1-2017

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Gioele Tropea

Victor Fet
Marshall University, fet@marshall.edu

Aristeidis Parmakelis

Panayiota Kotsakiozi

Iasmi Stathi

Ecologica Montenegrina

ISSN **2336-9744** (online) | ISSN **2337-0173** (print)
The journal is available on line at www.biotaxa.org/em

Research Article

https://zoobank.org/urn:lsid:zoobank.org:pub:96D3A9DD-41F8-49A7-87F1-AC4C8939C8D7

Redescription of *Euscorpius tauricus* (C.L. Koch, 1837), with the description of two new related species from Greece (Scorpiones: Euscorpiidae)

GIOELE TROPEA[1], VICTOR FET[2], ARISTEIDIS PARMAKELIS[3], PANAYIOTA KOTSAKIOZI[4] & IASMI STATHI[5]

[1] *Via Gavinana 2, 00192 Rome, Italy: email: gioele.tropea@gmail.com*
[2] *Department of Biological Sciences, Marshall University, Huntington, West Virginia 25755-2510, USA; email: fet@marshall.edu*
[3] *Department of Ecology and Taxonomy, Faculty of Biology, University of Athens, Panepistimioupoli Zografou, GR-15784 Athens, Greece; email: aparmakel@biol.uoa.gr*
[4] *Department of Human and Animal Physiology, Faculty of Biology, University of Athens, Panepistimioupoli Zografou, GR-15784 Athens, Greece; email: pkotsakiozi@hotmail.com*
[5] *Natural History Museum of Crete, University of Crete, GR-71409 Heraklion, Crete, Greece; email: iasmi@nhmc.uoc.gr*

Received 19 November 2016 | Accepted 6 January 2017 | Published online 10 January 2017.

Abstract
Euscorpius tauricus (C. L. Koch, 1837) was previously known only from the Crimea Peninsula, Ukraine. We report an unexpected presence of this species in the Cyclades Islands (Greece) and northwestern Anatolia (Turkey). In addition we designate a neotype for this species. We synonymize *Euscorpius carpathicus aegaeus* Di Caporiacco, 1950 **syn. n.**, from Antiparos Island and *Euscorpius rahsenae* Yağmur et Tropea, 2013 **syn. n.**, from Anatolia, with *E. tauricus*. In addition, we describe two new species related to *E. tauricus*, from the Cyclades Islands: *E. curcici* **sp. n.**, from Ios and Sikinos Islands, and *E. amorgensis* **sp. n.**, from Amorgos Island. Identity and level of divergence of these taxa is confirmed by multiple DNA markers.

Key words: scorpions, systematics, phylogeny, Aegean, Mediterranean.

Introduction

The genus *Euscorpius* Thorell, 1876, widespread especially in southern Europe and Anatolia, is one of the most studied scorpion taxa. Despite this, the taxonomy of this genus is very complicated and still far from being resolved. This is also true for the *Euscorpius* of Greece, where, especially due to the unavailability of lack of specimens from many areas, this genus has been insufficiently studied. In addition, the taxonomic studies of *Euscorpius* are hindered by existence of cryptic species complexes, which are difficult to resolve even with phylogenetic analysis using multiple DNA markers. However, recently several studies delineated and described various new and old forms of this genus resulting in a significant increase of the number of species in Greece (Fet *et al*., 2013a, 2013b, 2014; Parmakelis *et al*., 2013; Tropea & Rossi, 2012; Tropea & Fet, 2015; Tropea *et al*., 2013, 2014a, 2015). In this study, with the use of multiple DNA markers, as a part of an ongoing revisionary study of scorpions of Greece and adjacent areas, we confirm the unexpected

presence of *Euscorpius tauricus* on the Cyclades Islands of Antiparos, Paros, Sifnos, and Naxos, as well as in northwestern Turkey. In addition, two new species from the Cyclades Islands are described herein, *E. curcici* sp. n., from Ios and Sikinos Islands, and *E. amorgensis* sp. n., from Amorgos Island, increasing the number of valid species of the genus *Euscorpius* in Greece to 22. Our data indicate the existence of more undescribed species of *Euscorpius* in Greece (Tropea *et al*., in press).

Material and Methods

The trichobothrial notation follows Vachon (1974). Morphological measurements are given in millimetres (mm) following Tropea *et al*. (2014b) but we use *Wchel = Wchel-A*. Morphological nomenclature follows Stahnke (1971), Hjelle (1990), and Sissom (1990); the chela carinae and denticle configuration follows Soleglad & Sissom (2001) but we united *ID+IAD*; and sternum terminology follows Soleglad & Fet (2003). The map was generated using Earth Explorer 6.1.

Abbreviations

Dp: pectinal teeth number; *Wchel:* chela width (=*Wchel-A* of Tropea *et al*., 2014b); *CarA/CarP %*: average ratio of distances from centre of median eyes to anterior and posterior margins of the carapace; *DPS*: dorsal patellar spur; *imm*.: immature specimen (in any stage of development).

Depositories:

AZMM, Alaşehir Zoological Museum, Celal Bayar University, Manisa, Turkey;
GTC, private collection of Gioele Tropea, Rome, Italy;
MCSNG, Museo Civico di Storia naturale di Genova, Genoa, Italy;
MNHNP, Muséum National d'Histoire naturelle, Paris, France;
MSNB, Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy;
MZUF, Museo di Storia naturale dell'Università di Firenze, Sezione di Zoologia "La Specola", Florence, Italy;
NHMC, Natural History Museum of Crete, University of Crete, Heraklion, Crete, Greece;
NHMW, Naturhistorisches Museum Wien, Vienna, Austria.

Material Studied

A detailed list of material with label data is given under each species.

DNA Analysis and Species Validation

Validity of the herein treated species was supported by our molecular phylogenetic study of *Euscorpius* populations across Greece (Parmakelis *et al*., 2013). All DNA work was performed in the University of Athens by P.K. and A.P. For details on molecular and phylogenetic analysis, see Parmakelis *et al*. (2013). Several methods of species delimitation and a species validation method were employed in Parmakelis *et al*. (2013) based on the phylogeny inferred using sequence data from one nuclear and three *mtDNA* loci. In the molecular phylogeny study, for *E. tauricus*, we analyzed specimens from Crimea as well as Naxos, Paros, and Sifnos islands, and northwestern Turkey. Two populations from neighbouring islands related to *E. tauricus* were also analyzed and are described here as two new species.

Genetic distances are expressed as the number of base substitutions per site. Standard error estimates are shown above the diagonal and were obtained by a bootstrap procedure (1000 replicates). Analyses were conducted using the Kimura 2-parameter model (Kimura, 1980). All ambiguous positions were removed for each sequence pair. In the present study, only *16S rRNA* and *COI* sequence data were used in the phylogenetic analysis. There were 437 positions in total in the final dataset for *16S rRNA* and 595 for *COI*. Evolutionary analyses were conducted in MEGA5 (Tamura *et al.*, 2011).

History of *Euscorpius tauricus* species

Euscorpius tauricus (C. L. Koch, 1837) was described from the southern coast of the Crimea Peninsula (then in the Russian Empire, now in Ukraine). It was first moved into *E. carpathicus* by Kraepelin (1894: 159). However, the Crimean form was usually treated as an endemic species, especially by the Russian zoologists. Already Birula (1900: 250–251) compared *E. tauricus* with *E. carpathicus* from Banat (Romania), noting

especially very long metasomal segment V (L/H 3.1 in females, 3.7 in males of *E. tauricus*), versus 2.7 and 2.8 in *E. carpathicus*; he also noted obsolete granulation on metasomal segment V. *E. tauricus* was redescribed and discussed in a great detail by Birula (1917). Origins and relationships of this isolated form have been unclear. Fet (1989a, 1989b) reviewed all the Crimean specimens available in the main Russian museums. Fet (2003) first compared a DNA marker (*16S rRNA*) from Crimea to several *Euscorpius* species, and argued that DNA data supported species status for *E. tauricus* as an endemic, strongly isolated taxon. Distribution and ecology of *E. tauricus* in Crimea has been recently studied in detail by Kukushkin (2013).

Brewer *et al*. (2005), based on a DNA marker sequence (*16S rRNA*), first reported that the specimens from Paros Island (Cyclades, Greece) showed affinity with those from Crimea. Several years later, Parmakelis *et al*. (2013) addressed the Paros population, and some populations of other Cycladic Islands, as *E. tauricus* complex.

Specimens of *Euscorpius* from the Western Cyclades are very rare in zoological museums. Pavesi (1878: 339) studied five juvenile specimens collected "near the entrance of a cave" on Antiparos Island during the Mediterranean travel of the cutter *Violante* in July–October 1876. This naturalistic expedition was led by the Marquis Giacomo Doria (1840–1913), an Italian naturalist and the founder of Museo Civico di Storia naturale di Genova (MCSNG), and Captain Enrico D'Albertis (1846–1832) of Genoa, Italy. The Antiparos specimens were identified by Pavesi as *Euscorpius carpathicus*. Pavesi (1878) reported number of *Dp* = 8 (2), 9 (2), 10 (1), and *Pv* = 8 (4) and 7 (1).

Pavesi's five specimens from MCSNG (3♂, 2♀) were studied by Di Caporiacco (1950: 187–188) and described as a new subspecies, *Euscorpius carpathicus aegaeus*. Di Caporiacco (1950) noted they all were uniform light yellow, and had the following variation: *Dp* in males, 9/9 (2), 9/10 (1), *Dp* in females, 8/8 (2); *Pv*= 8/8 (4), 8/7 (1). Number of external patellar trichobothria was 24/24 (3), 23/24 (1), and 24/23 (1).

Di Caporiacco wrote in his original description: 'Dorsal metasomal carinae very weakly granulated, with very small, sparse granules; granules hardly visible in ventral carinae of metasoma V. No dorsolateral carinae on the first metasomal segments; no ventromedian carina on metasoma V....These values fit in the form of Antiparos, to which I give the name of *E. carpathicus aegaeus*, in the oligotrichous group of Hadži." He further compared this new form to other "oligotrichous" *Euscorpius*, and wrote: "The discussed form is close … especially to *E. tauricus* and the specimens of *Euscorpius* from Istanbul described by Hadži (1930). It differs in the absence of the ventromedian carina on metasoma V; and from *E. tauricus*, according to the description by Birula, by also having ventral surface of metasoma V as flat, not convex; it has the segment V long just three time the width, and female with 8 (not 7) pectinal teeth."

The subspecies *E. c. aegaeus* was largely ignored, and later was synonymized with *E. carpathicus* by Kinzelbach (1975: 3). Only one of Di Caporiacco's syntypes, a damaged juvenile male, was found in MZUF (Bartolozzi *et al*., 1988), labelled "Grecia: Mar Egeo, Isola Antiparo (entrata di gr.[= grotta] (Crociera del "Violante"; dal Museo di Genova)." We studied this specimen, and its morphology fits the specimens from neighbouring Paros Island, and we introduce its formal synonymy with *E. tauricus* here.

Recently, Yağmur et Tropea (2013) described *Euscorpius rahsenae* from northwestern Turkey (Bursa Province). Our new *DNA* data unexpectedly revealed that this species is identical to *E. tauricus* from Crimea and Paros. We therefore synonymize it with *E. tauricus* here.

Systematics

Genus *Euscorpius* Thorell, 1876

Subgenus Incertus

Euscorpius tauricus (C.L. Koch, 1837)
(Figs. 1–18; Table 1)

Scorpius tauricus C.L. Koch, 1837: 6–8, pl. CXI, fig. 255.
Female holotype from Crimea, Ukraine, is lost.

We designate herein a neotype according to the Article 75 of the ICZN as it is required for the purposes of clarifying the taxonomic status of specific populations.

Neotype designated herein: ♀, **Ukraine:** Crimea, Yalta, June 1985, leg. M. Eidelberg (NHMW 14647).

***Other specimens examined*: Greece:** Cyclades Islands, Paros Island, Agioi Pantes, 15 December 1979, leg. M. Mylonas, 1♂ imm., 3♀ (NHMC Eus61); same data but 1♀ (GTC); Paros Island, Paros Town, 24 May 1988, leg. E. Kritscher, 1♀ (NHMW 16002/5); same data but 1♂ (GTC); Paros Island, Pataloudes, 20 May 1988, leg. E. Kritscher, 5♀ (NHMW 16001/1, 5, 6, 12; 16000/3); Paros Island, SW Parikia, 16 May 1988, leg. E. Kritscher, 1♀ (NHMW 16000/1); Cyclades Islands, Naxos Island, Kaurus, near Miloi, 8 May 1988, leg. E. Kritscher, 1♂, 4♀ (NHMW 15997/1-5); Naxos Island, Koronos-Skado, 37°08'N, 25°32'E, 8 December 1979, leg. M. Mylonas, 2♂ imm., 1♀ (NHMC 3228 Eus68); Naxos Island, 2 May 1982, leg. J.J. Geoffroy, 1♀ (MNHNP RS 7438). **Turkey:** Bursa Province, Mudanya District, Tirilye Village, 40°23'08.9"N, 28°48'20.9"E, 39 m, red pine forest, 6 July 2012, leg. R.S. Kaya & H. Koru, 1 ♂ (AZMM); same data, 17 June 2012, leg. E.A. Yağmur & R.S. Kaya, 1♂, 1♀ (GTC); Bursa Province, Nilüfer District, Beşevler Neighborhood, 40°11'47"N, 28°57' 58"E, 153 m, 5 May 2005, leg. R.S. Kaya, 1♀ (AZMM); Prinkipos Island, 5 May 1902, leg. A. Penther, 2♂ imm., 3♀ (NHMW). **Ukraine**: data as neotype, 2♂, 1♀ (NHMW 14647); data as neotype, 1♀ (GTC); Crimea, Nikita [Botanical] Garden, 10 June 1903, Simferopol Museum (written in Russian), 1♀ (MSNB 10009). We have also taken into account the data on the specimens examined by the second author (V.F.) from Crimea (Fet, 1997), and by the first author (G.T.) from Turkey (Yağmur *et* Tropea, 2013).

Synonyms

Euscorpius carpathicus aegaeus Di Caporiacco, 1950, **syn. n.** Syntypes 2♂ and 3♀: 1♂ immature, Antiparos, Greece [1886], leg. G. Doria (MZUF 97); 1♂, 3♀, same label (possibly in MCSNG).

Euscorpius rahsenae Yağmur et Tropea, 2013, **syn. n.** Holotype: 1♂, Tirilye Village, Mudanya District, Bursa Province, Turkey, 06.07.2012, 40°23'08.9"N, 28°48'20.9"E, 39 m, red pine Forest, leg. R.S. Kaya & H. Koru (AZMM). Paratypes: 1♀, Beşevler Neighborhood, Nilüfer District, Bursa Province, 23.06.2004, 21.04.2012, 40°12'46"N, 28°57'58"E, 140 m, leg. R.S. Kaya (AZMM); 1♀, same data, 05.05.2005, 40°11'47"N, 28°57'58"E, 153 m, leg. R.S. Kaya (AZM); 3♀, Yalıçiftlik Village, ruined building, Mudanya District, Bursa Province, 21.04.2012, 40°21'16"N, 28°42'58"E, 97 m, leg. H. Koru (AZMM); same data, 1♂, 23.10.2012 (GTC); 1♂, 1♀, same data as holotype, 17.06.2012, leg. E.A. Yağmur & R.S. Kaya (GTC); same data, 6♀ (AZMM); same locality, 4♂, 3♀, 06.07.2012, leg. R.S. Kaya & H. Koru; 3♂, 7♀, 22.09.2012, leg. R.S. Kaya & H. Koru (GTC); same data, 1♂, 1♀ (MSNB); same data, 2♂, 9♀ (AZMM); same locality, 2♂, 8♀, 06.11.2012, leg. R.S. Kaya & H. Koru (AZM); 1♂, 1♀, Çiftehavuzlar Neighbourhood, Karadeniz Street, Osmangazi District, Bursa Province, 28.10.2012, 40°12'30"N, 29°03'05"E, 110 m, home garden, leg. H. Koru (AZMM).

REFERENCES

Crimea (selected; for a full list of Crimean references, see Fet, 2003):
Scorpio carpathicus: Pallas, 1795: 64; Pallas, 1799: 475.
Scorpio europaeus var. *tauricus*: Nordmann, 1840: 731, pl. I, fig. 3.
Scorpius tauricus: C. L. Koch, 1850: 86.
Scorpio tauricus: Kessler, 1874: 23.
Euscorpius tauricus: Simon, 1879: 113; Birula, 1900: 250; Birula, 1904: 33; Birula, 1917: 168, 208–224, pl. 3, fig. 10, pl. 5, figs. 3–4; Puzanov, 1949: 22; Fet, 2003: 274; Fet *et al*., 2004: 55; Kaltsas *et al*., 2008: 226; Vignoli & Salomone, 2008: 203, fig. 40; Fet, 2010: 7; Kukushkin, 2013: 144; Parmakelis *et al*., 2013: 735.
Euscorpius carpathicus oligotrichus: Hadži, 1930: 35 (in part; Crimea).
Euscorpius carpathicus tauricus: Di Caporiacco, 1950: 193, 209; Fet, 1989a: 82; Fet, 1989b: 124; Fet, 1997: 106; Fet & Sissom, 2000: 365.

Greece:
Euscorpius carpathicus: Pavesi, 1878: 339, 361 (in part; Antiparos); Simon, 1884: 351 (in part; Antiparos); Stathi & Mylonas, 2001: 289 (in part; Antiparos, Naxos, Paros).
Euscorpius carpathicus aegeus (incorrect subsequent spelling): Bartolozzi *et al*., 1988: 295.

Euscorpius carpathicus aegaeus: Di Caporiacco, 1950: 187, 188; Lacroix, 1991: 19; Fet & Soleglad, 2007: 419; Vignoli & Salomone, 2008: 198, fig. 6 (Paros); Tropea & Rossi, 2012: 31; Tropea *et al*., 2012: 75.
Euscorpius carpathicus carpathicus: Kritscher, 1993: 384 (in part; Naxos, Paros).
Euscorpius carpathicus "Subgroup A3": Fet, 2000: 53 (in part; Paros).
Euscorpius "*carpathicus*" *aegaeus*: Fet *et al*., 2004: 55; Kaltsas *et al*., 2008: 234.
Euscorpius tauricus complex: Parmakelis *et al*., 2013: 735.

Turkey:
Euscorpius rahsenae: Yağmur *et* Tropea, 2013: 91–105.

***Geographic distribution*: Greece:** Cyclades Islands (Paros, Sifnos, Antiparos, and Naxos Islands); **Turkey:** northwest; **Ukraine:** Crimea (Fig. 55).

***Diagnosis*:** A medium small to medium large *Euscorpius* species, total length 26 to 38 mm. Colour of adults from very light brown-yellowish to brown-reddish, without reticulations or marbling. The carapace and pedipalps could be darker reddish. The number of trichobothria on the pedipalp manus ventral surface is 4 ($V_{1\text{-}3}$+Et_1); trichobothrium *et* on fixed finger is located distally to the notch of the fixed finger; *est* is located distally to the centre of the notch; and *dsb* is located proximally to the notch. The number of ventral trichobothria on the pedipalp patella mostly is 8 (7–9); the number of external trichobothria on pedipalp patella mostly is: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 4, *est* = 4, *et* = 6 (5–7). The pectinal teeth number most is 9 (8–10) in males and 7 (6–9) in females. Chela carina *V1* follows a direction toward the external side of the trichobothrium Et_1. Dorsal patellar spur well developed. Femur of pedipalp more or less as long as the patella; both could be slightly shorter or slightly longer than patella (average *Lfem/Lpat* ratio = 1). Carapace can be both slightly shorter than wide or slightly longer than wide (average ratio *Lcar/Wcar* = 0.98). Long-limbed metasoma (*Lmet/Wmet* = 1.70–1.96); metasoma segment I can be more or less as long as wide (*L/W* segment I = 0.90–1.06); metasoma segment V usually with small and serrulated granules on the ventrolateral carinae while the ventromedian is less developed, it can be more or less present with small and spaced granules.

Trichobothrial and pectinal teeth count variation
The variation observed in 160 studied specimens (44 ♂ and 116 ♀) is given below.
Pectinal teeth in males: 8/8 (3), 8/9 (4), 9/8 (4), 9/9 (26), 9/10 (3), 10/9 (2), 10/10 (2); in total 8 in (14/80) pectines, 9 in (65/80) pectines, and 10 in (9/80) pectines; mean = 8.94, SD = 0.51.
Pectinal teeth in females: 6/6 (2), 6/7 (4), 7/6 (1), 7/7 (68), 7/8 (6), 8/7 (11), 8/8 (21), 8/9 (2), 9-9 (1); in total 6 in (9/232) pectines, 7 in (158/232) pectines, 8 in (61/232) pectines, and 9 in (4/232) pectines; mean = 7.25, SD = 0.56.
Pedipalp patella trichobothria Pv: 6/7 (1), 7/7 (9), 7/8 (5), 8/7 (15), 8/8 (123), 8/9 (2), 9/8 (3), 9/9 (4); in total 6 in (1/324) pedipalp, 7 in (39/324) pedipalps, 8 in (271/324), and 9 in (13/324); mean = 7.91, SD = 0.41.
Pedipalp patella trichobothria Pe: *et* = 5/5 (11), 5/6 (18), 6/5 (5), 6/6 (122), 6/7 (3), 7/6 (3), 7/7 (1); in total 5 in (45/326) pedipalps, 6 in (273/326) pedipalps, and 7 in (8/326) pedipalps; mean = 5.88, SD = 0.38; *est* = 3/4 (2), 4/4 (324); *em* = 4/4 (326); *esb*= 2/1 (1), 2/2 (325); eb_a = 4/4 (326); *eb* = 4/4 (325), 4/5 (1).

Description of the female neotype

***Coloration*:** Whole colour light brown, with darker brown/reddish carapace and pedipalps; sternites, pectines and genital operculum light brownish; chelicerae brown-orange.
***Carapace*:** a fine granulation is present on most of surface, behind the lateral eyes it is formed by slightly larger granules; anterior edge slightly leaning forward at the centre; anterior median, posterior lateral and posterior median furrows are presents; two pairs of lateral eyes and a pair of median eyes, situated distally of the middle; distance from centre of median eyes to anterior margin is 43.50% of carapace length.
***Mesosoma*:** Tergites laterally finely granulated, except the segment VII, which is all finely granulated; sternites finely punctated. Spiracles small, oval shaped and inclined about 45° downward towards outside.

Figures 1–2. *Euscorpius tauricus***,** male (Turkey), dorsal and ventral views.

Figures 3–4. *Euscorpius tauricus***,** female neotype (Crimea), dorsal and ventral views.

Figures 5–18. *Euscorpius tauricus* (based on the female neotype, except for the Figs. 6 and 15*)* **. 5.** Carapace. **6.** External view of chela of adult male. **7.** External view of chela of adult female. **8.** Dorsal view of pedipalp patella. **9.** Ventral view of pedipalp patella. **10.** External view of pedipalp patella. **11.** Dorsal view of pedipalp femur. **12.** Ventral view of pedipalp femur. **13.** Dorsal view of chela. **14.** Ventral view of chela. **15.** Telson of adult male. **16.** Telson of adult female. **17.** Ventral view of the metasomal segment V. **18.** Lateral view of the metasomal segment V.

Table 1. Measurements (mm) and morphometric ratios of *Euscorpius tauricus*, *E. curcici* **sp. n.** and *E. amorgensis* **sp. n. *** Due to lack of adult males in good condition, we used the measurements and morphometric ratios of the holotype of *E. rahsenae*.

		E. tauricus		***E. curcici* sp. n.**		***E. amorgensis* sp.n.**	
		♂*	***Neotype*** ♀	***Holotype*** ♂	***Paratype*** ♀	***Holotype*** ♂	***Paratype*** ♀
Total	**Length**	28.86	31.22	31.58	29.98	25.32	23.97
Carapace	**Length**	4.11	4.80	4.59	4.44	3.84	3.87
	Post. width	4.14	5.04	4.50	4.56	3.72	3.78
Metasoma	**Length**	11.40	12.68	12.29	10.78	10.35	9.12
Segment I	**Length**	1.50	1.62	1.56	1.44	1.32	1.20
	Width	1.49	1.56	1.51	1.45	1.32	1.26
Segment II	**Length**	1.80	1.95	1.92	1.68	1.62	1.44
	Width	1.26	1.33	1.32	1.22	1.14	1.08
Segment III	**Length**	1.98	2.21	2.16	1.86	1.83	1.56
	Width	1.20	1.26	1.26	1.11	1.08	1.02
Segment IV	**Length**	2.34	2.64	2.57	2.25	2.16	1.92
	Width	1.14	1.20	1.20	1.08	1.03	0.96
Segment V	**Length**	3.78	4.26	4.08	3.54	3.42	3.00
	Width	1.14	1.17	1.20	1.08	1.08	0.96
Telson	**Length**	3.75	3.84	4.26	3.60	3.69	2.94
Vesicle	**Length**	2.85	2.64	3.24	2.41	2.73	2.04
	Width	1.38	1.26	1.68	1.19	1.26	0.99
	Height	1.38	1.23	1.68	1.20	1.35	0.96
Aculeus	**Length**	0.90	1.20	1.02	1.14	0.96	0.90
Femur	**Length**	3.42	4.23	4.20	4.08	3.60	3.30
	Width	1.32	1.56	1.50	1.50	1.32	1.26
Patella	**Length**	3.54	4.23	4.08	3.96	3.48	3.36
	Width	1.38	1.68	1.62	1.68	1.47	1.38
Chela	**Length**	7.20	8.76	8.46	8.10	7.23	6.78
	Width–A	3.06	3.36	3.39	3.06	2.88	2.64
Mov. finger	**Length**	4.20	5.01	4.68	4.27	4.02	3.75
Ratio	***CarA (%)***	42.33	43.50	41.83	40.54	41.41	41.86
	Lcar/Wcar	0.993	0.952	1.020	0.974	1.032	1.024
	Lcar/Lfer	1.202	1.135	1.093	1.088	1.066	1.173
	LcarL/pat	1.161	1.135	1.125	1.121	1.103	1.152
	Lcar/Ltel	1.096	1.250	1.077	1.233	1.041	1.316
	Lchel/Wchel	2.353	2.607	2.495	2.647	2.510	2.568
	L/W met.seg I	1.007	1.038	1.036	0.996	1.000	0.952
	L/W met.seg II	1.428	1.464	1.454	1.372	1.421	1.333
	L/W met.seg III	1.650	1.752	1.714	1.676	1.694	1.529
	L/W met.seg IV	2.052	2.200	2.140	2.089	2.105	2.000
	L/W met.seg V	3.316	3.641	3.400	3.278	3.166	3.125
	Lmet/Wmet	1.830	1.944	1.894	1.814	1.833	1.727
	Lmet/Lcar	2.774	2.641	2.677	2.427	2.695	2.356
	Lfem/Lpat	0.966	1.000	1.029	1.030	1.034	0.982
	Htel/Wves	1.000	0.976	1.000	0.995	1.066	0.969

***Metasoma*:** Dorsal carinae on segments I–IV with spaced granules; ventrolateral carinae on segment I absent, on segment II obsolete and smooth, on segment III with very small, spaced and hardly visible granules, on segment IV small and spaced granules are present, on segment V small and serrulated granules are present; ventromedian carina on segments I–IV absent or obsolete, on segment V formed by spaced and serrulated granules; dorsal and lateral intercarinal spaces very finely granulated, ventral intercarinal spaces on segments I–II smooth, III-IV from smooth to granulated.
***Telson*:** Vesicle with a few very small and scattered granules, with ventral setae of different sizes, especially in surround of the vesicle/aculeus juncture.
***Pectines*:** Teeth number 7/7; several microsetae on marginal lamellae, middle lamellae and fulcra.
Genital operculum. The genital operculum is formed by two united subtriangular sclerites; a few microsetae are present.
***Sternum*:** Pentagonal shape, type 2; slightly wider than long; deep posterior emargination.
***Pedipalps*:** Coxa and trochanter with tuberculated carinae. Femur: dorsal and ventral internal carinae tuberculated and dark; dorsal external carinae formed by tubercles slightly serrulated and spaced; ventral external carinae irregular, present mostly in the proximal half; external median carinae serrulated; anterior median formed by about 9–11 conical tubercles, of which three bear a macrosetae each; intercarinal spaces with granules of different size. Patella: dorsal and ventral internal carinae tuberculated, the latter slightly serrulated; dorsal external carinae from almost smooth and rounded in proximally to dark and slightly crenulated in distally; ventral external carinae crenulated; intercarinal surface with scattered minute granules positioned in a non-uniform way. Dorsal patellar spur well-developed. Chela carina *D1* from rough to slightly crenulated; *D4* formed by very low and little marked tubercles; *V1* is distinctly strong, dark and crenulated; *V3* rounded, with a few very small and scattered granules and dark in the distal half; intercarinal tegument with very minute spaced granules. 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 6/6 *OD* and 10/9 *ID*; movable finger has 7/7 *OD* and 13/13 *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 very near to the carina V_1; the trichobothrium on fixed finger *est* is situated distally the notch of the fixed finger; *et-est*/*est-dsb* ratio = 1.18. Patella: ventral (*Pv*): 8/8; patella external (*Pe*): *et* = 6/6, *est* = 4/4, *em* = 4/4, *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 10/13 spinules of increasing size from proximal to distal, ending with 2 spinules that form a "Y" shape; 3 flanking pairs of tarsal setae adjacent to the ventral spinules row. Tubercles present on ventral and dorsal surface of all leg femora, they are more marked and dark ventrally.
***Chelicerae*:** Typical of the genus *Euscorpius*.

Euscorpius curcici Tropea, Fet, Parmakelis, Kotsakiozi et Stathi, **sp. nov.**
(Figs. 19–36; Table 1)

https://zoobank.org/urn:lsid:zoobank.org:act:0234C38F-7776-4630-ADAE-ACA8448CC612

REFERENCES
Euscorpius carpathicus: Werner, 1935: 295 (in part; Sikinos); Stathi & Mylonas, 2001: 289 (in part; Sikinos).
Euscorpius carpathicus s. str.: Kinzelbach, 1975: 33 (in part; Sikinos).
Euscorpius carpathicus carpathicus: Kritscher, 1993: 384 (in part; Ios).
Euscorpius tauricus complex: Parmakelis *et al*., 2013: 735 (in part; Sikinos).

Type material (2 specimens: 1 ♂, 1 ♀). ***Holotype*:** ♂, Greece: Sikinos Island, east, 36°41'N, 25°07'E, 23 January 1980, leg. M. Mylonas (NHMC 7358 Eus83). ***Paratype***. ♀, Ios Island, Mylopotamos, 13 April 1981, leg. E. Kritscher, 1 ♀ (NHMW 15988)

Figures 19–20. *Euscorpius curcici* **sp. n.,** male holotype, dorsal and ventral views.

***Etymology*:** Named after the late Serbian zoologist and arachnologist Prof. Dr. Božidar Ćurčić whose early work on *Euscorpius* has been an inspiration for many zoologists.

***Geographic distribution*: Greece:** Cyclades Islands: Sikinos and Ios (Fig. 55).

Figures 21–**22.** *Euscorpius curcici* **sp. n.,** female paratype, dorsal and ventral views.

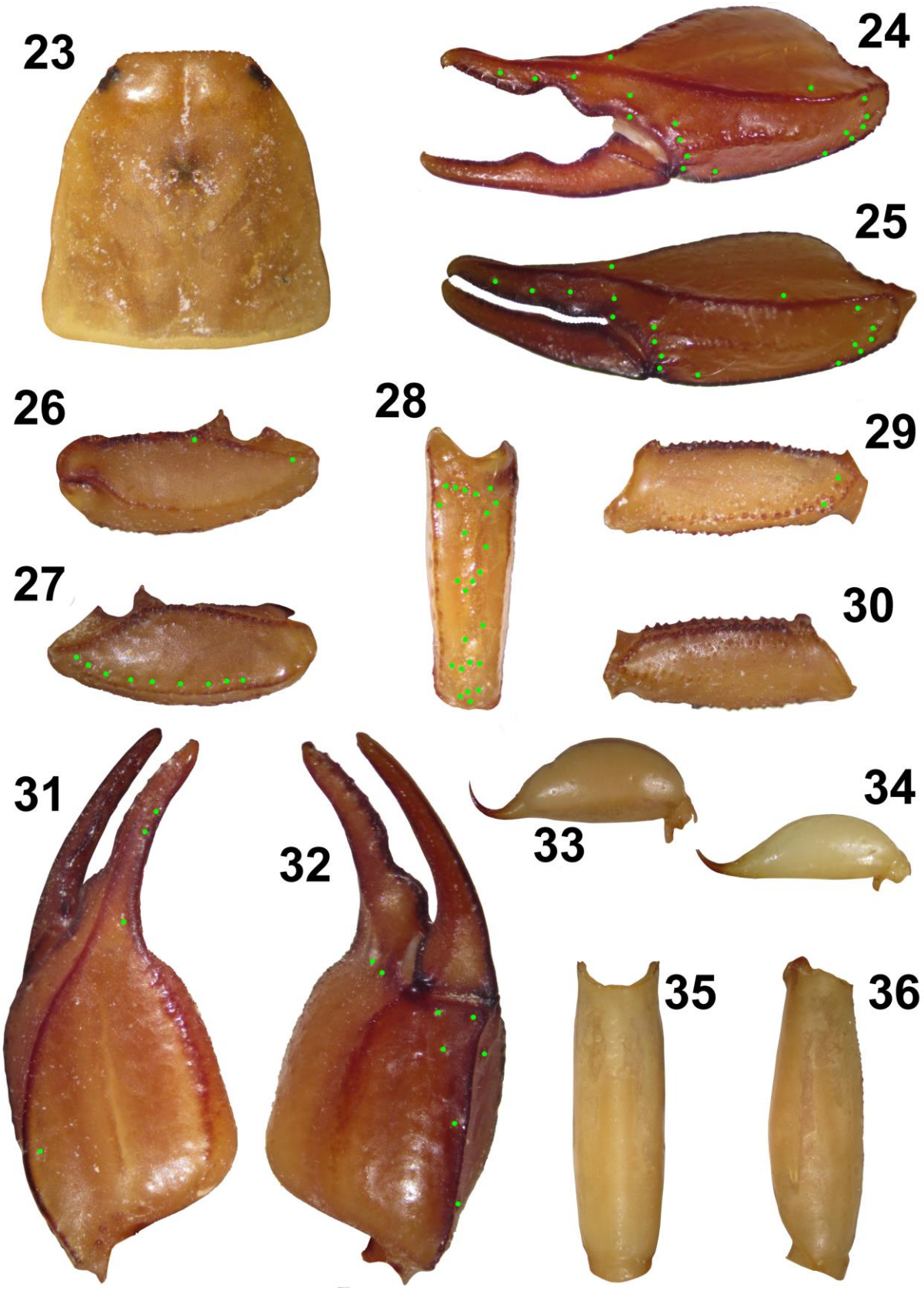
***Diagnosis*:** A medium *Euscorpius* species, total length around to 30 mm. Colour of adults very light brown/yellowish without reticulations or marbling, with slightly darker carapace and chelae. The number of trichobothria on the pedipalp manus ventral surface is 4 ($V_{1\text{-}3}$+Et_1); trichobothrium *et* on fixed finger is located distally to the notch of the fixed finger; *est* is located distally to the centre of the notch; and *dsb* is located proximally to the notch. The number of ventral trichobothria on the pedipalp patella mostly is 9 (8–9); the number of external trichobothria on pedipalp patella mostly is: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 4, *est* = 4, *et* = 6 (6–7). The pectinal teeth number is 9 in male and 7 in female. Chela carina *V1* follows a direction toward the external of the trichobothrium Et_1. Dorsal patellar spur well developed. Femur of pedipalp more

or less as long as the patella (*Lfem/Lpat* ratio is 1.03 in the two specimens examined). Carapace can be both slightly shorter than wide or slightly longer than wide. Long-limbed metasoma (*Lmet/Wmet* is 1.81–1.89 in the two specimens examined); metasoma segment I more or less as long as wide (*L/W* segment I is 0.996–1.036 in the two specimens examined); metasomal carinae poorly developed; metasoma segment V usually with small and serrulated granules on the ventrolateral carinae while the ventromedian is less developed, it can be more or less present with small and spaced granules.

Trichobothrial and pectinal teeth count variation
The variation observed in 2 studied specimens (1 ♂ and 1 ♀) is given below.
Pectinal teeth in males: 9/9 (1).
Pectinal teeth in females: 7/7 (1).
Pedipalp patella trichobothria Pv: 9/8 (1), 9/9 (1); in total 8 in 1 pedipalp and 9 in 3 pedipalps.
Pedipalp patella trichobothria Pe: *et* = 6/6 (1), 7/6 (1), in total 6 in 3 pedipalps and 7 in 1 pedipalp; *est* = 4/4 (2); *em* = 4/4 (2); *esb*= 2/2 (2); eb_a = 4/4 (2); *eb* = 4/4 (2).

Description of the male holotype

***Coloration*:** Whole colour very light brown/yellowish without marbling, with slightly darker carapace and chelae; sternites, pectines and genital operculum very light brownish/ivory.
***Carapace*:** With a very fine and hardly visible granulation is present on most of surface except behind the lateral eyes, where larger granules are present; anterior edge straight; anterior median, posterior lateral and posterior median furrows are presents; two pairs of lateral eyes and a pair of median eyes, situated distally of the middle; distance from centre of median eyes to anterior margin is 41.83 % of carapace length.
***Mesosoma*:** Tergites finely granulated; sternites very finely punctated. Spiracles small, oval shaped and inclined about 45° downward towards outside.
***Metasoma*:** Dorsal carinae on segments I–IV with low and little visible granules; ventrolateral carinae on segment I absent, on segment II obsolete or absent, on segment III smooth and little notable, on segment IV three, four small, low, spaced and barely visible granules are present, on segment V small, spaced and serrulated granules are present; ventromedian carina on segments I–IV absent, on segment V formed by small, spaced and serrulated granules; intercarinal spaces most smooth.
***Telson*:** Vesicle smooth, with ventral setae of different sizes, especially in surround of the vesicle/aculeus juncture.
***Pectines*:** Teeth number 9/9; several microsetae on marginal lamellae, middle lamellae and fulcra.
Genital operculum. The genital operculum is formed by two longitudinally separated subtriangular sclerites; a few microsetae are present.
***Sternum*:** Pentagonal shape, type 2; length approximately equal to width, deep posterior emargination.
***Pedipalps*:** Coxa and trochanter with tuberculated carinae. Femur: dorsal and ventral internal carinae tuberculated and dark; dorsal external carinae formed by tubercles slightly serrulated and spaced; ventral external carinae irregular, present mostly in the proximal half; external median carinae serrulated; anterior median formed by about 11–13 conical tubercles, of which three bear a macroseta each; intercarinal spaces with granules of different size. Patella: dorsal and ventral internal carinae tuberculated, the latter slightly serrulated; dorsal external carinae from smooth and rounded in proximal half to dark and slightly crenulated in distal half; ventral external carinae crenulated; intercarinal surface with scattered minute granules positioned in a non-uniform way. Dorsal patellar spur well-developed. Chela carina *D1* from smooth to rough with a few low tubercles proximally; *D4* formed by dark, very low and little marked tubercles; *V1* is distinctly strong, dark and from crenulated to smooth; *V3* rounded, with a few small and scattered granules and dark in the distal half; intercarinal tegument with very minute scattered granules. 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 6 /6 *OD* and 10/10 *ID*; movable finger has 7/6 *OD* and 14/14 *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 near the carina V_1; the trichobothrium *est* on fixed finger is situated distally to the notch of the fixed finger; *et-est*/*est-dsb* ratio = 1. Patella: ventral (*Pv*): 9/9; patella external (*Pe*): *et* = 6/6, *est* = 4/4, *em* = 4/4, *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.



Figures 23–36. *Euscorpius curcici* **sp. n. 23.** Carapace. **24.** External view of chela of adult male. **25.** External view of chela of adult female. **26.** Dorsal view of pedipalp patella. **27.** Ventral view of pedipalp patella. **28.** External view of pedipalp patella. **29.** Dorsal view of pedipalp femur. **30.** Ventral view of pedipalp femur. **31.** Dorsal view of chela. **32.** Ventral view of chela. **33.** Telson of adult male. **34.** Telson of adult female. **35.** Ventral view of the metasomal segment V. **36.** Lateral view of the metasomal segment V.

***Legs*:** Legs with two pedal spurs; no tarsal spur; ventral row of tarsus III with a total of 13 spinules of increasing size from proximal to distal, ending with 2 spinules that form a "Y" shape; 3 flanking pairs of tarsal setae adjacent to the ventral spinules row. Tubercles present on ventral and dorsal surface of all leg femora, they are more marked and dark ventrally.
***Chelicerae*:** Typical of the genus *Euscorpius*.

Euscorpius amorgensis Tropea, Fet, Parmakelis, Kotsakiozi et Stathi, **sp. nov.**
(Figs. 37–54; Table 1)

https://zoobank.org/urn:lsid:zoobank.org:act:6F74A9C8-8A55-4CD6-9502-CB3B4D4B29D

REFERENCES
Euscorpius carpathicus "Subgroup A3": Fet, 2000: 53 (in part; Amorgos)
Euscorpius carpathicus: Stathi & Mylonas, 2001: 289 (in part; Amorgos).
Euscorpius tauricus complex: Parmakelis *et al*., 2013: 735 (in part; Amorgos).

Type series. Holotype female (NHMC)

Type material (4 specimens: 1 ♂, 3 ♀). ***Holotype*:** ♂, Greece: Cyclades Islands, Amorgos Island, Agia Anna, March 1982, leg. M. Mylonas (NHMC Eus75); Amorgos Island, Agios Georgios to Katapola Anna, 3 December 1979, leg. M. Mylonas, 1♀ (GTC); Amorgos Island, Richti to Aigiali, 36°53'N, 25°58'E, November 1979, leg. M. Mylonas (NHMC 7507 Eus71)

***Etymology*:** The specific epithet refers to Amorgos, the collection locality of the new species.

***Geographic distribution*: Greece:** Cyclades Islands, Amorgos (Fig. 55).

***Diagnosis*:** A small *Euscorpius* species, total length around to 23–25 mm. Colour of adults very light brown/yellowish to light brown-reddish without reticulations or marbling, with carapace and pedipalps that can be darker. The number of trichobothria on the pedipalp manus ventral surface is 4 ($V_{1\text{-}3}$+Et_1); trichobothrium *et* on fixed finger is located distally to the notch of the fixed finger; *est* is located distally to the centre of the notch; and *dsb* is located proximally to the notch. The number of ventral trichobothria on the pedipalp patella mostly is 8 (7–8); the number of external trichobothria on pedipalp patella mostly is: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 4, *est* = 4, *et* = 6. The pectinal teeth number is 8 in male and 6–7 in female. Chela carina *V1* follows a direction toward the external side of the trichobothrium Et_1. Dorsal patellar spur well developed. Femur of pedipalp more or less as long as the patella (*Lfem/Lpat* ratio is 0.97–1.04). Carapace can be both slightly shorter than wide or slightly longer than wide (*Lcar/Wcar* = 0.98–1.03). Long-limbed metasoma (*Lmet/Wmet* is 1.70–1.83); metasoma segment I more or less as long as wide (*L/W* segment I is 0.90–1.00); metasomal carinae poorly developed; metasoma segment V with serrulated granules on the ventrolateral carinae while the ventromedian is less developed, it can be more or less present with small and spaced granules.

Trichobothrial and pectinal teeth count variation
The variation observed in 4 studied specimens (1 ♂ and 3 ♀) is given below.
Pectinal teeth in males: 8/8 (1).
Pectinal teeth in females: 6/7 (1), 7/6 (1), 7/7 (1); in total 6 in 2 pedipalps and 7 in 4.
Pedipalp patella trichobothria Pv: 7/7 (1), 8/8 (3); in total 8 in 6 pedipalps and 7 in 2.
Pedipalp patella trichobothria Pe: *et* = 6/5 (1), 6/6 (3) in total 6 in 7 pedipalps and 5 in 1; *est* = 4/4 (4); *em* = 4/3 (1), 4/4 (3); *esb*= 2/2 (4); eb_a = 4/4 (4); *eb* = 4/4 (4).

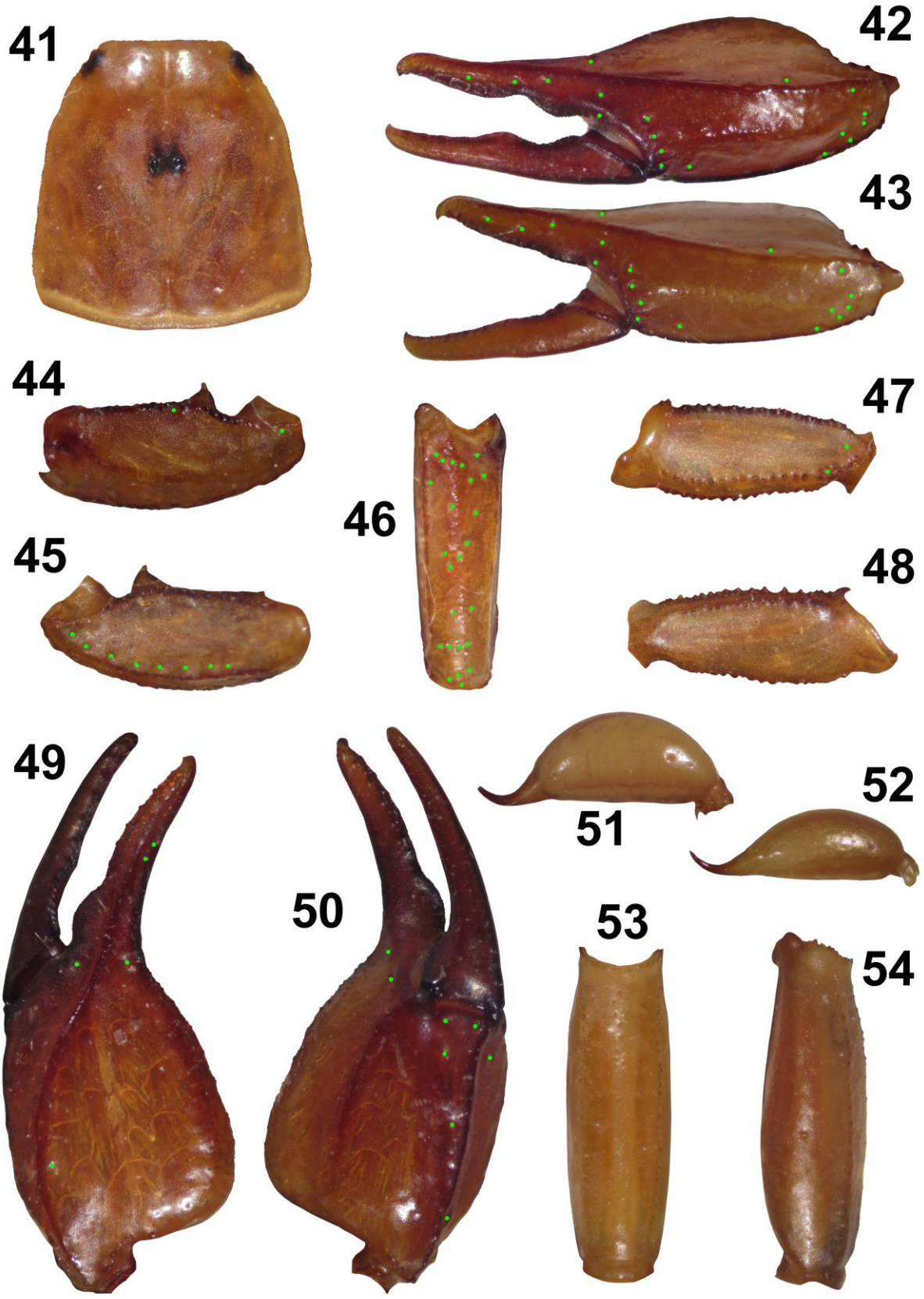
Figures 37–38. *Euscorpius amorgensis* **sp. n.,** male holotype, dorsal and ventral views.

Description of the male holotype

***Coloration*:** Whole colour light brownish, with darker brown/reddish carinae of the chelae; chelicerae, sternites, pectines and genital operculum very light brownish.
***Carapace*:** A very fine and homogeneous granulation is present on most of its; anterior edge straight; anterior median, posterior lateral 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 41.41 % of carapace length.
***Mesosoma*:** Tergites finely granulated; sternites very finely punctated. Spiracles small, oval shaped and inclined about 45° downward towards outside.
***Metasoma*:** Dorsal carinae on segments I–IV with small and spaced granules; ventrolateral carinae on segment I absent, on segment II obsolete or absent, on segment III smooth and little notable, on segment IV two, three small, low, spaced and barely visible granules are present, on segment V marked serrulated granules are present; ventromedian carina on segments I–IV absent, on segment V with a few small and spaced granules; intercarinal spaces most smooth.

Figures 39–40. *Euscorpius amorgensis* **sp. n.,** female paratype, dorsal and ventral views.

***Telson*:** Vesicle smooth, with ventral setae of different sizes, especially in surround of the vesicle/aculeus juncture.
***Pectines*:** Teeth number 8/8; several microsetae on marginal lamellae, middle lamellae and fulcra.
***Genital operculum*:** The genital operculum is formed by two longitudinally separated subtriangular sclerites with genital papillae protruding; a few microsetae are present.
***Sternum*:** Pentagonal shape, type 2; wider than long, deep posterior emargination.



Figures 41–54. *Euscorpius amorgensis* **sp. n. 41.** Carapace. **42.** External view of chela of adult male. **43.** External view of chela of adult female. **44.** Dorsal view of pedipalp patella. **45.** Ventral view of pedipalp patella. **46.** External view of pedipalp patella. **47.** Dorsal view of pedipalp femur. **48.** Ventral view of pedipalp femur. **49.** Dorsal view of chela. **50.** Ventral view of chela. **51.** Telson of adult male. **52.** Telson of adult female. **53.** Ventral view of the metasomal segment V. **54.** Lateral view of the metasomal segment V.

***Pedipalps*:** Coxa and trochanter with tuberculated carinae. Femur: dorsal and ventral internal carinae tuberculated and dark; dorsal external carinae formed by tubercles slightly serrulated and spaced; ventral external carinae irregular, present mostly in the proximal 1/3; external median carinae serrulated; anterior median formed by about 13 conical tubercles, of which three bear a macroseta each; intercarinal spaces mostly with very small granules. Patella: dorsal and ventral internal carinae tuberculated, the latter slightly serrulated; dorsal external carinae mostly smooth and rounded, but distally is slightly crenulated and reddish; ventral external carinae slightly crenulated; intercarinal surfaces are from almost smooth ventrally to very finely granulated dorsally. Dorsal patellar spur well-developed. Chela carina *D1* almost smooth with a few low tubercles proximally; *D4* and *V3* dark with a few small and scattered granules; *V1* is distinctly strong, dark and from smooth to slightly crenulated; intercarinal tegument from smooth to granulated with very minute granules. 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 6/6 *OD* and 11/11 *ID*; movable finger has 7/7 *OD* and 14/14 *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 a bit on the external surface near the carina V_1; the trichobothrium *est* on fixed finger is situated distally to the centre of the notch of the fixed finger; *et-est*/*est-dsb* ratio = 1.52. Patella: ventral (*Pv*): 8/8; patella external (*Pe*): *et* = 6/6, *est* = 4/4, *em* = 4/4, *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 well 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 12 spinules of increasing size from proximal to distal, ending with 2 spinules that form a "Y" shape; 3 flanking pairs of tarsal setae adjacent to the ventral spinules row. Tubercles present on ventral and dorsal surface of all leg femora, they are more marked and dark ventrally.

***Chelicerae*:** Typical of the genus *Euscorpius*.

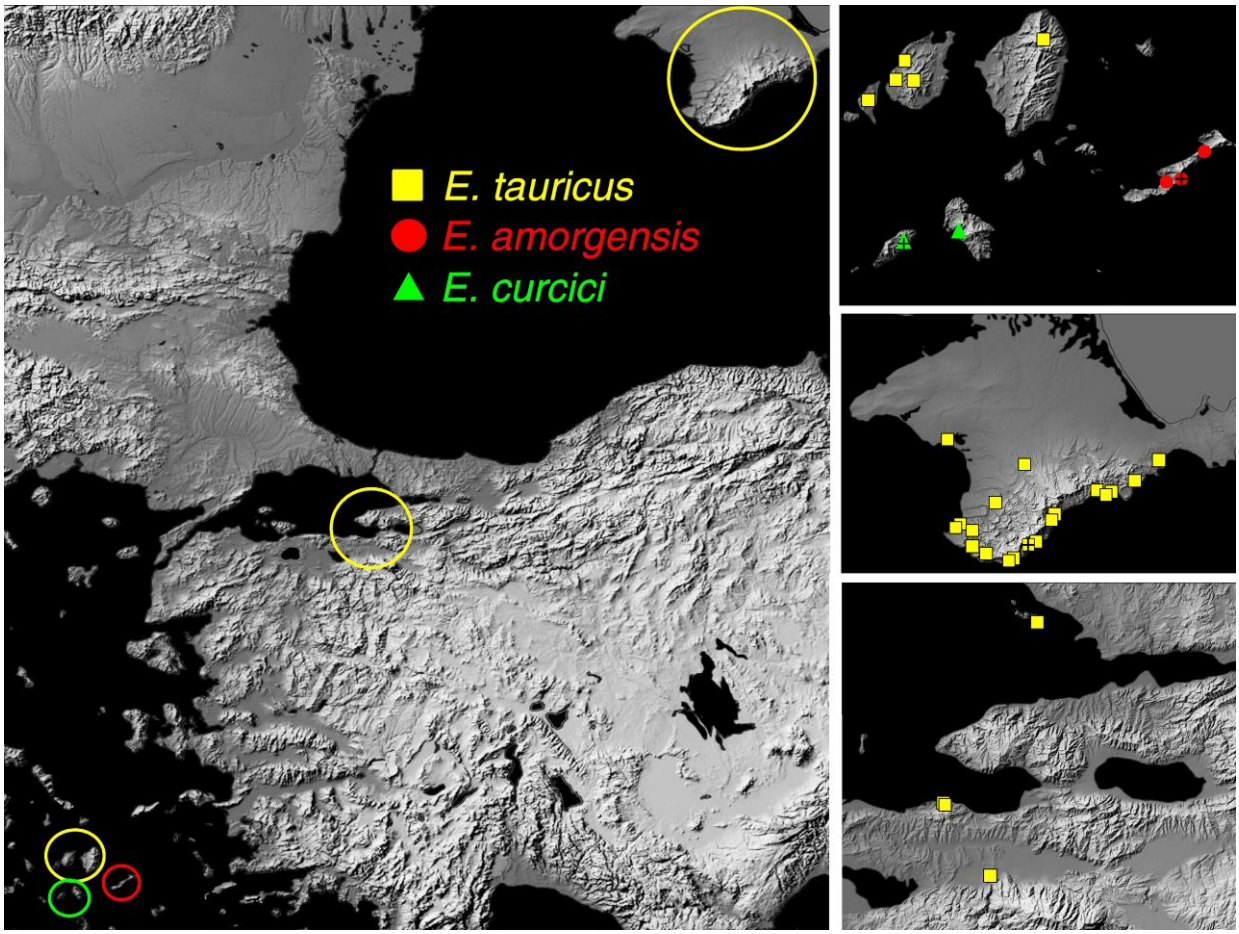


Figure 55. Distribution of *Euscorpius tauricus* (yellow squares), *E. amorgensis* **sp. n.** (red circles), and *E. curcici* **sp. n.** (green triangles). The type localities are marked with a cross.

Table 2. DNA sequences used in phylogenetic analysis

Species	Locality	Accession number and references	
		16S rRNA	*COI mtDNA*
E. tauricus 1	Turkey, Bursa, Tirilye Village	KY353266	KY353261
E. tauricus 2	Turkey, Bursa, Tirilye Village	KY353267	KY353262
E. tauricus 3	Turkey, Prinkipos Island (Büyükada)	KY353268	KY353263
E. tauricus 4	Turkey, Prinkipos Island (Büyükada)	KY353269	KY353264
E. tauricus 5	Greece, Paros Island, Marathi, ancient quarries	n.a.	KC215685 (Parmakelis et al., 2013)
E. tauricus 6	Greece, Paros Island, Petaloudes	KC215652 (Parmakelis et al., 2013)	KC215738 (Parmakelis et al., 2013)
E. tauricus 7	Ukraine, Crimea, Nikita Botanical Garden	KC215587 (Parmakelis et al., 2013)	KC215670 (Parmakelis et al., 2013)
E. tauricus 8	Greece, Sifnos Island, Agios Antreas, historical Acropolis	KC215599 (Parmakelis et al., 2013)	KC215682 (Parmakelis et al., 2013)
E. tauricus 9	Greece, Naxos Island, Apollonas to Koronida	KC215600 (Parmakelis et al., 2013)	KC215683 (Parmakelis et al., 2013)
E. amorgensis **sp. n.**	Greece, Amorgos Island, Agios Georgios, 85m	KC215606 (Parmakelis et al., 2013)	KC215690 (Parmakelis et al., 2013)
E. curcici **sp. n.** 1	Greece, Cyclades Islands, Sikinos Island, Chorio	KC215598 (Parmakelis et al., 2013)	KC215681 (Parmakelis et al., 2013)
E. curcici **sp. n.** 2	Greece, Cyclades Islands, Ios Island	KY353265	KY353260
E. avcii	Greece, Samos Island, 1 km north of Manolates	KC215588 (Parmakelis et al., 2013)	KC215671 (Parmakelis et al., 2013)
E. vignai	Greece, Karpathos Island, Pyles, primary school	KC215591 (Parmakelis et al., 2013)	KC215674 (Parmakelis et al., 2013)
E. stahlavskyi	Greece, Epiros, Mt. Smolikas	KC215653 (Parmakelis et al., 2013)	KC215739 (Parmakelis et al., 2013)
E. flavicaudis	Italy, Sardinia, Chiaramonti	KC215632 (Parmakelis et al., 2013)	KC215716 (Parmakelis et al., 2013)

Discussion

Scorpius tauricus (C. L. Koch, 1837) was described from the Crimea Peninsula, in Ukraine. However, his description was not very detailed, and for this reason, it was treated as a synonym, subspecies or race of *E. carpathicus* until Fet (2003) elevated it to species status, based on *16S rRNA* of specimens from Crimea. It has always been considered an endemic species of the Crimea with doubts about its relationship with the other species.

Brewer *et al*. (2005) were the first to report that the Paros Island specimens showed affinity with that from Crimea, based on *16S rRNA* sequence data; this was confirmed eight years later by Parmakelis *et al*. (2013). The latter work showed the phylogeny of *Euscorpius* with a large number of populations, addressing the populations from Amorgos, Naxos, Paros, Sifnos, and Sikinos as "*E. tauricus* complex", including also *E. avcii* Tropea *et al*., 2012, from Samos Island. In addition, in the present work we provided for the first time the sequences (*16S* r*RNA* and *COI*) of populations from Ios, an island of the Cyclades, as well as from Prinkipos Island (Büyükada), a small island southeast of Istanbul in the Marmara Sea, in Turkey, and from Bursa, the type locality of *E. rahsenae*. The latter two populations, although not morphologically identical

(the first is smaller and darker than the second) showed the same identical haplotype. Also, these two populations share the same haplotype with the populations from Paros Island (from Petaloudes) and Sifnos Island in both *16S rRNA* and *COI* sequences. The divergence between these populations and *E. tauricus* from Crimea ranges between 1.0% and 1.1% in *16S rRNA*, and between 1.0% and 1.2% in *COI*. Interestingly, on Paros, despite being a small island, there are two haplotypes (at least). In fact, the population from Marathi (Paros) (for which we only have *COI* sequence, not included in our phylogeny) is closer to the Crimean population showing just a divergence of 0.2%, while the divergence with the population from Petaloudes (Paros) is 0.9%. A relatively higher divergence is shown by the specimens from Naxos when compared to other populations of *E. tauricus* (0.9% to 1.6% for *16S rRNA*, and 2.7 to 3.8 for *COI*). Probably, Paros population has been separated for a longer time from Naxos than from Sifnos, or has been introduced on the latter. However, the divergence is very low compared to other species, thus all these populations (Paros, Sifnos, Antiparos, Naxos, Crimea, and northwestern Turkey) are considered as belonging to *E. tauricus*. We do not have sequence data of specimens from Antiparos, i.e. *E. carpathicus aegaeus* Di Caporiacco, 1950, but the second author (VF) had the opportunity to examine a syntype of this subspecies, held in MZUF, who despite being young and damaged, fits the characters of *E. tauricus*, which is quite expected considering that this small island is located less than 2 km apart from Paros.

Herein we described two new species, *E. amorgensis* sp. n. from Amorgos Island and *E. curcici* sp. n. from Sikinos and Ios Islands, genetically well-separated. *E. tauricus* has a divergence with *E. amorgensis* sp. n. ranging from 3.4% to 6.0% for *16S rRNA*, and 4.9 to 6.3 for *COI*, and with *E. curcici* sp. n. ranging from 2.2% to 4.6% for *16S rRNA*, and 4.9% and 6.6% for *COI*. The divergence between *E. amorgensis* sp. n and *E. curcici* sp. n. is 4.2% and 4.4% for *16S rRNA* and 4.7% and 5.5% for *COI*. The divergence values are within the limits reported for other valid species.

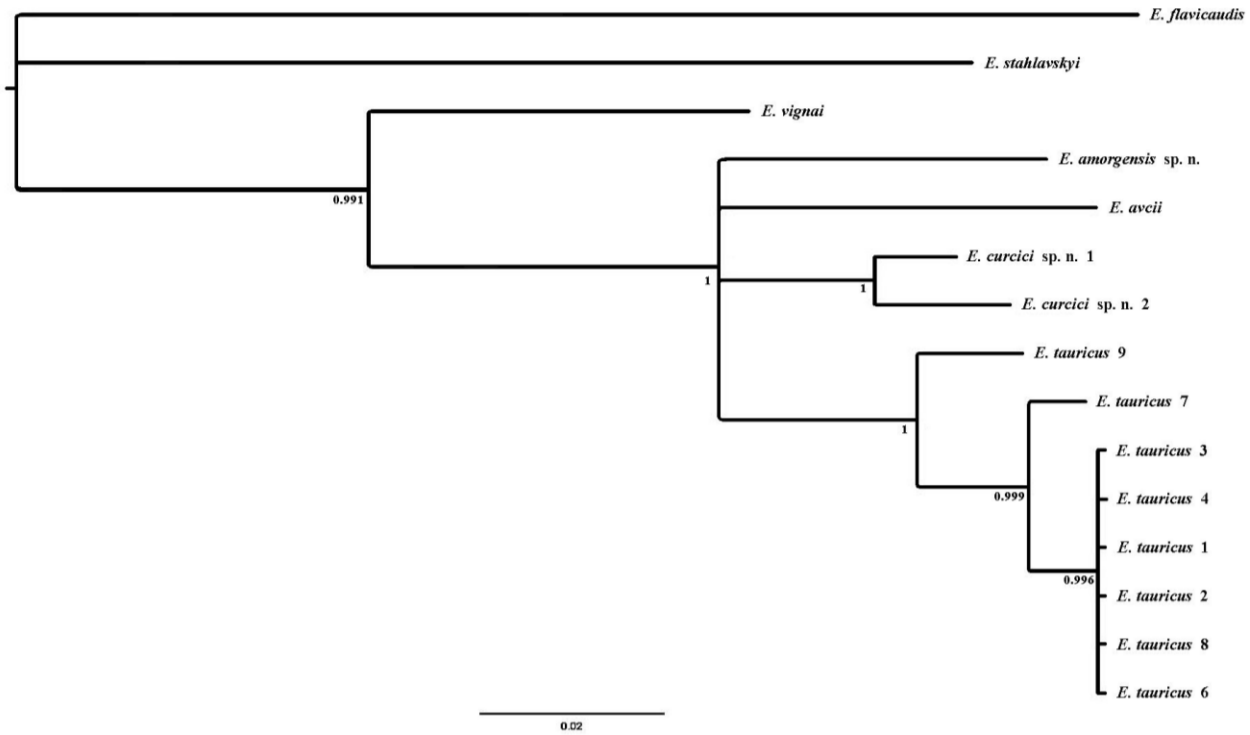


Figure 56. Phylogeny based on concatenated sequences of *16S rDNA* and *COI mtDNA.*

According to the phylogeny in Parmakelis *et al*. (2013) and our additional data, *E. vignai* Tropea *et al*., 2014 (Dodecanese Islands) forms the sister clade of the "*E. tauricus* clade" (*E. tauricus* + *E. curcici* sp. n. + *E. amorgensis* sp. n. + *E. avcii*). The phylogenetic relationships within "*E. tauricus* clade" are not well resolved, and can change depending on the marker sequence (e.g. *16S rRNA* or *COI mtDNA*) and/or the method used to construct the phylogenetic tree (e.g. Maximum Likelihood or Bayesian). In some cases (e.g. *16S* ML) *E. amorgensis* sp. n. grouped with *E. avcii* as a sister clade of *E. tauricus*, and *E. curcici* sp. n. was

basal to this group, while in another phylogeny (e.g. *COI* ML), *E. avcii* has been basal to this group, well separated from *E. amorgensis*.

Our data clearly show that *E. tauricus* not only is not endemic to Crimea, but is allochthonous there, as well as in the northwestern Turkey. It was previously suggested (Fet, 1997) that the existence of the Crimean scorpion was a result of a (possibly recent) migration from the Balkans or Anatolia during Pleistocene interglacials. *E. tauricus* could disperse to Crimea from Anatolia, to which the Crimean Peninsula had many connections during the Tertiary (Fet, 1997). The Crimean Peninsula itself originated as an island in the Tethys Sea during the Mesozoic Era and throughout the Tertiary Period was connected many times to different land masses (Caucasus, Balkan Peninsula, Anatolia, and/or modern Ukraine). Golovach (1984) analyzed the diplopod fauna in the Crimea, and suggested that its age is primarily Pleistocene and that the source of migration was the eastern Mediterranean, especially the Balkan Peninsula. Severe Pleistocene glaciations could have eliminated most of the ancient thermophilic and mesophilic biota in the Crimea. However, considering the data available in this work, such as the almost inexistent divergence between the population from Crimea (Ukraine) and the population from Marathi (Paros, Greece) (0.02% for *COI*), it seems plausible that a recent introduction of the Cycladic species to Anatolia and Crimea has taken place, e.g. by the ancient Greeks, who have been great navigators and founded colonies throughout the Mediterranean, including Crimea.

As for the morphological differences, the low number of specimens from Amorgos, Sikinos, and Ios islands, did not allow us to find or to ascertain well-defined and fixed characters in the populations to entirely separate the discussed species. These populations are closely related, and as often happens in these cases, it becomes even less easy to find the diagnostic characters for species identification, especially with such a low number of specimens (2 specimens *E. curcici* sp. n. and 4 specimens *E. amorgensis* sp. n.); e.g. of 4 examined pedipalps of *E. curcici* sp. n., three have *Pv* = 9 and one *Pv* = 8. This might suggest that this species may have a higher *Pv* than *E. tauricus* and/or *E. amorgensis* sp. n. Thus, additional specimens from these, and other Aegean islands are needed to understand the true variation and distribution of these and other possible new species of *Euscorpius*.

Acknowledgements

We are grateful to many colleagues who kindly loaned and shared types and comparative material with us, and helped in field collection and laboratory procedures, including Petar Beron, Matt Braunwalder, Michael Brewer, Alberto Chiarli, Marco Colombo, Jason Dunlop, Mikhail Eidelberg, Elizabeth Fet, Galina Fet, Simon Fet, Benjamin Gantenbein, Pier Mauro Giachino, Matthew Graham, Jürgen Gruber, Christoph Hörweg, Mark Judson, Alexander Khaustov, Dimitris Kaltsas, Rahşen S. Kaya, Ragnar Kinzelbach, Hayri Koru, František Kovařík, Oleg Kukushkin, Elise-Anne Leguin, Wilson Lourenço, Petros Lymberakis, Jochen Martens, Maurizio Mei, Kirill Mikhailov, Moysis Mylonas, Paolo Pantini, Alexi Popov, Stavroula Poulikarakou, Carsten Renker, Stylianos Simaiakis, Michael Soleglad, Verena Stagl, František Šťáhlavský, Pavel Stoev, Maria Tavano, Apostolos Trichas, Dante Vailati, Marco Valle, Katerina Vardinoyannis, Augusto Vigna Taglianti and Ersen Aydın Yağmur. Special thanks are to Michael Soleglad for producing a high-quality map (Fig. 55). V.F. thanks the Fulbright Scholar Program (Council for International Exchange of Scholars, USA) and Fulbright Foundation – Greece for their support that allowed Victor and Galina Fet to travel and stay in Greece (2012), as well as Fulbright Foundation – Austria and Fulbright Foundation – France for their support in V.F.'s travel to MNHN and NHMW in Spring 2012. We also thank two anonymous reviewers for their fruitful comments on a previous version of the manuscript.

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