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EUSCORPIUS LESBIACUS SP. N., A NEW SPECIES OF SCORPION FROM LESVOS ISLAND, GREECE (SCORPIONES: EUSCORPIIDAE)

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http://zoobank.org/urn:lsid:zoobank.org:pub:F68878B9-393D-4001-9486-8CBB2DE85E2B

Abstract: A new scorpion species is described from Lesvos Island (Greece), *Euscorpius lesbiacus* **sp. n.**, based on morphological and molecular evidence. Identity and level of divergence of this taxon is confirmed by a phylogeny based on multiple DNA markers. Morphologically, the new species is mainly characterized by a trichobothrial numbers Pv = 7 and Pe-et = 6, and pectinal tooth numbers (Dp) usually 8 to 9 in males and 7 in females.
Key words: Scorpiones, Euscorpiidae, systematics, phylogeny, Aegean, Lesvos Island, Greece, *Euscorpius lesbiacus* **sp. n.**

***Euscorpius lesbiacus* sp. n., una nueva especie de escorpión de la isla de Lesbos, Grecia (Scorpiones: Euscorpiidae).**
Resumen: Se describe una nueva especie de escorpión de la isla de Lesbos (Grecia), *Euscorpius lesbiacus* **sp. n.**, basado en evidencia morfológica y molecular. La identidad y el nivel de divergencia de este taxón se confirma mediante una filogenia basada en múltiples marcadores de ADN. Morfológicamente, la nueva especie se caracteriza principalmente por un número tricobotrial Pv = 7 y Pe-et = 6, y un número de dientes pectinales (Dp) generalmente de 8 a 9 en machos y 7 en hembras.
Palabras clave: Scorpiones, Euscorpiidae, sistemática, filogenia, Egeo, isla de Lesbos, Grecia, *Euscorpius lesbiacus* **sp. n.**

Taxonomy / Taxonomía: *Euscorpius lesbiacus* **sp. n.**

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 Euscorpiinae of Greece, where, mainly due to the unavailability or a small number 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 taxa of this genus resulting in a significant increase of the number of species in Greece (see Fet *et al*., 2013, 2014, 2018; Kovařík *et al.*, 2014; Parmakelis *et al*., 2013a, 2013b; Tropea & Rossi, 2012; Tropea & Fet, 2015; Tropea *et al*., 2013, 2014, 2015, 2017; Fet *et al*., 2018; Kovařík & Šťáhlavský, 2020). In this study, with the use of multiple DNA markers and morphological evidence, as a part of an ongoing revisionary study of scorpions of Greece and adjacent areas, we describe a new species from Lesvos Island, *Euscorpius lesbiacus* **sp. n.**, increasing the number of valid species of the genus *Euscorpius* in Greece to 27.

Methods and Material

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

Depositories: GTC, private collection of Gioele Tropea, Rome, Italy; NHMC, Natural History Museum of Crete, University of Crete, Heraklion, Crete, Greece. Material studied is listed in detail in the type specimens' section.

DNA Analysis and Species Validation

Validity of the herein treated species was supported by molecular phylogenetic study of *Euscorpius* populations across Greece (Parmakelis *et al*., 2013a). Several methods of species delimitation and a species validation method were employed in Parmakelis *et al*. (2013a) based on the phylogeny inferred using sequence data from one nuclear and three mtDNA loci. For details on molecular and phylogenetic analysis, see Parmakelis *et al*. (2013a).

Genetic distances are expressed as the number of base substitutions per site from between sequences. Standard error estimates are shown above the diagonal and were obtained by a bootstrap procedure (1,a000 replicates). Analyses were conducted using the Tamura 3-parameter model (Tamura, 1992) for *16S* and Tajima-Nei model (Tajima & Nei, 1984)

for *COI*. The rate variation among sites was modeled with a gamma distribution (shape parameter = 1). The analysis involved 21 nucleotide sequences. All ambiguous positions were removed for each sequence pair. There was a total of 411 positions in the final dataset for *16S* and 583 for *COI*. Evolutionary analyses were conducted in MEGA5 (Tamura *et al.*, 2011).

DNA sequences used for genetic distances are specified in table IV.

Systematics

Genus *EUSCORPIUS* Thorell, 1876

Subgenus Incertus

***Euscorpius lesbiacus* sp. n.**
Figs. 1–24; Tables I-IV.
http://zoobank.org/urn:lsid:zoobank.org:act:E2B4E9E2-6DBF-499B-9F82-6E8FA68932B7

REFERENCES:
Euscopius [sic] *carpathicus*: Voulalas & Michalis, 1977: 134.
Euscorpius carpathicus carpathicus (in part): Kritscher, 1993: 384.
Euscorpius sp. Clade E2: Parmakelis *et al.*, 2013a: 735, figs. 2-4; Fet *et al.*, 2018: 126, figs. 1, 8.

TYPE MATERIAL:
(39 specimens: 17 ♂, 22 ♀). **Holotype:** ♂, Greece, Lesvos Island, Mt. Olympus, in Sanatorio area, chestnut forest under stones and rotten wood, 19 August and 27 September 2020, leg. S. Zafeiriou (GTC). **Paratypes**: same label as holotype, 13 ♂, 16 ♀ (GTC); Lesvos Island, Mt. Lepetymnos, northern side, 26 June 2004, leg. J. O. Rein, 1 ♂, 2 ♀ (NHMC); Lesvos Island, Petra, Alma Beach, 23 June 2004, leg. J. O. Rein, 1 ♂, 1 ♀ (NHMC); Lesvos Island, Philia and Antissa, July-September 1996, leg. V. Dengos, 2 ♀ (NHMC 81.1.1.46-47); Lesvos Island, Vatera, 21 September 1995, leg. Renaud, 1 ♂, 1 ♀ (NHMC).

ETYMOLOGY. The specific epithet "*lesbiacus*" refers to the Latin name of Lesvos (*Lesbo*), meaning "of Lesvos", the collection locality of the new species.

GEOGRAPHIC RANGE. Known only from Lesvos (=Lesbos) Island (see map in Fig. 23).

DIAGNOSIS. A small *Euscorpius* species, total length around to 23.5–28 mm. Colour of adults from very light brown-reddish without reticulations or marbling, to medium brown with reticulations or marbling on the carapace, mesosoma and metasoma, more rarely on legs, but never on chelicerae, telson and pedipalps. 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 on the centre of the notch; and *dsb* usually is located on proximally half to the notch. The number of ventral trichobothria on the pedipalp patella usually is *Pv* = 7 (7–8); the number of external trichobothria on pedipalp patella usually is: *eb* = 4, eb_a = 4, *esb* = 2, *em* = 4, *est* = 4, *et* = 6. The pectinal teeth number mostly is 9 and 8 in males and 7 in females. Chela carina *V1* follows a direction toward the external of the trichobothrium Et_1. Finger usually with a large notch, which begins very proximally, almost at the junction of the fixed finger, ending almost at the level of the trichobothrium *et*, on movable finger the lobe is shifted to a very distal position from the centre of the notch on fixed finger, in the distal half of the notch on fixed finger, an asymmetry that forms a weak but wide notch on the movable finger, in adult males, obsolete in females. Dorsal patellar spur well developed. Femur of pedipalp slightly longer than patella or as long as it. Carapace usually as long as wide in males, usually slightly wider than long in females. Thin metasoma. Metasomal segment I from almost as long as wide to slightly wider than long in males, wider than long in females. Metasomal carinae on segment V with serrulated and spaced granules. Ventral row of tarsus III ending distally with 2 spinules that form a "Y" shape. Average distance from centre of median eyes to the anterior margin of the carapace is 41.81% of the carapace length. Telson usually slightly higher than wide or as high as wide in males, and slightly wider than high in females, with profile tapering distally. Vesicle particularly low in comparison to the length in females.

DESCRIPTION OF THE MALE HOLOTYPE

Colouration: Whole colour very medium to light brown without marbling, with carapace and pedipalps with reddish trend and lighter legs; the telson and the chelicerae are yellow without marbling; sternites, pectines and genital operculum whitish/ivory, the sternites are very light brownish.

Carapace: With a very fine and homogeneous granulation on most of surface; anterior edge straight; posterior lateral, anterior median and posterior median furrows are presents, but especially the latter two little marked; two pairs of lateral eyes and a pair of median eyes, situated distally of the middle, are presents; distance from centre of median eyes to anterior margin is 42.70 % of carapace length.

Mesosoma: Tergites laterally finely granulated; sternites are glossy smooth or in places very finely punctated. Spiracles small, oval shaped and inclined about 45° downward towards outside.

Metasoma: Dorsal carinae on segments I–III with very low and little visible granules, on segment IV slightly more visible; ventrolateral carinae on segment I absent, on segment II obsolete or absent, on segment III smooth and little notable, on segment IV a few small, low and spaced granules are present, on segment V serrulated and spaced granules are present; ventromedian carina on segments I–IV absent, on segment V formed by serrulated and spaced granules; intercarinal spaces on segments I–IV are ventrally and laterally smooth, dorsally with a very fine granulation, on V segment it is very finely granulated, laterally mostly smooth and ventrally with scattered granules. Dorsal furrows little marked.

Telson: Slightly higher than wide. Vesicle smooth, with ventral setae of different sizes, especially in surround of the vesicle/aculeus juncture.

Pectines: Teeth number 9/8; middle lamellae 6/5; 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 tuberculated; dorsal external carinae formed by tubercles slightly serrulated; ventral external carinae irregular, present mostly in the proximal 1/3; external median carinae serrulated; anterior median



Figs. 1–2. Dorsal and ventral view of *Euscorpius lesbiacus* **sp. n.** male holotype
Figs. 3–4. Dorsal and ventral view of *Euscorpius lesbiacus* **sp. n.** female paratype



Figs. 5–19. *Euscorpius lesbiacus* **sp. n.** male holotype (except Figs. 7 and 16 that are of a female paratype). **5.** Carapace. **6.** External view of chela. **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.** Ventral view of chela. **14.** Dorsal view of chela. **15.** Telson. **16.** Telson of adult female. **17.** Ventral view of the metasomal segment V. **18.** Lateral view of the metasomal segment V. **19.** Ventral view of tarsus III ending with two spinules that form a "Y" shape.

formed by about 9 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 2/5 to slightly crenulated in distally; ventral external carinae unevenly crenulated; intercarinal surface ventrally almost smooth, frontally with a very minute granules uniformly distributed, scattered minute granules positioned in a non-uniform way. Dorsal patellar spur well-developed. Chela: carina *D1* mostly smooth with slight undulation especially proximally; *D4* formed by dark, very low and little marked tubercles; *V1* is distinctly strong, dark and mostly crenulated, especially proximally, where there are also some tubercles; *V3* is rounded, dark, with a few small and scattered granules; intercarinal internal tegument granulated, ventral mostly smooth, external and dorsal with very



Fig. 20. A female of *E. lesbiacus* **sp. n.**, *in situ* in chestnut forest. Photograph by S. Zafeiriou.



Fig. 21. A male of *E. lesbiacus* **sp. n.** in the wild. Photograph by S. Zafeiriou.



Fig. 22. Two *E. lesbiacus* **sp. n.** females with offspring on their backs. Photograph by S. Zafeiriou.

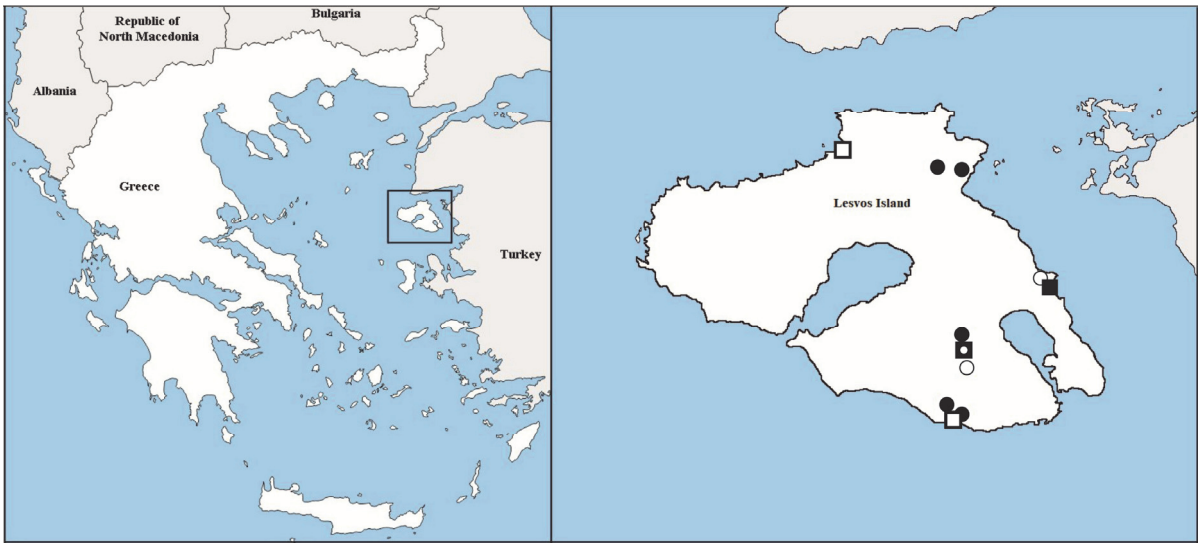


Fig. 23. Maps of distribution with all known localities. ◘ type locality; ○ records by S. Zafeiriou confirmed by photographs; □ Parmakelis *et al.* (2013a); ● Voulalas & Michalis (1977); ■ Kritscher (1993).

Table I. Measurements (mm) of *Euscorpius lesbiacus* **sp. n.** male holotype and a female paratype

		♂ Holotype	♀ Paratype
Total	Length	26.49	25.98
Carapace	Length	3.65	3.70
	Post. width	3.70	3.75
Metasoma	Length	10.04	9.18
Segment I	Length	1.30	1.18
	Width	1.35	1.30
Segment II	Length	1.55	1.45
	Width	1.20	1.10
Segment III	Length	1.79	1.65
	Width	1.10	1.05
Segment IV	Length	2.10	1.90
	Width	1.05	1.00
Segment V	Length	3.30	3.00
	Width	1.05	1.00
Telson	Length	3.70	3.00
Vesicle	Length	2.75	2.10
	Width	1.40	1.12
	Height	1.43	1.05
Aculeus	Length	0.95	0.90
Femur	Length	3.10	3.00
	Width	1.15	1.16
Patella	Length	3.15	3.00
	Width	1.30	1.30
Chela	Length	6.51	6.10
	Width	2.75	2.45
Movable finger	Length	3.74	3.35
Ratios			
CarA-CarP %		41.92 – 58.08	41.89 – 58.11
Lcar/Wcar		1.00	0.99
Lcar/Lpat		1.16	1.23
Lcar/Ltel		0.99	1.23
Lfem/Lpat		0.98	1.00
Lchel/Wchel		2.64	2.49
Lmet/ met.seg V		3.04	3.06
Ltel/Wtel		2.64	2.68
Lmet/Lcar		2.75	2.48
Lmet/Wmet		1.75	1.68
L/W met.seg I		0.96	0.81
L/W met.seg II		1.29	1.32
L/W met.seg III		1.63	1.57
L/W met.seg IV		2.00	1.90
L/W met.seg V		3.14	3.00

minute granules to form a reticulation; fixed finger with a large notch, which begins very proximally, almost at the junction of the fixed finger, ending almost at the level of the trichobothrium *et*, on movable finger the lobe is shifted in a very distal position from the centre of the notch on fixed finger, an asymmetry that forms a weak but wide notch on the movable finger. 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 12/12 *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 on the external surface on the carina V_1; the trichobothrium *et* on fixed finger is located barely distally to the notch of the fixed finger; *est* is located on the centre of the notch; and *dsb* is located on proximally half to the notch; *et-est*/*est-dsb* ratio is about 1.60. Patella: ventral (*Pv*): 7/7; 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 13/12 spinules of increasing size from proximal to distal, ending with 2 spinules that form a "Y" shape; 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 more marked, and dark ventrally.

Chelicerae: Typical of the subfamily Euscorpiinae.

Measurement: See table I.

Hemispermatophore.

Both right and left hemispermatophores of five specimens were examined. They have a well-developed lamina tapered distally; well-developed basal constriction present; truncal flexure present; median projection with *lde*, *ldi* and *lb*; internal projection distally with 5–10 tines in its crown. The number and the shape of tines of the crown varied between specimens and between the right and the left hemispermatophores.

Trichobothrial and pectinal teeth count variation

Pectinal teeth in males (n = 34): 8/8 (5), 9/8 (1), 9/9 (9), 10/10 (2); in total, 8 in 32.35% (11), 9 in 55.88% (19), and 10 in 11.76% (4); mean = 8.79, SD = 0,64.

Pectinal teeth in females (n = 44): 6/6 (1), 7/7 (16), 7/8 (3), 8/7 (1), 8/8 (1); in total, 6 in 4.54% (2), 7 in 81.82% (36) and 8 in 13.64% (6); mean = 7.09, SD = 0,42.

Pedipalp patella trichobothria *Pv* (n = 73): 6/7 (1), 7/6 (1), 7/? (1), 7/7 (24), 7/8 (4), 8/? (1), 8/5 (1), 8/7 (3),8/8 (3); in total, 7 in 79.45% (58) and 8 in 20.55% (15); mean = 7.20, SD = 0.41.

Pedipalp patella trichobothria *Pe* (n = 75): *et* = 4/6 (1), 5/6 (7), 6/6 (43), 6/7 (5), 7/7 (3); in total, 5 in 10.66% (8), 6 in 84% (63), and 7 in 5.33% (4); mean = 5.95, SD = 0.40; *est* = 3/3 (1), 3/4 (1), 4/? (3), 4/3 (2), 4/4 (32); *em* = 4/? (3), 4/4 (36); *esb* = 2/? (3), 2/12 (1), 2/2 (35); eb_a = 4/? (3), 4/3 (2), 4/4 (35); *eb* = ¾ (1), 4/? (3), 4/4 (35).

Ecological notes

Euscorpius lesbiacus **sp. n**. is known only from the Lesvos Island (Fig. 23). In this island the climate is Mediterranean, with mild winters with the greatest annual rainfall, and hot and sunny summers with very rare rainfall. Most of the specimens were collected at 600–700 m a.s.l., in moist and sunless areas, under stones, inside rotten trunks and under rotten bark of chestnut forest mixed with *Pinus* sp. and *Quercus* sp., rarely in *Abies cephalonica* forest. *E. lesbiacus* has not been found together with other scorpion species, but it is known that *Aegaeobuthus gibbosus* (Brullé, 1832) (Buthidae) is also present on this island (Kinzelbach, 1975; Voulalas & Michalis, 1977; Kritscher, 1993), but the latter has more xeric preferences than the majority of Euscorpiinae. This could lead to a low probability of encounter between the two species.

Discussion

The existence of a population of *Euscorpius* on Lesvos Island has been known for several decades but misidentified as *E. carpathicus* (L., 1767) (Voulalas & Michalis, 1977; Kritscher, 1993). *Euscorpius lesbiacus* **sp. n**. is evidently a very distinct species from all the other Greek taxa, as demonstrated by the DNA phylogeny (Fig. 24; modified after Parmakelis *et al.*, 2013a), as well as from the Anatolian species, as shown by the genetic divergence (Tables II and III). The genetic divergence between the new species and the other species compared herein is from 6.5% to 13.6% by *16S rRNA* marker and from 7.1% to 15.7% by *COI*.

Although being a Greek island, Lesvos lies only 10 km off the coast of the Anatolian Peninsula. Despite this, there are no known species particularly close to *E. lesbiacus* **sp. n.** in Turkey (as well as in Greece). In fact, the geographically closest known Anatolian species is *E. idaeus* Yağmur & Tropea, 2017, which is related to the genus *Alpiscorpius* Gantenbein *et al.*, 1999 and is easily distinguishable, mainly by the trichobothrial series *Pv* = 6, *Pe-et* = 4-5, and *Pe-em* = 3. The second geographically closest species, *E. avcii* Tropea *et al.*, 2012, is found about 130-150 km further southeast, in the Dilek Peninsula (Turkey) and in the Samos Island (Greece) (Parmakelis *et al.*, 2013b). It has the same *Pv* = 7 as *E. lesbiacus* **sp. n**., but mostly has *Pe-et* = 5, *Dp* = 8 in males and the carinae on the metasomal segment V strongly reduced, almost smooth.

E. tauricus (C.L. Koch, 1837), described from Crimea, is present both in the northwestern Turkey and in the Aegean Islands (Tropea *et al.*, 2017). *E. lesbiacus* **sp. n.**, is easily distinguishable from *E. tauricus* as well as the other two related species from the Aegean islands, *E. curcici* Tropea *et al.*, 2017 and *E. amorgensis* Tropea *et al.*, 2017. All these species usually have *Pv* = 8 or 9, the trichobothrium *est* distal to the center of the notch on the fixed finger, the notch on the fixed finger from medium to small, and a poorly developed ventromedian carina. In a phylogenetic tree (Fig. 24), *E. avcii, E. tauricus,* and other Aegean island species form an independent clade from *E. lesbiacus* **sp. n**.

Several other Greek species that have *Pv*=7 (*E. mylonasi, E. ossae*, *E. stahlavskyi*) are easily distinguishable from the new Lesvos species by a combination of other morphological characters, genetic distance, and a very different position in the DNA phylogeny (Fig. 24; Tables II and III).

In the last two decades, due to detailed morphological and molecular studies, the diversity of the subfamily Euscorpiinae increased more than 20-fold: from four main "old" species (*E. italicus* (Herbst, 1800), *E. flavicaudis* (DeGeer, 1778), *E. carpathicus* (L., 1767) and *E. germanus* (C.L. Koch, 1837); see, e.g., Kinzelbach, 1975) to as many as 81 species (including *E. lesbiacus* **sp. n.** described here), 54 of which have been described only since 2012. In addition, descriptions of several further new species are now in press or in preparation. This large increase in species diversity, and in studies that led to establishing these taxa, reflect a great degree of speciation and endemism in the Euscorpiinae. Species of this subfamily are often restricted to very limited areas such as a mountain range or an island, or a small group of mountains or islands. Recent studies have also brought to light the drastic shortage of specimens from many areas, without which we could hardly make an accurate description of the species and have a true understanding of the true diversity of the Euscorpiinae, albeit with the aid of molecular techniques. For example, *E. lesbiacus* **sp. n.** occurs in Lesvos Island, the third largest Greek island, known for its rich biodiversity (ca. 1,400 species of flora) and endemic species, e.g., in recently assessed spider fauna (Bosmans, 2011). Despite of this its population has been largely neglected (it has only been mentioned by Voulalas & Michalis, 1977; Kritscher, 1993; and Parmakelis *et al.*, 2013a), and an adequate number for the description of the species was not available in the museum collections. Another issue concerns the taxonomic position inferred from molecular analyses, which often leaves a doubt about the status of some populations, as well as the relationship between the various taxa. Those can significantly change according to the populations involved, the DNA marker used (e.g. *16S*, *COI*, *ITS1*, analysed separately or in a concatenated way, etc.) and the method for inferring the phylogenetic tree (Bayes, Beast, ML, NJ etc.). In the case of *E. lesbiacus* **sp. n.**, its validity at the species level is certainly not in question, which is both morphologically and genetically evident, as explained above. However, its position at the higher levels (subgenus/genus), and therefore its relationship with other taxa, is still ambiguous (Parmakelis *et al.*, 2013a). It is clear that *E. lesbiacus* **sp. n.** does not fall into the subgenus/genus *Euscorpius* s. str., and therefore here we provisionally place it in the genus *Euscorpius* and "subgenus incertus", pending clarification (Tropea *et al.*, in progress).

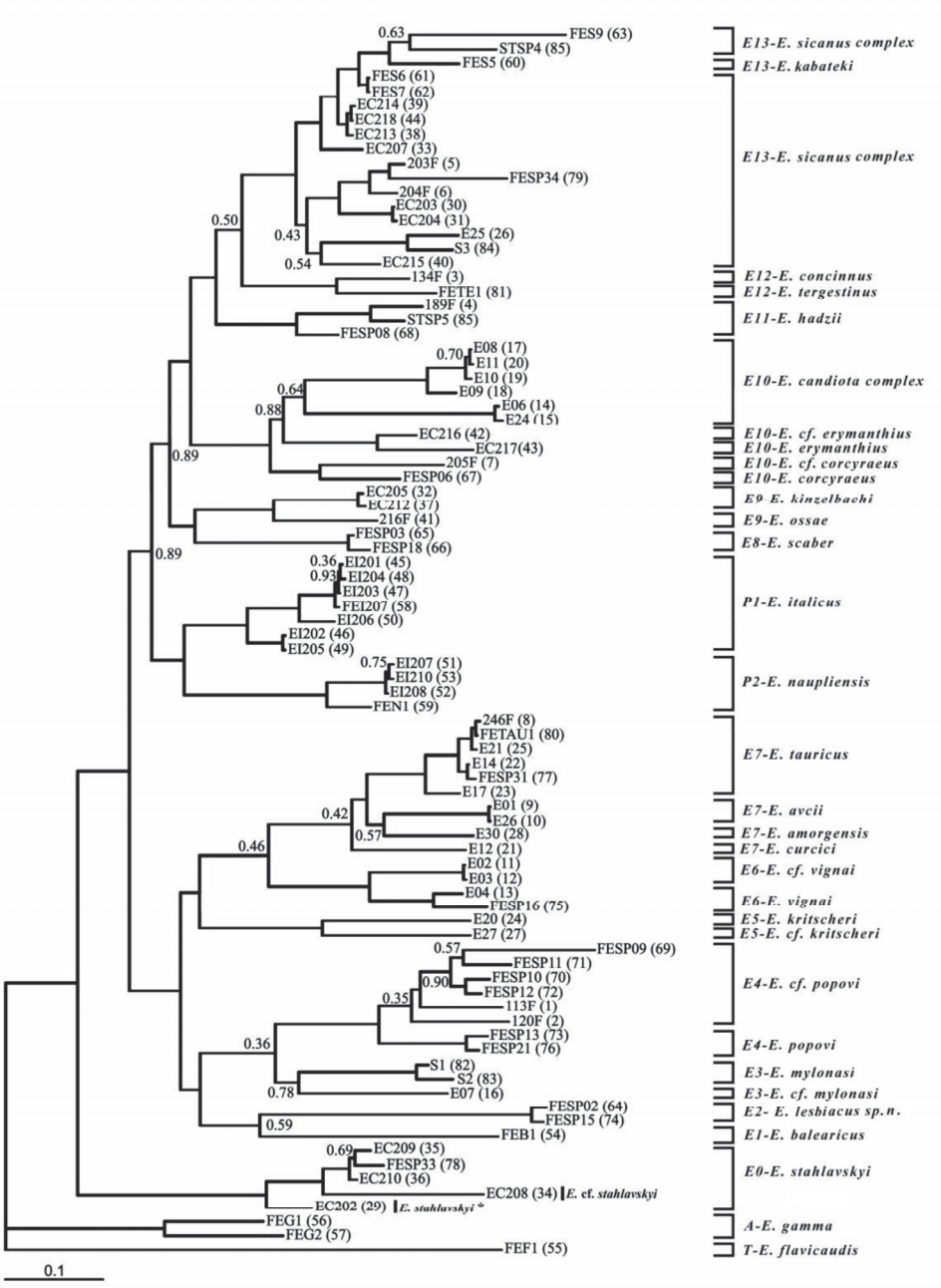


Fig. 24. A phylogenetic tree of the genus *Euscorpius*, modified after Parmakelis *et al.* (2013a).

Table IV. DNA sequences used to estimate genetic distance.
Ref.: Reference: (**1**): Parmakelis *et al*. (2013a); (**2**): Parmakelis *et al*. (2013b); (**3**) Tropea *et al*. (2016)

Species	Locality	Accession number and references			
		16S rRNA	◄Ref:	*COI*	◄Ref:
T. flavicaudis	Italy, Sardinia, Chiaramonti	KC215632	(1)	KC215716	(1)
E. stahlavskyi	Greece, Epiros, Mt. Smolikas	KC215653	(1)	KC215739	(1)
E. avcii	Turkey, Aydın Province, Dilek Peninsula	KF030937	(2)	KF030935	(2)
E. tergestinus	Croatia, Rab Island, Jurine, Banjol	KC215656	(1)	KC215742	(1)
E. concinnus	Italy, Elba Island, Procchio	KC215581	(1)	KC215664(	(1)
E. kinzelbachi	Greece, Thessaly, Mt. Olympos	KC215615	(1)	KC215694	(1)
E. scaber	Greece, Thasos Island, Skala Sotiros	KC215650	(1)	KC215736	(1)
E. erymanthius	Greece, Peloponnese, Kalentzi Mt.	KC215620	(1)	KC215704	(1)
E. lycius	Turkey, Muğla and Antalya Provinces	KX807080	(3)	KX807088	(3)
E. cf. candiota	Greece, Crete, Dionysades, Prasonisi	KC215594	(1)	KC215677	(1)
E. koci	Turkey, Mersin Province, 4km N Koramisli Village	KX807079	(3)	KX807087	(3)
E. gocmeni	Turkey, Antalya Province, Murtici Village	KX807077	(3)	KX807084	(3)
E. alanyaensis	Turkey, Antalya Province, Taşatan Plateau	KX807074	(3)	KX807081	(3)
E. popovi 1	Greece, Central Macedonia, Serres, Kerkini Lake	KC215647	(1)	KC215733	(1)
E. popovi 2	Bulgaria, Blagoevgrad Province, Melnik	KC215651	(1)	KC215737	(1)
E. amorgensis	Greece, Cyclades Islands, Amorgos Island, Agios Georgios	KC215606	(1)	KC215690	(1)
E. curcici	Greece, Cyclades Islands, Sikinos Island, Chorio	KC215598	(1)	KC215681	(1)
E. mylonasi	Greece, Evvoia Island, Nea Styra Islet	KC215657	(1)	KC215743	(1)
E. vignai	Greece, Karpathos Island, Arkasa	KC215649	(1)	KC215735	(1)
E. lesbiacus ***sp. n.*** *1*	Greece, Lesvos Island, Petra	KC215640	(1)	KC215725	(1)
E. lesbiacus ***sp. n.*** *2*	Greece, Lesvos Island, Mt. Lepetymnos	KC215648	(1)	KC215734	(1)

Table II. Genetic distances between *16S rDNA* gene sequences.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	*T. flavicaudis*		0,023	0,020	0,022	0,026	0,022	0,022	0,024	0,021	0,024	0,024	0,022	0,027	0,026	0,027	0,022	0,019	0,023	0,021	0,023	0,022
2	*E. stahlavskyi*	0,130		0,021	0,022	0,022	0,020	0,018	0,020	0,018	0,019	0,021	0,019	0,022	0,021	0,021	0,023	0,021	0,023	0,020	0,022	0,023
3	*E. avcii*	0,122	0,121		0,018	0,020	0,017	0,015	0,020	0,014	0,015	0,016	0,015	0,017	0,018	0,019	0,010	0,010	0,020	0,013	0,015	0,015
4	*E. tergestinus*	0,122	0,109	0,088		0,010	0,014	0,012	0,017	0,014	0,018	0,014	0,013	0,015	0,020	0,020	0,022	0,018	0,019	0,021	0,020	0,020
5	*E. concinnus*	0,148	0,114	0,101	0,028		0,015	0,013	0,020	0,015	0,020	0,017	0,015	0,017	0,022	0,022	0,024	0,020	0,021	0,021	0,022	0,021
6	*E. kinzelbachi*	0,126	0,098	0,078	0,057	0,063		0,010	0,017	0,011	0,017	0,012	0,012	0,015	0,017	0,017	0,019	0,019	0,018	0,018	0,018	0,017
7	*E. scaber*	0,127	0,090	0,071	0,044	0,049	0,034		0,013	0,008	0,013	0,011	0,010	0,012	0,015	0,015	0,017	0,016	0,018	0,016	0,016	0,015
8	*E. erymanthius*	0,142	0,097	0,105	0,078	0,088	0,075	0,057		0,014	0,012	0,016	0,014	0,017	0,017	0,017	0,022	0,023	0,017	0,021	0,020	0,020
9	*E. lycius*	0,120	0,094	0,065	0,057	0,063	0,040	0,023	0,061		0,012	0,012	0,011	0,013	0,015	0,015	0,017	0,016	0,018	0,014	0,016	0,015
10	*E. cf. candiota*	0,141	0,097	0,080	0,088	0,093	0,076	0,054	0,047	0,048		0,016	0,016	0,017	0,015	0,017	0,017	0,019	0,017	0,015	0,019	0,018
11	*E. koci*	0,140	0,108	0,077	0,057	0,067	0,044	0,040	0,068	0,043	0,076		0,007	0,009	0,018	0,018	0,019	0,017	0,019	0,016	0,016	0,015
12	*E. gocmeni*	0,128	0,100	0,077	0,053	0,063	0,043	0,037	0,061	0,040	0,072	0,018		0,009	0,016	0,016	0,018	0,016	0,019	0,017	0,015	0,014
13	*E. alanyaensis*	0,153	0,110	0,082	0,055	0,067	0,059	0,043	0,064	0,050	0,073	0,027	0,024		0,020	0,020	0,020	0,018	0,021	0,019	0,019	0,018
14	*E. popovi 1*	0,148	0,111	0,097	0,097	0,105	0,072	0,070	0,077	0,072	0,072	0,083	0,076	0,093		0,005	0,018	0,020	0,018	0,018	0,018	0,017
15	*E. popovi 2*	0,155	0,108	0,101	0,094	0,102	0,070	0,067	0,075	0,070	0,079	0,080	0,073	0,090	0,010		0,019	0,021	0,019	0,018	0,019	0,019
16	*E. amorgensis*	0,134	0,134	0,037	0,116	0,123	0,095	0,088	0,106	0,084	0,091	0,095	0,095	0,099	0,094	0,098		0,012	0,022	0,015	0,017	0,017
17	*E. curcici*	0,113	0,129	0,039	0,092	0,105	0,094	0,081	0,125	0,081	0,111	0,088	0,087	0,090	0,111	0,116	0,046		0,020	0,015	0,017	0,017
18	*E. mylonasi*	0,124	0,111	0,103	0,086	0,092	0,071	0,078	0,070	0,081	0,070	0,086	0,085	0,088	0,079	0,084	0,104	0,107		0,017	0,020	0,020
19	*E. vignai*	0,116	0,115	0,062	0,110	0,110	0,089	0,081	0,106	0,069	0,072	0,082	0,089	0,091	0,095	0,095	0,072	0,076	0,076		0,017	0,016
20	*E. lesbiacus sp. n. 1*	0,136	0,122	0,078	0,101	0,107	0,085	0,081	0,101	0,081	0,101	0,075	0,069	0,087	0,088	0,096	0,085	0,088	0,095	0,086		0,002
21	*E. lesbiacus sp. n. 2*	0,132	0,126	0,074	0,097	0,103	0,082	0,078	0,097	0,078	0,097	0,072	0,065	0,083	0,085	0,093	0,082	0,085	0,095	0,082	0,002	

Table III. Genetic distances between *COI* gene sequences.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	*T. flavicaudis*		0,022	0,019	0,019	0,020	0,019	0,021	0,023	0,021	0,022	0,023	0,021	0,020	0,022	0,023	0,022	0,020	0,021	0,020	0,023	0,022
2	*E. stahlavskyi*	0,151		0,018	0,020	0,018	0,017	0,017	0,020	0,016	0,019	0,019	0,018	0,018	0,016	0,016	0,019	0,018	0,018	0,015	0,018	0,016
3	*E. avcii*	0,121	0,126		0,017	0,016	0,017	0,016	0,018	0,015	0,016	0,017	0,018	0,015	0,015	0,015	0,015	0,012	0,018	0,015	0,020	0,017
4	*E. tergestinus*	0,128	0,134	0,102		0,010	0,017	0,015	0,016	0,014	0,016	0,016	0,018	0,017	0,016	0,016	0,016	0,016	0,015	0,016	0,019	0,018
5	*E. concinnus*	0,131	0,120	0,098	0,053		0,016	0,013	0,015	0,013	0,016	0,016	0,016	0,015	0,014	0,014	0,016	0,016	0,015	0,014	0,019	0,016
6	*E. kinzelbachi*	0,122	0,116	0,105	0,113	0,105		0,016	0,017	0,016	0,017	0,017	0,014	0,015	0,017	0,017	0,017	0,017	0,016	0,017	0,018	0,018
7	*E. scaber*	0,142	0,113	0,100	0,088	0,078	0,095		0,018	0,012	0,016	0,012	0,014	0,013	0,013	0,013	0,014	0,014	0,014	0,015	0,014	0,012
8	*E. erymanthius*	0,155	0,137	0,110	0,103	0,093	0,111	0,118		0,016	0,016	0,018	0,019	0,020	0,017	0,017	0,017	0,017	0,017	0,018	0,019	0,018
9	*E. lycius*	0,142	0,104	0,098	0,086	0,077	0,100	0,066	0,096		0,017	0,012	0,013	0,012	0,014	0,014	0,014	0,014	0,014	0,015	0,016	0,014
10	*E. cf. candiota*	0,148	0,129	0,097	0,098	0,095	0,110	0,095	0,091	0,103		0,018	0,018	0,016	0,015	0,014	0,016	0,015	0,016	0,017	0,020	0,019
11	*E. koci*	0,161	0,132	0,115	0,097	0,107	0,113	0,075	0,121	0,075	0,115		0,014	0,013	0,015	0,015	0,018	0,017	0,017	0,018	0,018	0,015
12	*E. gocmeni*	0,139	0,127	0,120	0,116	0,105	0,083	0,089	0,124	0,081	0,118	0,093		0,012	0,016	0,016	0,016	0,018	0,016	0,015	0,020	0,017
13	*E. alanyaensis*	0,145	0,140	0,093	0,108	0,104	0,095	0,082	0,140	0,075	0,108	0,080	0,073		0,014	0,014	0,016	0,015	0,016	0,016	0,017	0,015
14	*E. popovi 1*	0,145	0,111	0,098	0,098	0,083	0,108	0,078	0,118	0,087	0,100	0,100	0,102	0,088		0,004	0,016	0,015	0,015	0,016	0,015	0,013
15	*E. popovi 2*	0,148	0,106	0,095	0,093	0,083	0,108	0,074	0,113	0,083	0,090	0,095	0,098	0,088	0,010		0,016	0,015	0,015	0,015	0,015	0,013
16	*E. amorgensis*	0,148	0,127	0,081	0,099	0,099	0,101	0,081	0,112	0,084	0,101	0,118	0,104	0,096	0,101	0,096		0,012	0,016	0,016	0,018	0,017
17	*E. curcici*	0,125	0,116	0,058	0,093	0,095	0,103	0,078	0,111	0,081	0,095	0,102	0,115	0,086	0,093	0,093	0,060		0,016	0,014	0,017	0,016
18	*E. mylonasi*	0,139	0,118	0,116	0,095	0,088	0,103	0,083	0,113	0,083	0,098	0,105	0,105	0,100	0,088	0,088	0,099	0,100		0,016	0,017	0,016
19	*E. vignai*	0,130	0,106	0,093	0,100	0,096	0,108	0,093	0,116	0,098	0,110	0,128	0,109	0,113	0,107	0,098	0,099	0,081	0,105		0,017	0,016
20	*E. lesbiacus sp. n. 1*	0,157	0,126	0,127	0,131	0,123	0,123	0,083	0,134	0,095	0,139	0,121	0,131	0,113	0,093	0,093	0,109	0,113	0,110	0,118		0,004
21	*E. lesbiacus sp. n. 2*	0,145	0,111	0,110	0,121	0,104	0,118	0,071	0,124	0,083	0,129	0,103	0,115	0,097	0,075	0,075	0,099	0,103	0,100	0,113	0,008	

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