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**A NEW SPECIES OF *EUSCORPIUS* THORELL, 1876 FROM CORFU,
WITH NOTES ON THE SUBGENUS *EUSCORPIUS* IN GREECE**
(Scorpiones: Euscorpiidae)

Abstract. *Euscorpium (Euscorpium) corcyraeus* **sp. n.** is described based on specimens from Corfu Island, in Greece. It is characterized by small size, light colour and a typical mesotrichous trichobothrial pattern ($Pv=9$, $et=6$, $em=9$, $eb=4$).

Riassunto. *Una nuova specie di Euscorpium Thorell, 1876 di Corfù (Scorpiones: Euscorpiidae). Euscorpium (Euscorpium) corcyraeus sp. n.* è descritta basandosi su esemplari dall'isola di Corfù, in Grecia. Essa è caratterizzata da piccole dimensioni, colore particolarmente chiaro e un tipico pattern tricobotriale ($Pv=9$, $et=6$, $em=9$, $eb=4$).

Key words. Scorpion, *Euscorpium*, new species, Corfu, Greece

Introduction

The genus *Euscorpium* Thorell, 1876 is one of the most studied taxa of scorpions, however, because of its complicated taxonomy, it is in continuous evolution and still unresolved. The populations of Greece are the focus of many studies from several time because of the particular geographical history and position of this country. In fact, Greece is in the middle of the distribution range of the genus *Euscorpium* and has over 3000 islands, which over the course of geological eras have been united and divided at the continent by the sea, thus, creating ideal situations for speciation and endemisms (e.g. the genera *Iurus* THORELL, 1876 and *Protoiurus* SOLEGLAD, FET, KOVAŘÍK & YAGMUR, 2012). Several authors contributed to the knowledge of the genus *Euscorpium* in Greece: C.L. KOCH (1837) described *Scorpius naupliensis* from Peloponnese; BIRULA (1900; 1903) described *Euscorpium koschewnikowi* and *E. scaber* from northeastern Greece and *E. candiota* from Crete; DI CAPORIAMCO (1950) described *E. carpathicus aegaeus* from Antiparos island, in the Aegean Sea, and *E. c. ossae* from Mt. Ossa in Thessaly. KINZELBACH (1975, 1982) divided *E. carpathicus* (LINNAEUS, 1767) into two species: *E. carpathicus* and *E. mesotrichus* HADŽI, 1929. Besides, he placed in synonymy all the forms of the subgenus *Euscorpium* with these two species, based on the number of trichobothria on the ventral surface of the pedipalp patella. The name *E. mesotrichus* is not available because it is a junior homonym of *E. italicus mesotrichus* HADŽI, 1929 (DI CAPORIAMCO 1950; FET 1997b; FET & BRAUNWALDER 2000). DI CAPORIAMCO (1950) synonymized "Hadži's" *E. mesotrichus* with *E. tergestinus* (C. L. KOCH, 1837), but further studies (GANTENBEIN *et al.* 2001; FET *et al.* 2003) reported that *E. mesotrichus*, according to Kinzelbach's interpretation, also refers to others species such as *E. balearicus* DI CAPORIAMCO, 1950, *E. sicanus* (C. L. KOCH, 1837) and other forms, besides *E. tergestinus*. *E. carpathicus* s. str. is restricted to the populations of the type locality in Romania (FET & SOLEGLAD 2002), so, the present *Euscorpium* taxonomy for Greece includes the following species: *Euscorpium (Polytrichobothrius) italicus* (HERBST, 1800), *E. (Polytrichobothrius) naupliensis* (C.L. KOCH, 1837), *E. (Euscorpium) sicanus* (C.L. KOCH, 1837), *E. (Euscorpium) koschewnikowi* BIRULA, 1900 and *E. (Euscorpium) hadzii* DI CAPORIAMCO, 1950 (GANTENBEIN *et al.* 2002; FET & SOLEGLAD 2002; FET *et al.* 2003; FET *et al.* 2004; VIGNOLI & SALOMONE 2008). In addition to these species, several subspecies of *E. carpathicus sensu lato*, should be added: *E. carpathicus scaber* BIRULA, 1900, *E. c. candiota*

BIRULA, 1903, *E. c. ossae* DI CAPORIAMCO, 1950 and *E. c. aegaeus* DI CAPORIAMCO, 1950, and forms still unnamed like the population of Samos island (VIGNOLI *et al.* 2008; TROPEA *et al.* 2012). Some of these forms are apparently good species but require further study. The new species described in this paper is *Euscorpius (Euscorpius) corcyraeus* sp. n., from Corfu, a Greek island located in the Ionian Sea, off the border between Albania and Greece.

Materials and methods

22 specimens collected at Corfu Island (Greece) were examined (see type material). Furthermore, 79 specimens were included in this study as comparison material (labeled as *E. carpathicus* from Greece of the MSNB: 4767, 4772, 4775, 4786, 4788, 4792, 4793, 4853, 4906, 4951, 10013, 10014, 10015, 10016, 10020, 10021, 13069, 13070, 13071, 13869, 13870, 13895, 13896, 13897, 13898, 13899; from Montenegro: 13258, 13259, 13262, 13263, 13264, 13265; from Bosnia 13260, 13261; labeled as *E. carpathicus* from Greece of the MCVR: 13066, 13067, 13068, 13069, 13070, 13071, 13072, 13073, 13074, 13075, 13076, 13077, 13078, 13079, 13080; of the GTC: *Euscorpius carpathicus* s.s. from Romania: 90, 91, 92; *E. sicanus* complex from Italy: 65, 66, 67, 68, 69, 72, 73, 74, 75, 107, 108, 186, 187, 196, 197, 198, 199, 215, 216, 217, 218, 219; *E. hadzii* from Bosnia and Montenegro: 228, 229, 230, 231, 232).

Abbreviations: *V*: trichobothria on ventral pedipalp chela manus; *Pv*: trichobothria on patella ventral surface; *Pe*: trichobothria on the pedipalp patella external surface; *et*: external terminal; *est*: external sub-terminal; *em*: external medium; *esb*: external suprabasal; *eba*: external basal *a*; *eb*: external basal; DPS: dorsal patellar spur; DD: distal denticle; MD: median dentition; OD: outer dentition; ID: inner dentition; IAD: inner accessory denticles; MSNB: Museo Civico di Scienze Naturali "E. Caffi" di Bergamo; MCVR: Museo Civico di Storia Naturale di Verona; GTC: private collection of Gioele Tropea.

The trichobothrial designations follow Vachon (1974). The morphological measurements are given in millimeters (mm) following Stahnke (1970). The morphological nomenclature follows Stahnke (1970), Hjelle (1990) and Sissom (1990); the chela carinae and denticle configuration follows Soleglad and Sissom (2001) and sternum terminology follows SOLEGLAD & FET (2003).

Description of the new species

Family Euscorpiidae LAURIE, 1896
Genus *Euscorpius* THORELL, 1876
Subgenus *Euscorpius* THORELL, 1876

***Euscorpius corcyraeus* sp. n.**

Type material. Holotypus ♀ (MSNB n. 922): Corfu Island, Greece, 23.04.1957, leg. Valle and Bianchi. Paratypus ♂ (MSNB n. 937): Corfu Island, Greece, 23.04.1957, leg. Valle and Bianchi. Paratypes ♀♀ (MSNB n. 906, 907, 909, 910, 911, 912, 913, 914, 920, 921, 924, 925, 926, 927, 928, 929, 930, 933, 934, 935): Corfu Island, Greece, 23.04.1957, leg. Valle and Bianchi

Etymology: The specific epithet refers to Latin name of Corfu.

Diagnosis: *Euscorpius corcyraeus* sp. n. is a very small *Euscorpius* species, with an average total length of 23 mm. Color is very light brownish-yellowish with carapace and pedipalps darker, sometimes brownish-reddish, and legs, telson and chelicerae lighter. The number of trichobothria on the pedipalp manus ventral surface is 4 (3 *V* + *Et* 1); the number of trichobothria on the pedipalp patella ventral surface is 9 (86.37% of the examined pedipalps); the number of trichobothria on pedipalp patella external surface is: *eb* = 4, *eba* = 4, *esb* = 2, *em* = 4, *est* = 4, *et* = 6 (84.10% of the examined pedipalps). The pectinal teeth count is 9 in male, 7 in females. The telson vesicle in males is

considerably more swollen than in females: Average L/H ratio of the vesicle is 1.63 in male and 2.18 in females. Chela with a notch on fixed finger and scalloping of the movable finger in adult males, obsolete in females. The dorsal patellar spur is well developed. Average L/W ratio of the chela is 2.24 in male and 2.48 in females. Average length/posterior width ratio of the carapace is 0.98. Average value of the length from center median eyes to anterior margin of the carapace is equivalent to 39.70% of the carapace length. Average value of the length from center median eyes to posterior margin of the carapace is equivalent to 60.30% of the carapace length.

Description of the holotypus (female), Colouration: Very light brownish/yellowish with carapace and pedipalps darker, legs, telson and chelicerae lighter. The coxal region is brownish/yellowish coloured. The sternites, pectines and genital operculum are very light brownish to white.

Carapace: Length 3.54 mm; posterior width 3.75. Very slightly and finely granulated. All the furrows are shallow, only the posterior furrows are slightly more marked. Distance from the center of the median eyes to the anterior margin of the carapace is equivalent to 39.83% of the prosoma; the length from the center of the median eyes to the posterior margin of the carapace is equivalent to 60.17% of the prosoma.

Mesosoma: Tergites very slightly and finely granulated, almost smooth; sternites finely punctate. The area of overlap between the sternites is lighter in colour. The spiracles are very small, oval shaped and it is inclined to about 45° downwards towards outside.

Metasoma: Medium to small size with respect to body length. Dorsal carinae from segment I-IV are slightly granulated, obsolete on the segment V; ventromedian carinae from segment I-IV absent, ventromedian carinae on segment V are formed by fine granules; ventrolateral carinae of the segments I and II are obsolete, of the segments III and IV slightly rough, of the segment V are finely serrulate.

Telson: Vesicle weakly swollen; smooth, with ventral setae of different sizes; telson height 0.96, telson length 2.94, vesicle length 2.10, vesicle width 0.96.

Genital operculum: Partially divided, finely punctate.

Pectines: Pectinal teeth count 7-7; middle lamellae count 4-4.

Sternum: Pentagonal shape, type 2. Length similar to width, deep posterior emargination.

Pedipalp: Coxa and trochanter with strong tuberculation. Femur: dorsal internal carinae formed by dark large tubercles; dorsal external carinae formed by slightly serrulate tubercles, their size increases from distal to proximal, intercarinal spaces uniformly very finely granulate; external median carinae serrulate but very little marked, anterior median formed by conical marked tubercle. Patella length 3.00; patella width 1.35; dorsal internal carinae crenulate and dark; dorsal external carinae from rough to very little marked; ventral external carinae from rough to finely serrulate; Ventral internal carinae serrulate, intercarinal spaces uniformly very finely granulate or rough. Dorsal patellar spur well developed. Chelal carina D_1 is distinctly strong, from smooth to rough; D_4 is formed by scattered granules; V_1 is distinctly strong, from rough to weakly crenulate and dark; V_3 is formed by granules on 2/3 of length; external carina with granules on distal half; intercarinal tegument rough or smooth except between carinae D_4 and V_3 , which is granulated. Movable finger dentition: MD like a straight line formed from very small denticles closely spaced and an DD on the distal tip; OD formed from 7 denticles on movable finger; ID formed from 7 denticles on movable finger; IAD on both movable and fixed finger are 4.

Trichobothria: Chela trichobothria series V standard: $V = 4-4$ (3 $V+$ Et_1); patella ventral (Pv): 7-7; Patella external (Pe): $et = 6-6$, $est = 4-4$, $em = 4-4$, $esb = 2-2$, $eba = 4-4$, $eb = 4-4$.

Legs: legs with two pedal spurs. Tarsal III ventral row with 7-7 stout spinules (the ventral distal spinules pair are not included); 3 tarsal setae flanked pairs adjacent to the ventral spinules row. Ventral granulation on the leg femora from I-III is tuberculate, smooth on IV leg; dorsal granulation on leg femora from I-IV is obsolete.

Chelicerae: movable finger: The dorsal distal tooth is smaller than the ventral distal tooth; Ventral edge is smooth with brush-like setae on the inner part; dorsal edge has five teeth: one distal, two small subdistal, one big median and a small basal; fixed finger has four

teeth: one distal, one subdistal, one median and one basal. The median and the basal are in a fork arrangement. The internal edge has brush-like setae.

Variations observed in 22 studied specimens (1 male, 21 females) are the follows: pectinal teeth in males: 9-9 (1/1); females: 7-7 (20/21), 7-8 (1/21); pedipalp patella trichobothria *Pv*: 8-8 (2/22), 9-8 (2/22), 9-9 (18/22); pedipalp patella trichobothria *Pe*: *et* = 3-6 (1/22), 5-6 (1/22), 6-6 (17/22), 6-7 (1/22), 7-7 (2/22), *est* = 3-3 (1/22), 4-3 (1/22), 4-4 (20/22), *em* = 4-3 (1/22), 4-4 (21/22), *esb* = 2-2 (22/22), *eba* = 4-4 (22/22), *eb* = 4-4 (22/22). The variations of the trichobothrial pattern is within the standard values of variability and shows the stability of diagnostic characters.

Discussion and comparison

Some specimens from Corfu were identified as *E. carpathicus* by WERNER (1928) and DI CAPORIANCO (1950). The specimens described by Werner are very light, of medium-large size (35-40 mm) for the genus *Euscorpius*, with the average of pectinal teeth count of 8 in females and 9 in males. The two specimens described by Di Caporiano, brown-reddish colored and with telson and legs lighter, are not adults; their pectinal teeth count is 7 in the female and 8 in the male; the number of trichobothria on the pedipalp patella ventral surface is 8. *Euscorpius corcyraeus* sp. n. does not fit with any of these two forms according to the descriptions made by the two authors; the specimens described by Werner are larger, with an higher pectinal teeth count. The specimens described by Di Caporiano are dark, with a lower pectinal teeth count; further, the size of these young specimens is the same of adults *E. corcyraeus* sp. n.

Further studies are required to understand the scorpion populations of this island, which could include other forms of *Euscorpius*, besides *E. italicus* (VACHON 1975; GANTENBEIN *et al.*, 2002) and *E. corcyraeus* sp. n. In addition, on the island is also present *Mesobuthus gibbosus* (BRULLÉ, 1832).

The species of the subgenus *Euscorpius* in Greece are *E. sicanus*, *E. koschewnikowi* and *E. Hadzii*. In additions to these species, also several subspecies of *E. carpathicus sensu lato* are known in the Greek regions on the Aegean Sea: *E. carpathicus scaber*, *E. c. candiota*, *E. c. ossae* and *E. c. aegaeus*. All of these forms are compared with *E. corcyraeus* sp. n. following.

E. sicanus was described by C.L. KOCH, (1837) from Messina, Sicily. DI CAPORIANCO (1950) considered this form as a subspecies of *E. carpathicus* diffused in southern Italy. In the same work Di Caporiano described other subspecies, mostly from Italy. FET *et al.* (2003) elevated *E. sicanus* to the species status and synonymized with the latter all the subspecies described by Di Caporiano with series of trichobothria on pedipalp patella external surface *eba*=4-5 + *eb*=5. In the same paper the authors define *E. sicanus* some forms considered *E. mesotrichus* according to the interpretation of Kinzelbach. Populations considered *E. sicanus* have a high variability, often greater than that present between different species, for this reason we prefer to refer to these forms as *E. sicanus* complex for the moment. It is known now that *E. sicanus* complex is widespread in Greece, mainly peninsular, while was not found in majority of the Aegean Islands (FET *et al.* 2003), this is in contrast with the Italian forms which are often found on both major and minor islands. It is often found in sympatry with other forms of *Euscorpius*, as e.g. in Thessaly, Greece, where it is found with the *E. c. ossae*. It is possible to distinguish *E. sicanus* complex from *E. corcyraeus* sp. nov. for the series of trichobothria on pedipalp patella external surface which are *eba* = 4-5 + *eb* = 5 in *E. sicanus* complex and *eba* = 4 + *eb* = 4 in *E. corcyraeus* sp. n.

E. koschewnikowi was described by BIRULA (1900) from Mt Athos, Agion Oros, in the northeast of Greece. KINZELBACH (1975) synonymized it with *E. carpathicus* but FET & SOLEGLAD (2002) redescribed this form, elevating it to species status. *E. koschewnikowi* is a medium to large sized species, medium to very dark brown in color, slender appearance with well developed dorsal patellar spur and all metasoma segments longer than wide. In addition, according to FET & SOLEGLAD (2002) the exceptionally slender and smooth metasoma are key diagnostic characters of this species. It differs from *E. corcyraeus* sp. n. mainly in size and color; in fact the new species is one of the smallest species of the

genus *Euscorpius* (23 mm on average) and it is very light, in contrast with Birula's species which can reach 46 mm and it is medium to very dark brown in colour. In addition, *E. corcyraeus* sp. n. has not all metasomal segments longer than wide, in fact the L/W ratio of first segment is on average 0.844.

E. hadzii DI CAPORIAMCO, 1950 was initially described by HADŽI (1929) as *E. c. polytrichus*, but this name is a junior primary homonym of *Euscorpius italicus polytrichus* HADŽI, 1929, thus DI CAPORIAMCO (1950) redescribed this species as *E. carpathicus hadzii*, subsequently elevated to the species status by FET & SOLEGLAD (2002). This species is medium to large, dark brown-blackish colored with a long metasoma and well developed dorsal patellar spur. It occurs from Croatia to northern Greece and its particular *Pe* trichobothrial pattern makes it easy to identify: *em* = 4-5, *eba* = 4-8 and *eb* = 5. This species is in complete contrast with *E. corcyraeus* sp. n. in size, colour and trichobothrial pattern.

E. c. scaber was described by BIRULA, (1900) in the same year and from the same area as *E. koschewnikowi*, i.e. from Mount Athos in the north-east of Greece. About this form we know that it is dark, with a strong granulation ("scaber" in Latin means "scabrous, rough"), with a pectinal count of 10-11 in males and 7-8 in females and with the *Pv* = 8-9 and *Pe* total = 24 (*et* = 6, *em* = 4, *eb* = 4) (FET 1985; TROPEA et al. 2012). This form is differentiable from *E. corcyraeus* sp. n. because it is dark, very rough and with a higher pectinal count and trichobothrial pattern.

E. candiota was described by BIRULA (1903) from the island of Crete as a valid species, subsequently considered a subspecies of *E. carpathicus* by DI CAPORIAMCO (1950) and an hybrid population between *E. carpathicus* and *E. mesotricus* by KINZELBACH (1975). It is currently considered a subspecies of *E. carpathicus sensu lato*, but seems clear that it is a valid species. This is a light *Euscorpius* form, with both a higher trichobothrial pattern and pectinal teeth count that differentiates it well from *E. corcyraeus* sp.n.

DI CAPORIAMCO (1950) described two forms from Greece, *E. c. ossae* and *E. c. aegaeus*. The first is an oligotrichous form, dark brown in colour with lighter legs and telson. It was described by Mount Ossa, in Thessaly, but its real distribution could be much wider. This form can be distinguished mainly by the dark colour, the *Pv* = 7 and *et* = 5 (compared with *Pv* = 9 and *et* = 6 of *E. corcyraeus* sp. n.). *E. c. aegaeus* is a light form described from the island of Antiparos, in the central-south of the Aegean Sea. This form is distinguished by the higher pectinal teeth count and lesser number of trichobothria on the pedipalp patella ventral surface (*Dp* = 8 in female *Pv* = 8).

Besides, in Samos, a Greek island, occurs an unnamed oligotrichous form. The Samos population is characterized by small size, stocky pedipalps and trichobothrial pattern *Pv* = 5 and *et* = 5 (VIGNOLI & SALOMONE, 2008; TROPEA et al. 2012).

This form seems to have a lower *Pv* and *et* count. Furthermore, Samos Island is situated in the Aegean Sea, very close to the Dilek Peninsula, in Turkey (in some places less than two kilometers), while *E. corcyraeus* sp. n. occurs in the Ionian Sea, off the coast between Albania and Greece.

In addition, in the Peloponnese, on Mount Taigeto, between 1200 and 2000 meters a.s.l., occurs a very light form, brown-reddish colored, with carapace and pedipalps darker, reddish. General appearance is smooth or almost smooth, including the metasoma with few spaced minuscule granules only on the fifth segment. The dorsal patellar spur is well developed, the dorsal external carinae of patella are smooth or slightly rough and the dorsal internal carinae are formed by small granules. Telson and claws are long-limbed. Partially this form resembles *E. c. aegaeus* but, considering the area of its discovery, this population could be another form that awaits clarification.

In conclusion, the genus *Euscorpius* in Greece, but also other countries, should be further clarified. It is evident that in the near future several subspecies of *E. carpathicus sensu lato* should be elevated to the status of species and some already known or new forms could be described. With the description of *Euscorpius corcyraeus* sp. n. the number of valid species of the genus *Euscorpius* in Greece rises to 6, of which 4 belong to the subgenus *Euscorpius*, plus 4 subspecies of *E. carpathicus sensu lato*.

Acknowledgments

We wish to thank Dr. Paolo Pantini and Dr. Marco Valle for their kindness and for the material they provided. We would like to thank Dr. Ersen Aydin Yağmur, Dr. Paolo Tongiorgi and Dr. Michiel Cozijn for reviewing the document and Dr. Daniele Migliorini for her availability.



Fig. 1. Dorsal views of *Euscorpius corcyraeus* sp. n. female and male.

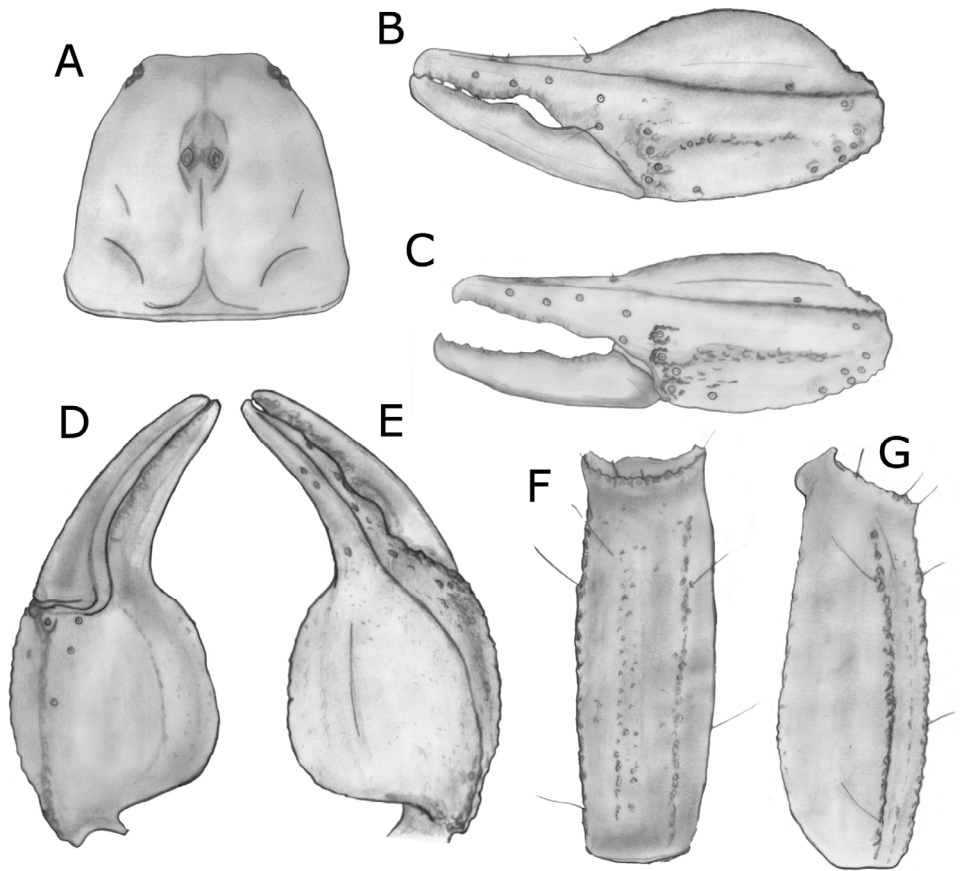


Fig. 2. (A) carapace; (B) external view of chela of the adult male; (C) external view of chela of the adult female; (D) ventral view of chela; (E) dorsal view of chela; (F) ventral view of the metasomal segment V; (G) latero-dorsal view of the metasomal segment V.

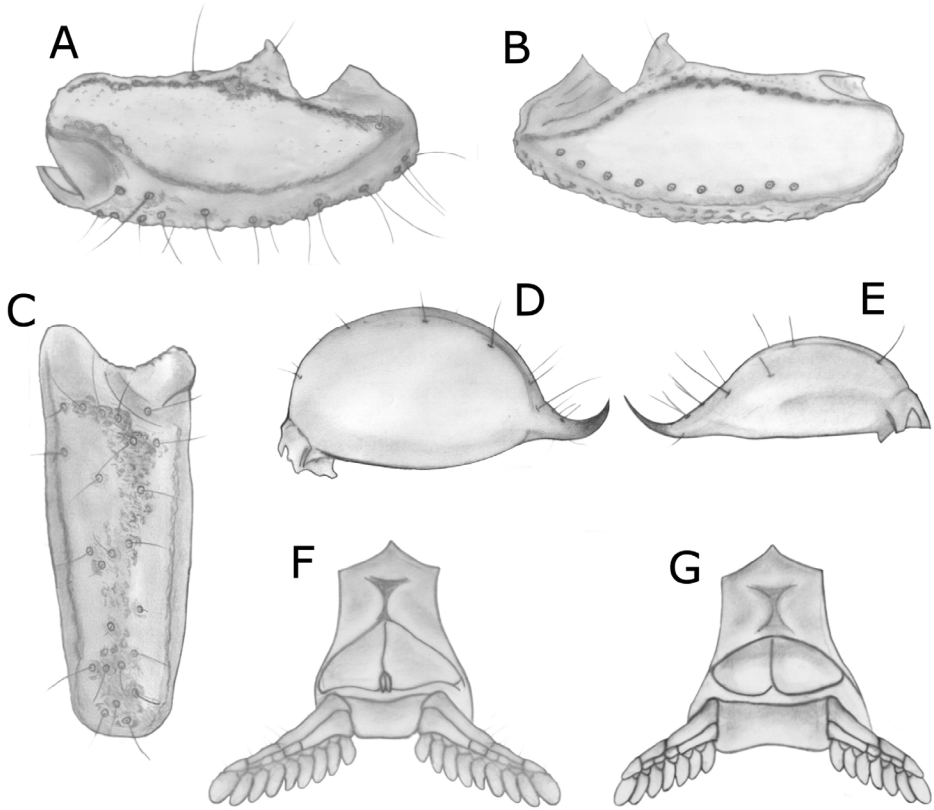


Fig. 3. (A) dorsal view of pedipalp patella; (B) ventral view of pedipalp patella; (C) view of external surface of pedipalp patella; (D) telson of adult male; (E) telson of adult female; (F) sternopectinal area of adult male; (G) sternopectinal area of adult female.

		Holotype female	Paratype male
Total	Length	23.92	21.94
Carapace	Length	3.54	3.48
	Posterior width	3.75	3.43
Metasoma	Length	8.32	8.32
Segment I	Length	1.08	1.02
	Width	1.26	1.26
Segment II	Length	1.26	1.26
	Width	1.08	1.14
Segment III	Length	1.44	1.39
	Width	1.05	1.05
Segment IV	Length	1.74	1.77
	Width	1.02	0.99
Segment V	Length	2.80	2.88
	Width	0.96	0.96
Telson	Length	2.94	3.36
Vesicle	Length	2.10	2.64
	Width	0.96	1.44
	Height	0.96	1.62
Aculeus	Length	0.84	0.72
Femur	Length	2.88	2.32
	Width	1.20	1.08
Patella	Length	3.00	2.94
	Width	1.35	1.20
Chela	Length	6.24	5.75
	Width	2.61	2.57
Movable finger	Length	3.54	3.36

Table 1: Measurements (in mm) of female holotype and a male paratype of *Euscorpium corcyraeus* sp. n.

Species	Pv	et	est	em	esb	eba	eb
<i>E. corcyraeus</i> sp. n.	9	6	4	4	2	4	4
<i>E. sicanus</i> complex	7-11(9-10)	5-8(7)	4	4	2	4-5	5
<i>E. koschewnikowi</i>	8	5-6	4	4	2	4	4
<i>E. hadzii</i>	8-13(11)	6-9(7)	4	4-5(4)	2	4-8	5
<i>E. c. aegaeus</i>	7-8(8)	5-6(6)	4	4	2	4	4
<i>E. c. ossae</i>	7	5	4	4	2	4	4
<i>E. c. scaber</i>	7-10(8-9)	6	4	4	2	4	4
<i>E. c. candiota</i>	9-10	6-7	4	4	2	4	4

Table 2: Trichobothrial counts of *Euscorpis* species discussed in this paper.

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