forming a more or less straight line, discontinued at the level of the *OD*; fixed finger has 6-6 *OD* and 11/11 *ID*; movable finger has 7/7 *OD* and 15/15 *ID*.

Trichobothria: Chela: trichobothria on the pedipalp manus ventral surface V = 3/3 ($V_{1\text{-}3}$) + Et_1 = 1/1; the trichobothrium V_4 is situated on the external surface of the carina V_1; the trichobothrium *et* on fixed finger is located distally to the notch of the fixed finger; *est* is located proximally to the centre to the notch; *et-est*/*est-dsb* ratio is about 2.86. Patella: ventral (*Pv*): 6/6; patella external (*Pe*): *et* = 5/5, *est* = 4/4, *em* = 3/3, *esb* = 2/2, eb_a = 4/4, *eb* = 4/4. Femur: trichobothrium *d* on femur is slightly proximal to *i,* while the trichobothrium *e* is distal to both, situated on dorsal external carina.

Legs: Legs with two pedal spurs; no tarsal spur; ventral

row of tarsus III with a total of 13/11 spinules of increasing size from proximal to distal, ending with a decentralized spinule; 3 larger flanking pairs of tarsal setae adjacent to the ventral spinules row are presents. Tubercles present on ventral and dorsal surface of all leg femora, they are much more marked and dark ventrally.

Chelicerae: Typical of the subfamily Euscorpiinae.

Comparison with geographically close species

Bonacina, 1980 briefly described "*Euscorpius mingrelicus caporiaccoi*" from Barevo, Bosnia-Herzegovina, as a species with *Pv* = 6 and *Pe* = 22/22, 22/21 and 21/21. This form was not used at the taxonomic level after its description, apart from a few sporadic quotations of little significance. In fact, although it is formally valid, it has not been reassigned to a genus or subgenus, but rather left in a "taxonomic limbo", like several other taxa (see Tropea 2013; Tropea 2017; Tropea et al. 2015; Kovařík et al. 2019). This taxon would seem differentiable, as far as is possible at the moment, from *A. gamma*, because it has *et* = 5-4 (54%-42.5%) vs *et* = 4 in *A. gamma*, *Dp* = 9 in males of *A. caporiaccoi* stat. et comb. n. vs *Dp* = 8 in males of *A. gamma*.

Alpiscorpius caporiaccoi stat. et comb. n. is mainly distinguishable from *A. dinaricus* stat. et comb. n. by having *Pv* 6 versus *Pv* 5. In addition, *A. caporiaccoi* stat. et comb. n. may have *et* = 4 and 5.

Thus this taxon is herein elevated to the species level and moved to the genus *Alpiscorpius* and subgenus *Balkanscorpius* subg. n., *Alpiscorpius* (*Balkanscorpius* subg. n.) *caporiaccoi* stat. et comb. n.

***Alpiscorpius* (*Balkanscorpius subg. n.*) *dinaricus* (Di Caporiacco, 1950) stat. et comb. n.**

(Figs 65-80, Table 2, 4 and 5)

Examined specimens (18 specimens: 9 ♂ and 9 ♀).

Bosnia-Herzegovina: Plasa, 1 ♀ (HNHM Scorp-0246); Plasa, 6 ♂, 4 ♀ (HNHM Scorp-0277); Lower Mijat Cave, Blidinje, Vran pl., Tomislavgrad, 30 August 2017, leg. R. Ozimec, 1 ♂ (ROC); Mt. Vran, east slope, Hajdučke vrleti, Blidinje, Vran pl., Tomislavgrad, 29 August 2018, leg. R. Ozimec, 2 ♂, 1 ♀ (ROC); Surroundings to Piva River near to the border Bosnia-Herzegovina/Montenegro, 3 ♀ (GTC).

Type series. Bosnia-Herzegovina: Prenj, 860 m a.s.l., Mostar, 1 ♀ (NHMW?, lost); Kalinovik, 8 ♂, 20 ♀ (PASW).

Known geographic range: Albania, Bosnia-Herzegovina, Croatia?, Montenegro, Serbia? (Fig. 81).

Diagnosis. A small Euscorpiinae species, total length 26-29 mm. Colour of adults mostly dark brown with darker marbling on whole body. The number of trichobothria on the pedipalp manus ventral surface is 4 (V_{1-3}+Et_1). Trichobothrium *est* on fixed finger is located proximally to the centre of the notch of the fixed finger. The number of trichobothria on the pedipalp patella ventral surface is 5. The number of trichobothria on the pedipalp patella external surface usually is: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 3, *est* = 4, *et* = 4. The number of pectinal teeth in males is usually 9 (8-10), and in females is usually 7 and 8. Pedipalp femur is shorter than the patella. Carapace tends to be as long as wide or slightly longer than wide. Carinae V_1 follows an internal direction to the trichobothria Et_1, to form a "Y" formation. Spinules on legs ending with a decentralized spinule. The metasomal segment V may have poorly marked to well-marked granules on the ventral carinae. Metasomal segment II is more or less as long as wide.

Trichobothrial and pectinal teeth count variation

The variation observed in 18 examined specimens, to which are added data from 29 specimens of Hadži (1930) and Di Caporiacco (1950) (17 ♂ and 30 ♀) is given below (left/right asymmetry not specified).

Pectinal teeth in males (n = 34): 8/8 (3), 8/9 (1), 9/9 (9), 9/10 (2), 10/10 (2); in total, 8 in 20.59% (7), 9 in 61.76% (21), and 10 in 17.65% (6); average = 8.97, SD = 0.63.

Pectinal teeth in females (n = 60): 7/7 (9), 7/8 (4), 8/8 (16), 8/9 (1); in total, 7 in 36.67% (22), 8 in 61.67% (37) and 9 in 1.67% (1); average = 7.65, SD = 0.51.

Pedipalp patella trichobothria *Pv* (n = 94): 5/5 (47); in total, 5 in 100% (94); average = 5, SD = 0.

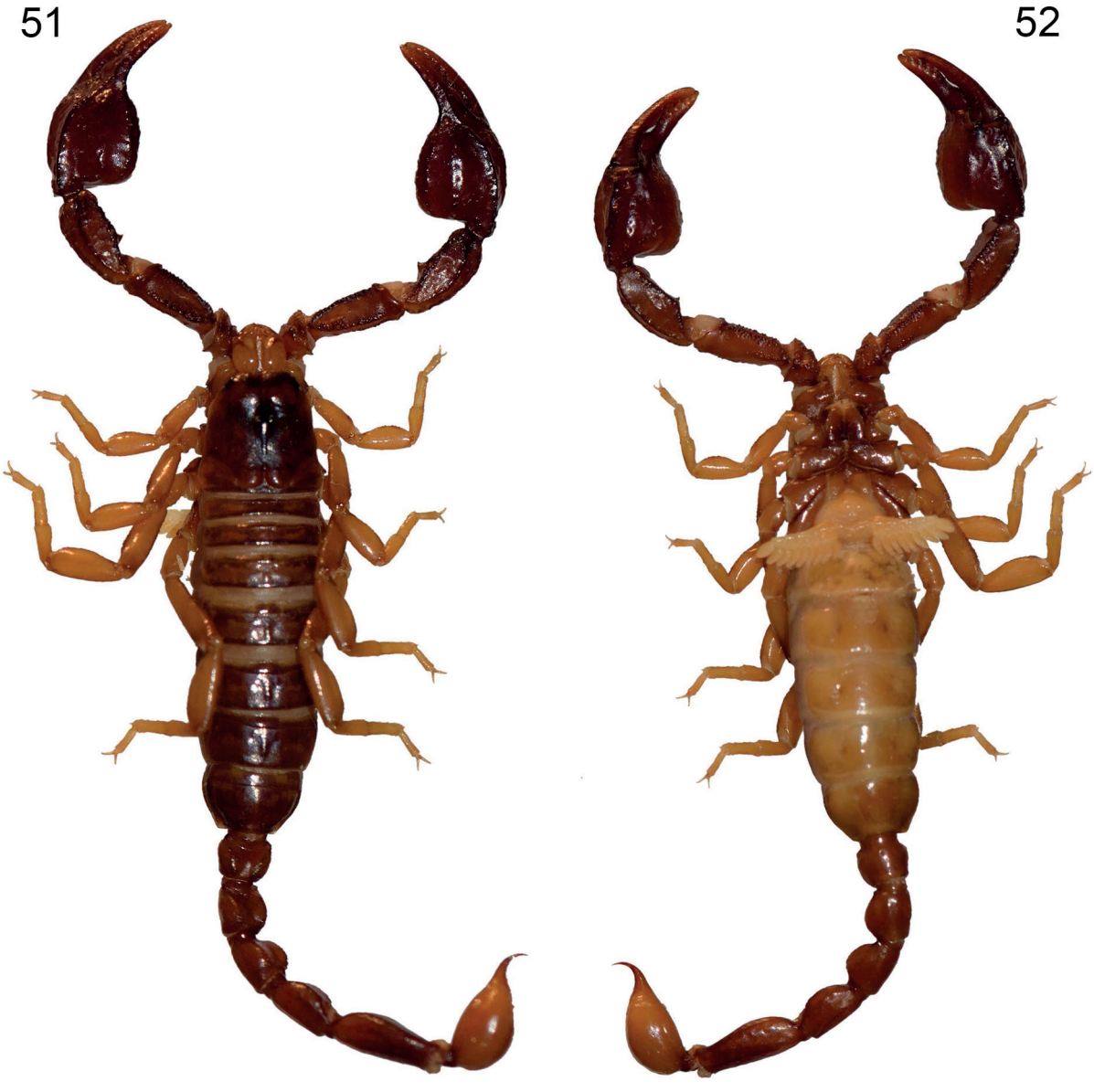
Pedipalp patella trichobothria *Pe* (n = 94): 4/4 (45), 4/5 (2); in total, 4 in 97.87% (92) and 5 in 1.06% (2); average = 4.02, SD = 0.14;

est = 3/4 (1), 4/4 (46); *em* = 3/3 (47); *esb* = 2/2 (47); eb_a = 4/4 (47); *eb* = 4/4 (47).

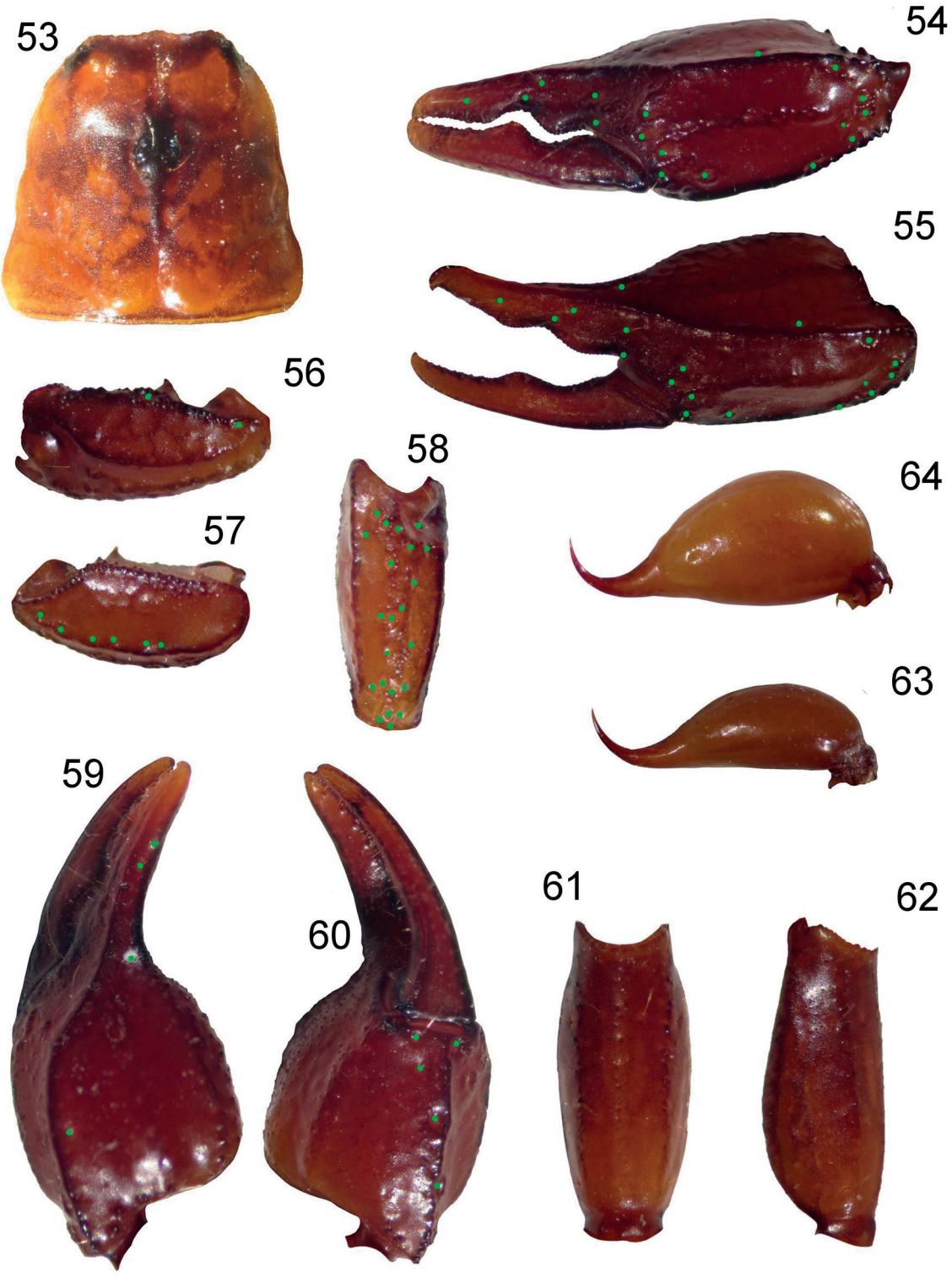
Comparison with geographically close species

Di Caporiacco (1950) described "*E. germanus dinaricus*" based on a specimen from Prenj, near Mostar, and data for 28 specimens from Kalinovik published by Hadži (1930). The main distinction was for females with *Dp* = 8. In fact, this population has a frequency of females with *Dp* = 8 in 61.67% of the pectines (see Table 4). This percentage was only equalled by *A. beroni* (here synonymized with *A. dinaricus* stat. et comb. n.), which has 62.50% (according to data reported by Fet 2000). Apart from these two populations, *A. zloporubovici* sp. n. has the highest *Dp* value, with just the 28.57% of *Dp* = 8 in the females. *Alpiscorpius dinaricus* stat. et comb. n. can also be distinguished from the species

Figs 49-50. Dorsal and ventral view of *Alpiscorpius* (*Balkanscorpius* subgen. n.) *caporiaccoi* **stat. et comb. n.** female lectotype.



Figs 51-52. Dorsal and ventral view of *Alpiscorpius* (*Balkanscorpius* subgen. n.) *caporiaccoi* **stat. et comb. n.** male paralectotype.



Figs 53-64. *Alpiscorpius* (*Balkanscorpius* subgen. n.) *caporiaccoi* **stat. et comb. n.** male paralectotype except figs. 55 and 63 that are of the female lectotype. **53.** Carapace. **54.** External view of chela of adult male. **55.** External view of chela of adult female. **56.** Dorsal view of pedipalp patella. **57.** Ventral view of pedipalp patella. **58.** External view of pedipalp patella. **59.** Dorsal view of chela. **60.** Ventral view of chela. **61.** Ventral view of metasomal segment V. **62.** Lateral view of metasomal segment V. **63.** Telson of adult female. **64.** Telson of adult male.

treated herein to have *Pv* = 5. In addition, some *COI mtDNA* sequences (HM418276; HM418277; KC215718; Graham et al. 2012; Parmakelis et al. 2013) formed a population ranging from the Southeast of Bosnia-Herzegovina, only 33 km from Kalinovik) to southeast of Montenegro. The genetic divergence between these populations ranges from 0.2% to 0.5%, confirming that they are the same species, which, according to geographic and morphological data, should be *A. dinaricus* stat. et comb. n. While the divergence with the other species of the subgenus *Balkanscorpius* subg. n. ranges from 4.7% with *A. omikron* Kovařík et al, 2019 to 7.4% with *A. omega* Kovařík et al., 2019, and higher values with the other *Alpiscorpius* species, confirming the validity of its species status.

Notes: The specimen from Prenj, according to Di Caporiacco (1950) was kept in the Vienna museum, however, despite several searches by the curator Christoph Hörweg, it seems not to be present in the museum. Research in other European museums also did not lead to the discovery of this specimen, so it must be considered lost. This specimen was the only one examined by Di Caporiacco, however, precisely for this reason, for the description of this taxon, the author also took into consideration 28 specimens from Kalinovik reported by Hadži (1930). Therefore, they should be considered syntypes (an opinion shared by Alberto Ballerio, member of the International Commission on Zoological Nomenclature). These specimens, according to Fet et al. (2000) are kept in the PASW, so one of these specimens should be chosen as the lectotype.

Hemispermatophores

Hemispermatophores of the Euscorpiinae are divided here into two main groups, *A* and *B*, primarily on a morphological basis. They are then divisible further by considering additional characters, but this will be taken into account in other documents. The hemispermatophore type A is the most widespread in the Euscorpiinae, such as in the genus *Euscorpius* Thorell, 1876 and related to it and the genus *Tetratrichobothrius* Birula, 1917. It has well-developed lamina that are highly tapered distally, ending in a pointed hook (Fig. 82 A). The Hemispermatophore of type B, on the other hand, is known in most of the *Alpiscorpius*, such as for example the subgenus *Balkanscorpius* subg. n. and probably the subgenus *Alpiscorpius*, as well as several Asian species such as *A. phrygius* and *A. uludagensis*, but it is not shared by *A. mingrelicus* and *E. ciliciensis* (Tropea et al. 2015). It has lamina that are distally squat and wide, ending in a rounded, weakly marked and large, sometime trunked, hook (Fig. 82 B).

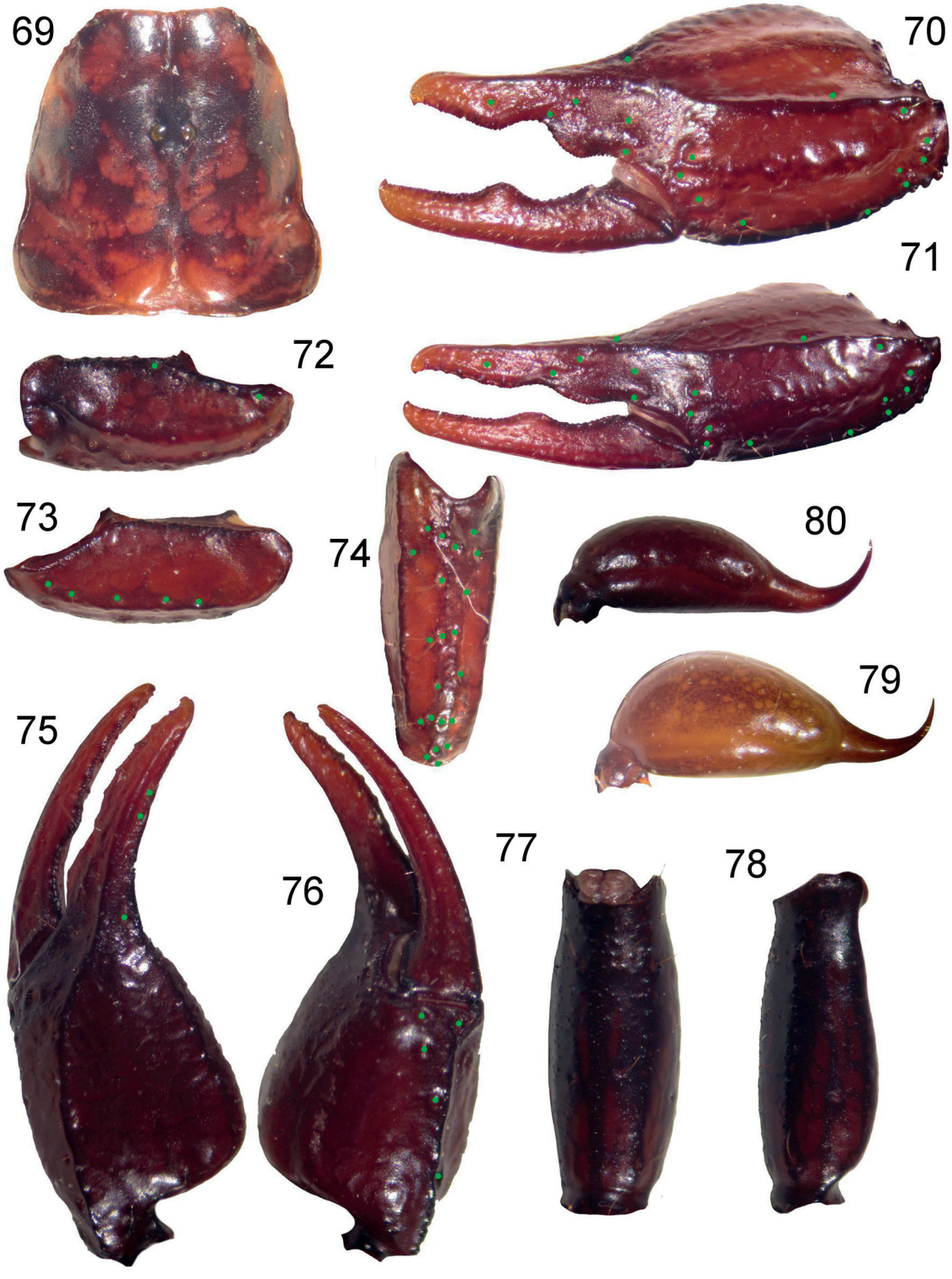
Comments

Like other species of the Euscorpiinae, species of the *Balkanscorpius* subg. n. are often cryptic and barely distinguishable. In addition to the number of a few trichobothrial series, a set of morphological characters must also be taken into consideration to identify them, together with a good number of specimens, precise locality, and sometimes genetic or chromosomal analyses. For the Euscorpiinae, it is difficult to find invariable fixed characters; instead they are commonly variable and shared among the various species, subgenera and genera. Di Caporiacco (1950) had already understood this, albeit in a rudimentary way, but most other authors mainly considered the number of a few trichobothrial series, ignoring the other characters and data, such as the various proportions of the body, the carinae and their graininess, spination of the legs, colouring and marbling and other trichobothrial series. Tropea (2013a, b), understood that the characters considered by other authors "*are not enough…further trichobothrial series and other morphological characters should be considered, which circumscribe well some populations*" and that certain populations "*has been "obscured" by unclear labelling and by the fact that the specialists too often looked only at the variable number of trichobothria neglecting other important morphological characters*". Due to the consideration of only a few characters by the majority of authors, very often a large number of taxa have been synonymous, considering most of the populations as *Euscorpius germanus* or its subspecies, *E. mingrelicus* or its subspecies, as well as "*E. mingrelicus* complex", "*E. gamma*" and "*E. beroni*". This also explains the reason for the great confusion surrounding their identity. The latter species was described from the north of Albania without comparison with similar Balkan taxa. The data of the specimens of *Alpiscorpius beroni* showed no significant differences with *A. dinaricus* stat. et comb. n. described from southern Bosnia-Herzegovina. They have the same trichobothrial and *Dp* number. In addition, the comparison of genetic sequences of specimens from southeastern Bosnia-Herzegovina (about 33 Km from Kalinovik, the type locality of *A. dinaricus* stat. et comb. n.) (Graham et al. 2012) and from Montenegro near Albania (about 40 km from the type locality of *A. beroni*) (Parmakelis et al. 2013), showed that *A. dinaricus* stat. et comb. n. has an area ranging from southern Bosnia-Herzegovina to at least the southeast of Montenegro (24 Km from the border with Albania). So, *A. beroni* is herein synonymized with *A. dinaricus* stat. et comb. n.

As for *A. gamma*, its identity is questionable. In fact, it was described as an "Isontina" (which inhabits the Isonzo valley) species. The Author examined mostly specimens around Isonzo River, especially from the northern stretch, but he also examined four specimens from the mouth of the

Figs 65-66. Dorsal and ventral view of *Alpiscorpius* (*Balkanscorpius* subgen. n.) *dinaricus* **stat. et comb. n.** male.

Figs 67-68. Dorsal and ventral view of *Alpiscorpius* (*Balkanscorpius* subgen. n.) *dinaricus* **stat. et comb. n.** female.



Figs 69-80. *Alpiscorpius* (*Balkanscorpius* subgen. n.) *dinaricus* **stat. et comb. n. 69.** Carapace. **70.** External view of chela of adult male. **71.** External view of chela of adult female. **72.** Dorsal view of pedipalp patella. **73.** Ventral view of pedipalp patella. **74.** External view of pedipalp patella. **75.** Dorsal view of chela. **76.** Ventral view of chela. **77.** Ventral view of metasomal segment V. **78.** Lateral view of metasomal segment V. **79.** Telson of adult male. **80.** Telson of adult female.

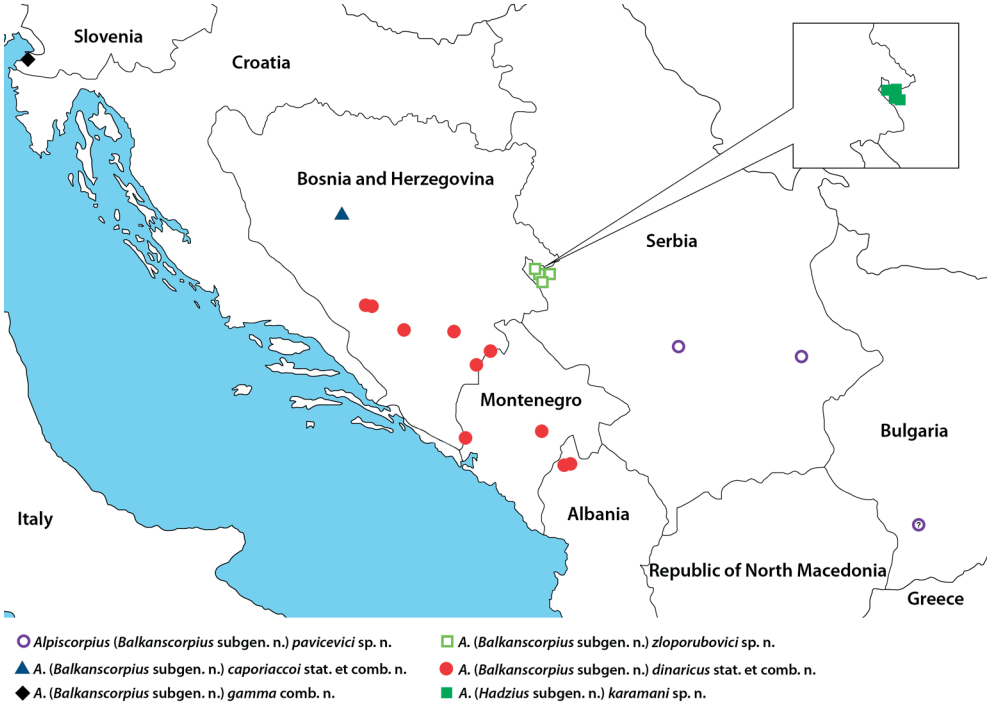


Fig. 81. Known geographic range of *Alpiscorpius* (*Hadzius* subg. n.) *karamani* sp. n., *A.* (*Balkanscorpius* subg. n.) *pavicevici* sp. n., *A.* (*Balkanscorpius* subg. n.) *zloporubovici* sp. n., *A.* (*Balkanscorpius* subg. n.) *dinaricus* stat. n. et comb. n., *A.* (*Balkanscorpius* subg. n.) *caporiaccoi* stat. n. et comb. n., and *A.* (*Balkanscorpius* subg. n.) *gamma* comb. n.

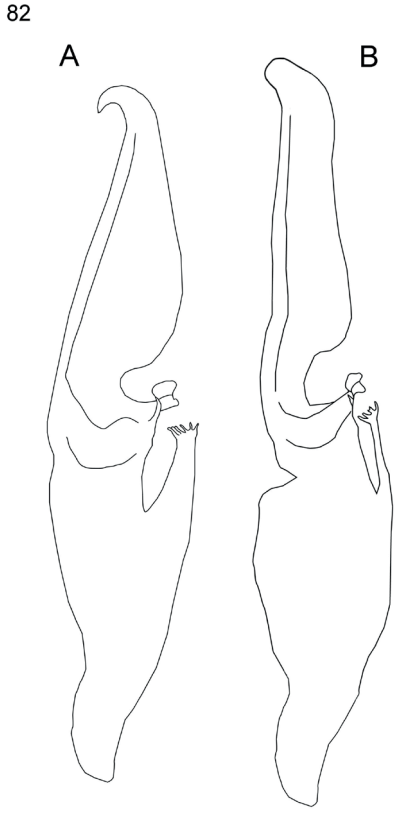


Fig. 82. Hemispermatophores A and B.

Rizana (Risano) River, north Istria, Slovenia. This last locality is also the type locality after the assignment of the lectotype by Scherabon et al. (2000). This assignment has led to some problems, because the mouth of a river is not the right place to find scorpions in general, and especially this group of scorpions. We do not know if the specimens were found in the middle of the mouth, near the mouth, or in the hills relatively far from the mouth, as well as to the orographic right or left of the river, and if there is only one species in the whole area. Thus, to give an identity to *A. gamma* we must hope to find specimens throughout the area to the orographic right and left of the river that they are from either a single species or with morphological differences, to understand where the lectotype belongs. Probably it would have been more suitable to designate the lectotype from a northern population, for simplicity in finding new specimens, for both morphological and molecular studies, and for consistency with what was stated by Di Caporiacco (1950). Now, those populations of "*E. g. gamma*" in the northern areas have been described as new species (see Kovařík et al. 2019), so his identity remains dubious at the moment. The species treated herein are quite distant geographically and have enough differences, at least with the data reported by Di Caporiacco (1950), with *A. gamma*, which allow for their description or redescription, within the limits of reasonableness, while waiting for clarification on *A. gamma*.

Another old taxon that needs to be considered is the forgotten *Scorpius bosnensis* Mollendorf, 1873. It was described with *Pv* = 6, serrated dorsal metasomal carinae and fifth segment with 3 granulous carinae ventrally. However, the type specimens are lost, there is no precise collection location and the description does not allow assignment of this name with certainty to any population. Therefore *Scorpius bosnensis* is considered herein *nomen dubium*.

As far as the supraspecific status is concerned, as has been explained, the morphological, geographical and / or genetic differences divide some populations in an accentuated way, in an equal or greater manner than between taxa of different genera or subgenera. This required the description of two supraspecific taxa, which at the moment have been chosen as a rank of subgenus, purely as a matter of convenience, to avoid confusion and making the genus *Alpiscorpius* paraphyletic; however, it will have to be elevated to genera when the supraspecific taxonomy of oriental species are determined.

Certainly more populations should be studied in order to clarify their status, belonging and diffusion, such as e.g. *Alpiscorpius gamma* Di Caporiacco, 1950, "*Euscorpius germanus histrorum*" Di Caporiacco, 1950 and *E. croaticus* Di Caporiacco, 1950, as well as several new ones.

Table 1. Measurements (mm) and ratios of *Alpiscorpius karamani* sp. n. and *A. zloporubovici* sp. n.

		A. karamani ♀ holotype	*A. karamani* ♂ paratype	*A. zloporubovici* ♂ holotype	*A. zloporubovici* ♀, Mitrovac
Total	L	31.62	31.73	24.30	24.56
Carapace	L / PW	4.95 / 5.00	4.70 / 4.60	3.60 / 3.70	3.70 / 3.65
Metasoma	L	11.50	12.43	9.90	9.08
Segment I	L / W	1.50 / 1.75	1.60 / 1.76	1.30 / 1.61	1.20 / 1.51
Segment II	L / W	1.70 / 1.55	1.80 / 1.61	1.50 / 1.50	1.40 / 1.40
Segment III	L / W	1.95 / 1.50	2.10 / 1.56	1.65 / 1.50	1.58 / 1.36
Segment IV	L / W	2.35 / 1.45	2.53 / 1.46	2.05 / 1.40	1.90 / 1.30
Segment V	L / W	4.00 / 1.45	4.40 / 1.50	3.40 / 1.50	3.00 / 1.35
Telson	L	4.10	4.90	3.70	3.18
Vesicle	L / W / H	2.75 / 1.40 / 1.32	3.70 / 1.90 / 2.00	2.70 / 1.72 / 1.50	2.18 / 1.22 /1.00
Aculeus	L	1.35	1.20	1.00	1.00
Femur	L / W	4.20 / 1.60	4.00 / 1.50	2.88 / 1.10	2.85 / 1.15
Patella	L / W	4.10 / 1.88	4.00 / 1.65	2.90 / 1.30	3.00 / 1.30
Chela	L / W	8.40 / 3.18	8.50 / 3.10	5.88 / 2.45	5.90 / 2.20
Movable finger	L	4.80	4.85	3.40	3.20
Ratio	*CarA %*	39.00	39.36	40.83	40.54
	Lcar/Wcar	0.99	1.02	0.97	1.01
	Lcar/Lpat	1.21	1.17	1.24	1.23
	Lcar/Ltel	1.21	0.96	0.97	1.16
	Lfem/Lpat	1.02	1.00	0.99	0.95
	Lchel/Wchel	2.64	2.74	2.40	2.68
	Htel/Wtel	0.94	1.05	0.87	0.82
	Ltel/Htel	3.11	2.45	2.47	3.18
	Lmet/ met.seg V	2.87	2.82	2.91	3.03
	Lmet/Lcar	2.32	2.64	2.75	2.45
	Lmet/Wmet	1.49	1.57	1.32	1.31
	L/W met.seg I	0.857	0.91	0.81	0.79
	L/W met.seg II	1.097	1.12	1.00	1.00
	L/W met.seg III	1.300	1.35	1.10	1.16
	L/W met.seg IV	1.621	1.73	1.46	1.46
	L/W met.seg V	2.759	2.93	2.27	2.22

Abbreviations: L = length, W = width, PW = posterior width, H = height.

Table 2. Measurements (mm) and ratios of *Alpiscorpius pavicevici* sp. n. and *A. dinaricus* stat. et comb. n.

		A. pavicevici ♂ holotype	*A. pavicevici* ♀ paratype	*A. dinaricus* ♂	*A. dinaricus* ♀
Total	L	19.60	20.20	27.50	28.51
Carapace	L / PW	2.80 / 2.80	2.90 / 3.00	3.80 / 3.80	4.30 / 4.30
Metasoma	L	7.40	7.20	10.75	10.91
Segment I	L / W	0.90 / 1.40	0.90 / 1.30	1.35 / 1.80	1.30 / 1.80
Segment II	L / W	1.10 / 1.25	1.10 / 1.20	1.65 / 1.68	1.68 / 1.60
Segment III	L / W	1.30 / 1.26	1.22 / 1.15	1.80 / 1.62	1.85 / 1.60
Segment IV	L / W	1.45 / 1.15	1.50 / 1.10	2.25 / 1.57	2.28 / 1.48
Segment V	L / W	2.65 / 1.20	2.48 / 1.10	3.70 / 1.60	3.80 / 1.54
Telson	L	3.00	2.70	3.95	3.80
Vesicle	L / W / H	2.10 / 1.50 / 1.20	1.80 / 1.10 / 0.87	2.85 / 1.80 / 1.60	2.50 / 1.58 1.20
Aculeus	L	0.90	0.90	1.10	1.30
Femur	L / W	2.15 / 0.90	2.10 / 0.85	2.80 / 1.15	3.18 / 1.35
Patella	L / W	2.23 / 1.00	2.30 / 1.00	3.03 / 1.20	3.30 / 1.50
Chela	L / W	4.38 / 1.70	4.50 / 1.80	6.26 / 2.70	6.60 / 2.60
Movable finger	L	2.50	2.60	3.53	3.60
Ratio	*CarA %*	41.07	41.38	39.47	41.86
	Lcar/Wcar	1.00	0.97	1.00	1.00
	Lcar/Lpat	1.25	1.26	1.25	1.30
	Lcar/Ltel	0.93	1.07	0.96	1.13
	Lfem/Lpat	0.96	0.91	0.92	0.96
	Lchel/Wchel	2.58	2.50	2.32	2.54
	Htel/Wtel	0.80	0.79	0.89	0.76
	Ltel/Htel	2.50	3.00	2.47	3.17
	Lmet/ met.seg V	2.79	2.90	2.90	2.87
	Lmet/Lcar	2.64	2.48	2.83	2.54
	Lmet/Wmet	1.18	1.23	1.30	1.36
	L/W met.seg I	0.64	0.69	0.75	0.72
	L/W met.seg II	0.88	0.92	0.98	1.05
	L/W met.seg III	1.03	1.06	1.11	1.16
	L/W met.seg IV	1.26	1.36	1.43	1.54
	L/W met.seg V	2.21	2.25	2.31	2.47

Abbreviations: L = length, W = width, PW = posterior width, H = height.

Table 3. Measurements (mm) and ratios of *Alpiscorpius caporiaccoi* stat. et comb. n.

		A. caporiaccoi 8737 ♂ paralectotype	*A. caporiaccoi* 8772 ♀ lectotype
Total	L	25.65	27.28
Carapace	L / PW	3.80 / 3.65	3.90 / 4.00
Metasoma	L	10.05	10.30
Segment I	L / W	1.30 / 1.58	1.35 / 1.60
Segment II	L / W	1.50 / 1.41	1.60 / 1.40
Segment III	L / W	1.70 / 1.40	1.75 / 1.35
Segment IV	L / W	2.15 / 1.32	2.10 / 1.28
Segment V	L / W	3.40 / 1.38	3.50 / 1.25
Telson	L	3.80	3.58
Vesicle	L / W / H	2.80 / 1.60 / 1.50	2.48 / 1.40 / 1.18
Aculeus	L	1.00	1.10
Femur	L / W	2.95 / 1.15	3.22 / 1.30
Patella	L / W	3.05 / 1.40	3.30 / 1.40
Chela	L / W	6.42 / 2.50	6.90 / 2.58
Movable finger	Length	3.80	3.90
Ratio	*CarA %*	40.79	38.97
	Lcar/Wcar	1.04	0.97
	Lcar/Lpat	1.25	1.18
	Lcar/Ltel	1.00	1.09
	Lfem/Lpat	0.97	0.98
	Lchel/Wchel	2.57	2.67
	Htel/Wtel	0.94	0.84
	Ltel/Htel	2.53	3.03
	Lmet/ met.seg V	2.96	2.94
	Lmet/Lcar	2.64	2.64
	Lmet/Wmet	1.42	1.50
	L/W met.seg I	0.82	0.84
	L/W met.seg II	1.06	1.14
	L/W met.seg III	1.21	1.30
	L/W met.seg IV	1.63	1.64
	L/W met.seg V	2.46	2.80

Abbreviations: L = length, W = width, PW = posterior width, H = height.

Table 4. Percentage of the number of pectinal teeth found in the examined specimens of Balkans *Alpiscorpius*.

	Dp ♂%					*Dp* ♀%				
	kara	*zlopo*	*dinar*	*capor*	*pavic*	*kara*	*zlopo*	*dinar*	*capor*	*pavic*
5	-	-	-	-	-	-	-	-	-	3.57
6	-	-	-	-	4	-	14.29	-	8.33	24.43
7	-	-	-	-	24	78.95	57.14	36.67	83.33	75.00
8	83.33	8.33	20.59	-	72	21.05	28.57	61.67	8.33	-
9	16.67	83.33	61.76	100	-	-	-	1.67	-	-
10	-	8.33	17.65	-	-	-	-	-	-	-
Average	**8.17**	**9.00**	**8.97**	**9**	**7.68**	**7.21**	**7.14**	**7.65**	**7**	**6.71**

Abbreviations: *kara* = *Alpiscorpius* (*Hadzius* subg. n.) *karamani* sp. n.; *zlopo* = *A*. (*Balkanscorpius* subg. n.) *zloporubovici* sp. n.; *dinar* = *A*. (*Balkanscorpius* subg. n.) *dinaricus* stat. n. et comb. n.; *capor* = *A*. (*Balkanscorpius* subg. n.) *caporiaccoi* stat. n. et comb. n.; *pavic* = *A*. (*Balkanscorpius* subg. n.) *pavicevici* sp. n.

Table 5. Percentage of the number of trichobothrial series *Pv* and *Pe-et* found in the examined specimens of Balkans *Alpiscorpius*.

	Pv%					*Pe-et*%				
	kara	*zlopo*	*dinar*	*capor*	*pavic*	*kara*	*zlopo*	*dinar*	*capor*	*pavic*
3	-	-	-	-	-	-	2.50	-	-	-
4	-	-	-	-	-	-	90.00	97.87	35	92.59
5	-	20	100	15	9.26	73.08	7.50	1.06	65	7.41
6	-	77.50	-	85	87.04	26.92	-	-	-	-
7	76.92	2.50	-	-	3.70	-	-	-	-	-
8	23.08	-	-	-	-	-	-	-	-	-
Average	**7.23**	**5.82**	**5**	**5.85**	**5.94**	**5.27**	**4.05**	**4.02**	**4.65**	**4.07**

Abbreviations: *kara* = *Alpiscorpius* (*Hadzius* subg. n.) *karamani* sp. n.; *zlopo* = *A*. (*Balkanscorpius* subg. n.) *zloporubovici* sp. n.; *dinar* = *A*. (*Balkanscorpius* subg. n.) *dinaricus* stat. n. et comb. n.; *capor* = *A*. (*Balkanscorpius* subg. n.) *caporiaccoi* stat. n. et comb. n.; *pavic* = *A*. (*Balkanscorpius* subg. n.) *pavicevici* sp. n.

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REFERENCES

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.

DI Caporiacco L. 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.

Fet V, Graham MR, Blagoev G, Karataş A, Karataş Ah. 2016. DNA barcoding indicates hidden diversity of *Euscorpius* (Scorpiones: Euscorpiidae) in Turkey. Euscorpius. 216:1–20.

Fet V, Sissom WD. 2000. Family Euscorpiidae. In: Fet V, Sissom WD, Lowe G, Braunwalder ME (Editors). Catalog of the Scorpions of the World (1758-1998). New York: New York Entomological Society. p. 355–381.

Gantenbein B, Fet V, Barker M, Scholl A. 2000. 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, Fet V, Largiadèr CR, Scholl A. 1999. First DNA phylogeny of *Euscorpius* Thorell, 1876 (Scorpiones: Euscorpiidae) and its bearing on taxonomy and biogeography of this genus. Biogeographica (Paris). 75:49–65.

Graham MR, Webber MM, Blagoev G, Ivanova N, Fet V. 2012. Molecular and morphological evidence supports the elevation of *Euscorpius germanus croaticus* Di Caporiacco,

1950 (Scorpiones: Euscorpiidae) to *Euscorpius croaticus* stat. nov., a rare species from Croatia. Revista Ibérica de Aracnología. 21:41–50.

Hadži J. 1929. Skorpije Schmidtove zbirke (*Euscorpius italicus polytrichus* n. ssp. i ostale nove rase). Die Skorpione der Schmidt'schen Sammlung (*Euscorpius italicus polytrichus* n. ssp. und andere neue Rassen). Glasnik Muzejskega Društva za Slovenijo, (B). 10(1-4):30–41 (in Serbo-Croatian).

Hadži J. 1930. Die europäischen Skorpione des Polnischen Zoologischen Staatsmuseums in Warszawa. Annales Musei Zoologici Polonici. 9(4):29–38.

Kovařík F, Štundlová J, Fet V, Šťáhlavský F. 2019. Seven new Alpine species of the genus *Alpiscorpius* Gantenbein et al., 1999, stat. n. (Scorpiones: Euscorpiidae). Euscorpius. 287:1–29.

Parmakelis A, Stathi I, Kotsakiozi P, Poulikarakou S, Fet V. 2013. Hidden diversity of *Euscorpius* (Scorpiones: Euscorpiidae) in Greece revealed by multilocus species-delimitation approaches. Biological Journal of the Linnean Society. 110:728–748.

Scherabon B, Gantenbein B, Fet V, Barker M. Kuntner M, Kropf C, Huber D. 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 (Editors): Proceedings of the 18th European Colloquium of Arachnology, Stará Lesná, 1999. Ekológia (Bratislava). 19 (Supplement 3):253–262.

Stahnke HL. 1971. Scorpion nomenclature and mensuration. Entomological News. 81:297–316.

Štundlová J, Šmíd J, Nguyen P, Šťáhlavský F. 2019. Cryptic diversity and dynamic chromosome evolution in Alpine scorpions (Euscorpiidae: *Euscorpius*). Molecular Phylogenetics and Evolution. 134:152–163.

Teruel R, Fet V, De Armas LF. 2004. A note on the scorpions from the Pirin Mountains, southwestern Bulgaria (Scorpiones: Buthidae, Euscorpiidae). Euscorpius. 14:1–11.

Tropea G. 2013a. Reconsideration of the taxonomy of *Euscorpius tergestinus* (Scorpiones: Euscorpiidae). Euscorpius. 162:1–23.

Tropea G. 2013b. A new species of *Euscorpius* Thorell, 1876 from the Western Balkans (Scorpiones: Euscorpiidae). Euscorpius. 174:1–10.

Tropea G, Yağmur EA, Fet V. 2015. A revision of the Anatolian-Caucasian "*Euscorpius mingrelicus* complex" (Scorpiones: Euscorpiidae). Euscorpius. 203:1–32.

Vachon M. 1974. Étude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en Arachnologie, Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. Bulletin du Muséum National d´Histoire Naturelle Paris. 140:857–958.