

A new species of *Euscorpium* Thorell, 1876 (Scorpiones, Euscorpidae) from Italy

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Summary

A new species of the genus *Euscorpium* Thorell, 1876 is described based on specimens collected at the locality Celano (AQ), Abruzzo, central Italy. It is characterized by a peculiar trichobothrial pattern (eba = 5-5 + eb = 4-4), a large number of pectine teeth, and a general colouration which is dark brownish, with legs and telson yellowish. With the description of this new species a new trichobothrial pattern is described. The number of *Euscorpium* species in Italy is thus raised to ten, and the number of species in the subgenus *Euscorpium* to five.

Introduction

The genus *Euscorpium* Thorell, 1876 is one of the most studied scorpion taxa; after several taxonomic changes, its present taxonomic status is 17 species (Vignoli & Salomone 2008) in four subgenera (*Alpiscorpius*, *Euscorpium*, *Politrichobothrius*, and *Tetratrachobothrius*) (Fet, Soleglad & Gantenbein, 2004). However, even this situation is not entirely clear, especially in the Balkans and in Turkey, but also in Western Europe. Italy is the country with the greatest number of *Euscorpium* species, and numerous studies have been done in this country. Nine species are recognized in Italy, three in the subgenus *Alpiscorpius* Gantenbein *et al.*, 1999: *E. alpha* Caporiacco, 1950, *E. gamma* Caporiacco, 1950, and *E. germanus* (C. L. Koch, 1837); four in the subgenus *Euscorpium* Thorell, 1876: *E. concinnus* (C. L. Koch, 1837), *E. oglasae* Caporiacco, 1950, *E. sicanus* (C. L. Koch, 1837), and *E. tergestinus* (C. L. Koch, 1837); one in the subgenus *Politrachobothrius* Birula, 1917: *E. italicus* (Herbst, 1800); and one in the subgenus *Tetratrachobothrius* Birula, 1917: *E. flavicaudis* (De Geer, 1778). The subgenus *Euscorpium* is the most representative and widespread of the entire genus, with nine species in Europe, four of which occur in Italy, in addition to several subspecies that are waiting to be clarified. The trichobothrial pattern of this subgenus is characterized by four trichobothria (3V + Et1) on the ventral pedipalp chela manus, and the pedipalp ventral patella surface with more than six trichobothria. The trichobothria on the external surface of the pedipalp patella (Pe) are very important diagnostic specific characters. The specimens described in this paper show a previously unrecognized Pe, and a high number of teeth on the combs. In the present paper, the species of *Euscorpium* in Italy are raised to a total of 10, of which five are in the subgenus *Euscorpium*.

Material and methods

Twenty-two specimens were collected at Celano (AQ) and Castel del Monte (AQ) in Italy. A further 81 specimens (*Euscorpium carpathicus garganicus* Caporiacco, 1950, syntypes 5895, 5898, 5900, 5901, 5903, 5910, 6162, 6165,

6167, 6168; *E. c. palmarolae* Caporiacco, 1950, syntypes 5757, 5758, 5759; *E. c. picenus* Caporiacco, 1950, lectotype 132/5856, paralectotypes 84/5847, 5848, 5861, 5862, 5863, 131/5838, 5839, 5840, 5841, 5842, 5843, 132/5854, 5856, 5857, 5860, 161/5850, 5851, 162/5864, 5865, 5866, 5867, 163/5987, 5988, 5889, 5990, 5991, 5992, 5993, 5994, 5995, 5996, 5997, 5998, 180/5852, 1417/5999, 6000, 6001, 6002, 6003, 6004, 6005, 6006, 6007, 6008, 6009, 6010, 6011, 6012; *E. oglasae* Caporiacco, 1950, lectotype 122/5974, paralectotypes 123/5975, *E. tergestinus* (C. L. Koch, 1837), 163/5997, 165/6226, 135/5699; *E. concinnus* (C. L. Koch, 1837), 139/5621, 1207/12610, 1211/12630, 308/9552, 276/9553, collo 1254, collo 1255, collo 1213; *E. hadzii* Caporiacco, 1950, 72/5968, 5969, *E. sicanus* 143/5780, 5782, 1077/12627, 1316) from the Museo Zoologico 'La Specola' dell'Università di Firenze; and 23 specimens from the private collection of Gioele Tropea: 7 *E. tergestinus* (from Abruzzo, Latium and Umbria); 8 *E. concinnus* (from Latium and Tuscany); 7 *E. sicanus* (from Tuscany and Sicily); 3 *E. carpathicus s.s.* (from Romania) were included in this study as comparison material.

Geographical coordinate data are in decimal degrees and were recorded with a portable GPS. Abbreviations: eb, external basal; eba, external basal a; esb, external supra-basal; et, external terminal; est, external subterminal; em: external medium; Pe, trichobothria on the external surface of pedipalp patella; Pv, trichobothria on patella ventral surface; V, trichobothria on ventral pedipalp chela manus. Institutional abbreviations: MZUF, Museo Zoologico 'La Specola' dell'Università di Firenze, Florence, Italy; GTC, private collection of Gioele Tropea. Trichobothrial notations follow Vachon (1974). Morphological measurements are given in millimetres (mm), following Stahnke (1970). Morphological nomenclature follows Stahnke (1970), Hjelle (1990), and Sissom (1990), but the chela carinae configuration follows Soleglad & Sissom (2001), and sternum terminology follows Soleglad & Fet (2003).

Euscorpidae Laurie, 1896

Euscorpium Thorell, 1876

(subgenus *Euscorpium* Thorell, 1876)

Euscorpium celanus n. sp. (Figs. 1–4)

Type material: holotype ♀ (Fig. 1), 1 paratype adult ♂ (Fig. 2), 1 paratype subadult ♀, 1 paratype subadult ♂ collected at the locality Celano (AQ), Abruzzo, central Italy, 42.08490°N 13.56734°E, 42.08865°N 13.56839°E, 862–986 m a.s.l., 29 June 2011, Gioele Tropea, deposited in MZUF, (holotype MZUF 1428, paratypes MZUF 1429, 1430, 1431). 1 paratype adult ♂, 1 paratype adult ♀, 2 paratype subadult ♂♂ collected at the locality Celano (AQ), Abruzzo, central Italy, 42.09838°N 13.57127°E, 862–986 m a.s.l., 29 June 2011, Gioele Tropea, held in GTC. 1 paratype adult ♂, 4 paratype adult ♀♀ collected at the locality Castel del Monte (AQ), Abruzzo, central Italy, 42.36773°N 13.72429°E, 42.36828°N 13.72137°E, 1360–1392 m a.s.l., 03 June 2012, Gioele Tropea, to be deposited in MZUF.



Fig. 1: Dorsal and ventral views of *Euscorpium celanus* n. sp. female holotype (MZUF 1428).



Fig. 2: Dorsal and ventral views of *Euscorpium celanus* n. sp. adult male paratype (MZUF 1430).

2 paratype adult ♂♂, 1 paratype subadult ♂, 3 paratype adult ♀♀, 3 paratype subadult ♀♀ collected at the locality Castel del Monte (AQ), Abruzzo, central Italy, 42.36773°N 13.72429°E, 42.36828°N 13.72137°E 1360–1392 m a.s.l., 03 June 2012, Gioele Tropea, held in GTC.

Etymology: The specific epithet refers to the Celano country, in which *Euscorpius celanus* n. sp. was collected.

Diagnosis: A medium-small *Euscorpius*, of total length 30 mm. Adult colouration: body dark brown, legs and telson lighter in female, much lighter in male, yellowish/ivory. Subadult specimens dark brown, with a distinct marbled strip from the posterior of the carapace to the 7th tergite (Fig. 4), legs and telson darker than in adults. Number of trichobothria on pedipalp manus ventral surface is typical of the subgenus *Euscorpius*: 4 (3V + Et1); the pedipalp patellar ventral trichobothria count is medium/high: Pv = 9/10; the number of trichobothria on the pedipalp patella external surface: eb = 4-4, eba = 5-5, esb = 2-2, em = 4-4, est = 4-4, et = 8-8/7-7 (Fig. 3B–D). The pectine tooth count is among the highest for the subgenus: 9-9/10-10 in ♂♂ (Fig. 3R), 7-7/8-9 in ♀♀ (Fig. 3S). The telson vesicle is more swollen in ♂♂ (Fig. 3J) than in ♀♀ (Fig. 3K). The notch of the fixed finger is developed in the proximal direction, and is more pronounced in ♂♂ (Fig. 3E) than ♀♀ (Fig. 3F). The dorsal patellar spur is moderately developed (Fig. 3B,C). Strong carinae on ventral metasomal segment V. Strong granulation on the ventral leg femora.

The new species can be distinguished from other *Euscorpius* species by the trichobothrial count eba = 5 + eb = 4, which is unique to *Euscorpius celanus* n. sp. (Table 2).

Description of holotype female (MZUF 1428) (Table 1): Colouration dark brown with reticulation or marbling on whole body, especially on carapace; mesosoma with slight clear marbled strip; legs, telson and chelicerae much paler, yellowish/ivory; telson marbled; chelicerae reticulated, with apical portion darker; chelae slightly lighter brown and not marbled; sternites and coxal region pale brown; pectines and genital operculum whitish/ivory.

Carapace (Fig. 3A) length 4.4, posterior width 4.75; sparsely finely granulated, especially on darker reticulation; deep posterior median, anterior median, and posterior lateral furrows; length from central median eyes to anterior margin c. 44.09% of carapace length; length from central median eyes to posterior margin c. 55.91% of the carapace length.

Mesosomal tergites sparsely finely granulated; sternites smooth, area of overlap between sternites paler; pectines tooth count 7-7.

Metasoma medium size with respect to body length; sparsely finely granulated, especially on darker reticulation; deep dorsal intercarinal furrows; metasomal segments cylindrical. Segment I: dorsal carinae partially smooth; obsolete dorsolateral carinae partially sparsely granulated; intercarinal surfaces sparsely granulated. Segments II–III–IV: dorsal carinae granulated; smooth dorsolateral carinae; ventrolateral carinae smooth but well evident; smooth ventromedian carinae. Segment V (Fig. 3L,M): dorsolateral carinae partially finely granulated; ventromedian and ventrolateral carinae crenulated and very marked. Anal arch crenulated.

Telson length 3.4, height 1.25; vesicle sparsely finely granulated on darker area, with ventral setae of different sizes; vesicle length 2.2, width 1.35.

Pectine length 1.9; tooth count 7-7; middle lamellae count 5-4; several microsetae on marginal lamellae, middle lamellae and fulcra.

Genital operculum partially divided; few microsetae present.

Sternum pentagonal shape, type 2; length approximately equal to width, deep posterior emargination.

Pedipalp coxa and trochanter with strong granulation; femur with granular carinae and conic granules, intercarinal spaces bear sparse granules of two sizes (large and small) on darker pigment area; patella length 3.75, width 1.65; dorsal internal and ventral internal carinae tuberculate; dorsal external carinae rough, ventral external carinae crenulated; external median carinae with rounded irregular granules; dorsal intercarinal surface with sparse granules mainly on darker pigmented area; ventral intercarinal surface almost completely smooth with few small granules on inner area; dorsal patellar spur short, weakly to somewhat developed, with small granules at base.

Chela carinae D1 and V1 stronger, distinct, and dark, with few tubercles (3/4) in proximal area; external carina distinct, with tubercles; carinae D4 and V3 dark and weakly tuberculate; carinae D3 finely granulated.

Trichobothria: chela series V standard: V = 4/4 (3V + Et1); patella ventral (Pv): 10-10; patella external (Pe) formula: et = 7-7, est = 4-4, em = 4-4, esb = 2-2, eba = 5-5, eb = 4/4.

		♀ holotype	♂ paratype
Total	length	29.65	29.77
Carapace	length	4.40	4.50
	posterior width	4.75	4.60
Metasoma	length	10.55	12.00
Segment I	length	1.40	1.55
	width	1.65	1.65
Segment II	length	1.60	1.80
	width	1.40	1.50
Segment III	length	1.80	2.05
	width	1.35	1.53
Segment IV	length	2.25	2.50
	width	1.35	1.50
Segment V	length	3.50	4.10
	width	1.35	1.52
Telson	length	3.40	4.27
Vesicle	length	2.20	3.17
	width	1.35	1.35
	height	1.25	1.70
Aculeus	length	1.20	1.10
Femur	length	3.80	3.65
	width	1.50	1.40
Patella	length	3.75	3.75
	width	1.65	1.60
Chela	length	7.55	7.82
	width	3.15	3.35
Movable finger	length	4.40	4.80
Pectine teeth	number	7-7	10-10

Table 1: Measurements (in mm) of female holotype (MZUF 1428) and male paratype (MZUF 1430) of *Euscorpius celanus* n. sp.

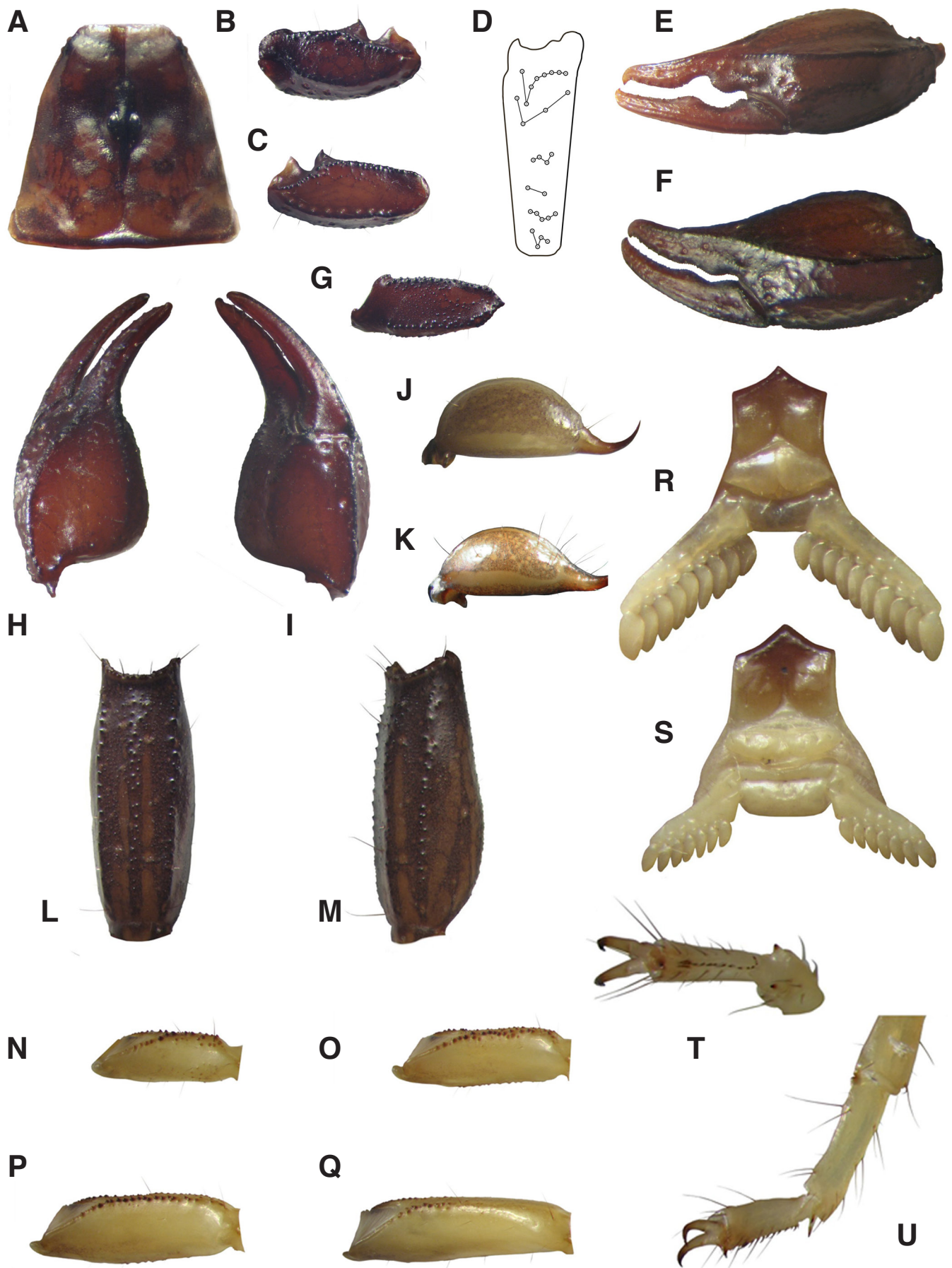


Fig. 3: *Euscorpium celanus* n. sp. **A** carapace; **B** dorsal view of pedipalp patella; **C** ventral view of pedipalp patella; **D** stylized view of trichobothrial pattern on external surface of pedipalp patella; **E** external view of chela of adult male; **F** external view of chela of adult female; **G** dorsal view of pedipalp femur; **H** dorsal view of chela; **I** ventral view of chela; **J** telson of adult male; **K** telson of adult female; **L** ventral view of fifth metasomal segment; **M** lateroventral view of the fifth metasomal segment; **N** first leg femur; **O** second leg femur; **P** third leg femur; **Q** fourth leg femur; **R** sternopectinal area of adult male; **S** sternopectinal area of adult female; **T** ventral view of tarsus; **U** lateral view of tarsus and basitarsus.

Legs with two pedal spurs (Fig. 3T,U); tarsal ventromedian row with 11/14 stout spinules (including the ventral distal spinule pair); 3/3 tarsal setae flanking pairs; basitarsus with 9–11 prolateral stout spinules on legs I; 8–10 prolateral stout spinules on legs II; 3–4 prolateral stout spinules on leg III, absent on leg IV; marked granulation on femora I, II and III, especially ventrally where formed by large granules and tubercles, less marked on femur IV.

Variation of diagnostic characters observed in 22 specimens studied (9♂♂, 13♀♀): Pectine teeth in ♂♂: 9-9 (2/9), 9-10 (6/9), 10-10 (1/9); ♀♀: 7-7 (2/13), 7-8 (3/13), 8-8 (6/13), 8-9 (2/13); pedipalp patella trichobothria Pv: 8-8 (1/22), 9-8 (3/22), 9-9 (10/22), 8-10 (1/22), 9-10 (5/22), 10-10 (2/22); pedipalp patella trichobothria Pe: et = 6-7 (1/22), 7-7 (14/22), 7-8 (4/22), 8-8 (3/22); est = 3-4 (3/22), 4-4 (19/22); em = 4-4 (17/22), 4-5 (4/22), 5-5 (1/22); est = 2-2 (22/22); eba = 4-5 (3/22), 5-5 (19/22); eb = 3-4 (1/22), 4-4 (21/22). The variations in the trichobothrial pattern are slight and not important; they are within the normal values of variability and show the stability of diagnostic characters.

Discussion

Euscorpium celanus n. sp. is a scorpion with unique characteristics when compared with other populations of the subgenus *Euscorpium*, and even more so when compared with the geographically closest *Euscorpium*.

E. tergestinus is light brown/reddish coloured. It is much more slender and has a more developed dorsal patellar spur than in *E. celanus*. Populations of *E. tergestinus* in Abruzzo and neighbouring regions (Lazio, Umbria and Marche) usually have a lower typical trichobothrial pattern: Pv = 9/8; series Pe: et = 6, est = 4, em = 4, esb = 2, eba = 4, eb = 4. The pectine tooth count is lower in these populations: 8-8 in ♂♂ and 7-7 in ♀♀. Both the trichobothrial pattern and the pectine tooth count increase in populations in north-eastern Italy and the Balkans, but the external series est, em, esb, eba and eb are always constant.

In Abruzzo, Marche and Tuscany, Caporiacco described *Euscorpium carpathicus picenus* (Caporiacco 1950), which is now synonymized with *E. tergestinus* (Fet & Soleglad 2002). I studied 49 specimens from the Museo Zoologico 'La Specola' dell'Università di Firenze labelled as *E. c. picenus* and none appeared similar to *Euscorpium celanus*; all specimens are similar to *E. tergestinus*, with the typical trichobothrial pattern.



Fig. 4: *Euscorpium celanus* n. sp. subadult specimen found under a stone show the longitudinal clear strip on back.

Some *Euscorpium concinnum* populations may be similar in appearance to *E. celanus* but *E. concinnum* has a pectine tooth count (8-8 in ♂♂ and 7-7 in ♀♀, Vignoli *et al.* 2005) and the trichobothrial count lower (Table 2). In addition, *E. celanus* has much more developed carinae on the fifth metasomal segment and granulation on the leg femora.

Euscorpium sicanius occurs in southern Italy and also in island and west-central Tuscany (Fig. 5); it is a polymorphic species with light and dark populations, but its trichobothrial pattern differs from that of *E. celanus*; Pe: eba = 4, eb = 5 is typical for peninsular Italy, while some Apulian, Greek and Sardinian populations may also have eba = 5, eb = 5 (Caporiacco 1950; Fet *et al.* 2003; Vignoli & Salomone 2008). So, in *E. sicanius* the eb is always 5, while in *E. celanus* it is always 4.

Euscorpium oglasae is the final species of the subgenus *Euscorpium* present in Italy, it is very far geographically (it is endemic to Montecristo Island, Tuscany) and morphologically from *E. celanus*. This species is light brown/reddish coloured, the trichobothrial pattern is among the lowest in the subgenus (Table 2), as also is the pectine tooth count of 7-7 in males and 6-6 in females (Vignoli *et al.* 2007).

On the opposite side of the Adriatic Sea, on the shores of the Balkans, *Euscorpium hadzii* occurs. This species may have the same Dp and Pv number as *E. celanus*, but normally has a higher Pe number: eba = 6/8, eb = 5; some populations in Bulgaria can have eba = 5 but the eb series always is 5 (Fet & Soleglad 2007).

According to the data of this study and those of the literature, there is no species or subspecies that corresponds to

Species	Pv	Pe - et	Pe - est	Pe - em	Pe - esb	Pe - eba	Pe - eb
<i>E. celanus</i> n. sp.	9-10	7-8	4	4	2	5	4
<i>E. balearicus</i>	9-14	6-10	4	4	2	4	4
<i>E. carpathicus</i>	7-9 (8)	5-7 (7)	4	3	2	4	4
<i>E. concinnum</i>	7-9 (8)	6-7	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. koschewnikowi</i>	8	5-6	4	4	2	4	4
<i>E. oglasae</i>	7	5	4	4	2	4	4
<i>E. tergestinus</i>	8-11 (9)	6-8 (6)	4	4	2	4	4
<i>E. sicanius</i>	9-11 (9)	5-9 (7)	4	4	2	4-5	5
<i>E. tauricus</i>	7-8	6	4	4	2	4	4

Table 2: Trichobothrial counts of the valid species of the subgenus *Euscorpium*.

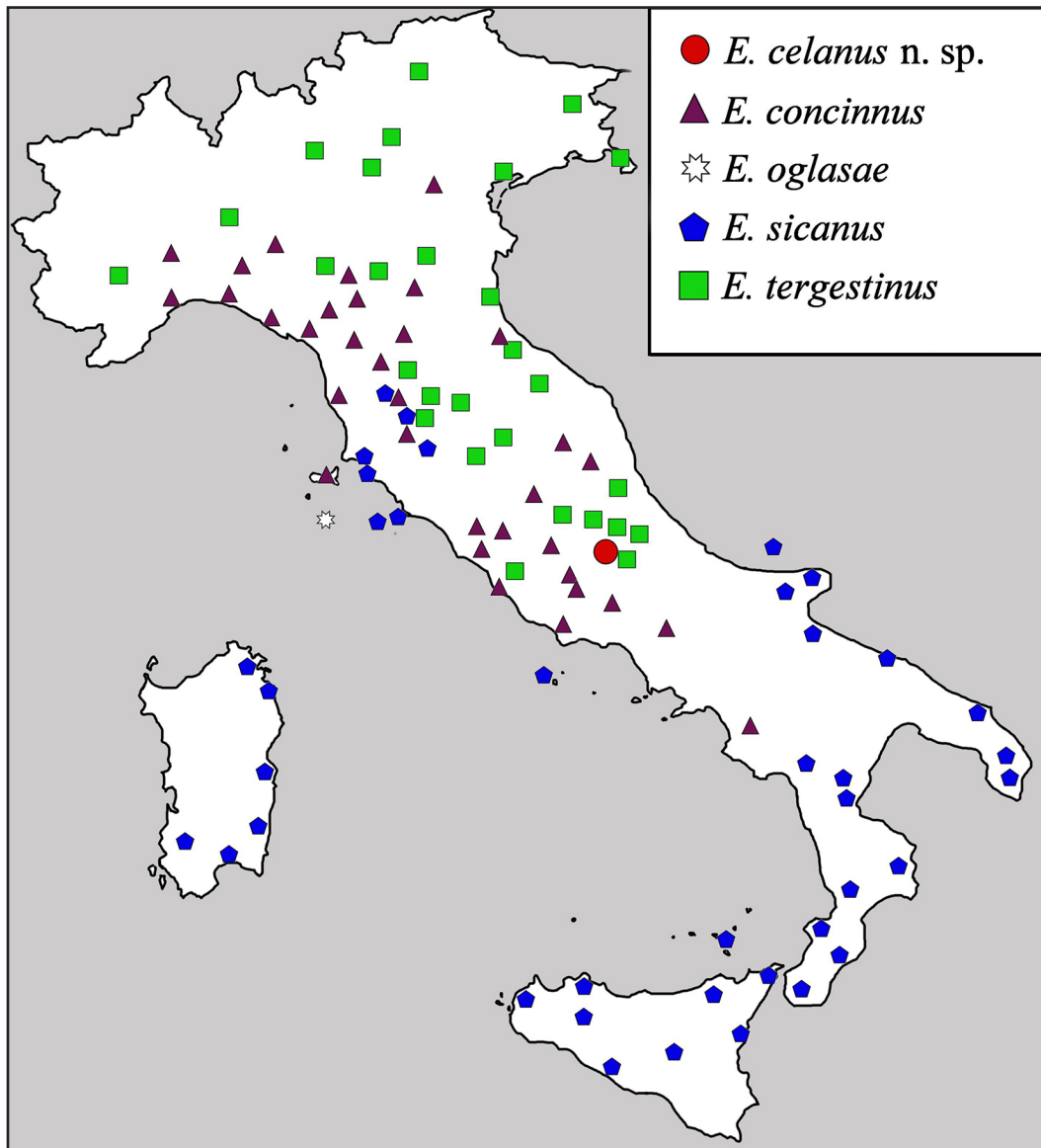


Fig. 5: Distribution map of the subgenus *Euscorpium* in Italy.

Euscorpium celanus; in particular, no species with the trichobothrial series $eba = 5$ with $eb = 4$ has been described. This is a new trichobothrial pattern and it is the most diagnostic character for this new species; in fact, all other species belonging to the subgenus *Euscorpium* with $eb = 4$ always have $eba = 4$, while species that may have $eba = 5$ (*E. hadzii* and *E. sicanus*) always have $eb = 5$ (Table 2).

Considering morphological characters such as the number of pectine teeth, the pedipalp patella trichobothria count, and the presence of the series $eba = 5$, *E. celanus* could be relatively closer to populations of *E. sicanus* or *E. hadzii*, which may have lost one or more accessory trichobothria during the course of speciation, as is known for other species of scorpions (Soleglad & Fet 2004). But further studies, especially molecular, would help to understand its relationships with the other *Euscorpium* species.

Ecology

Euscorpium celanus specimens were found in lapidicolous habitats between 862 and 1392 m a.s.l. on the

Apennine Mountains in mountain gorges with mixed vegetation (mostly shrubs and small deciduous trees and some conifers), forests of *Quercus* sp. (Fig. 6), and also in bleak areas under rocks and in stone walls. In this area the climate is warm but not too hot in the summer, quite cold in winter with snow. Searches were also made in *Fagus sylvatica* woods about 4.5 km to the east, between 1300 and 1400 m a.s.l., but no specimens were found. In the original locality under stones, two females of *Euscorpium tergestinus* were found, one of which was not far (about 40–50 cm) from a specimen of *Euscorpium celanus* (paratype MZUF 1430). Most likely this species is endemic to a small area in the Abruzzo region, but further studies must be made to understand its distribution and ecology.

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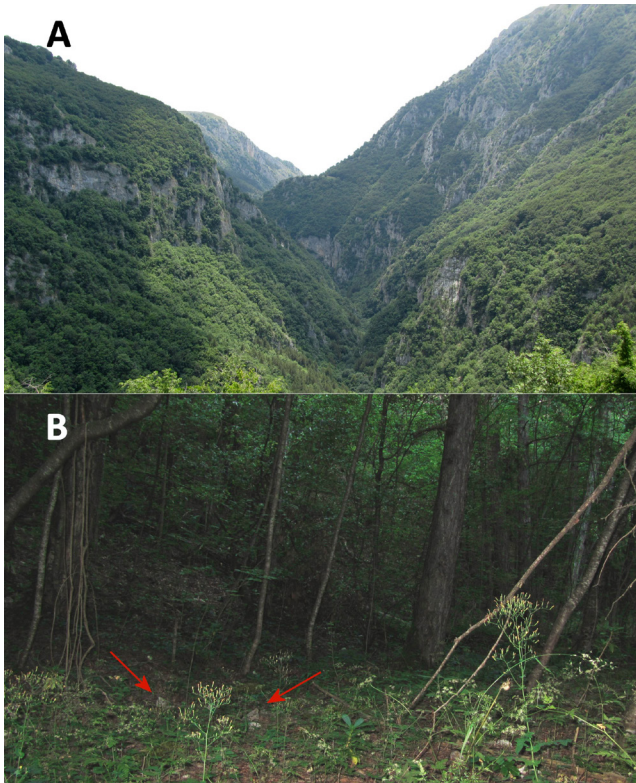


Fig. 6: *Euscorpius celanus* n. sp. habitat. **A** the gorges of Celano; **B** arrows indicate where two specimens were found.

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