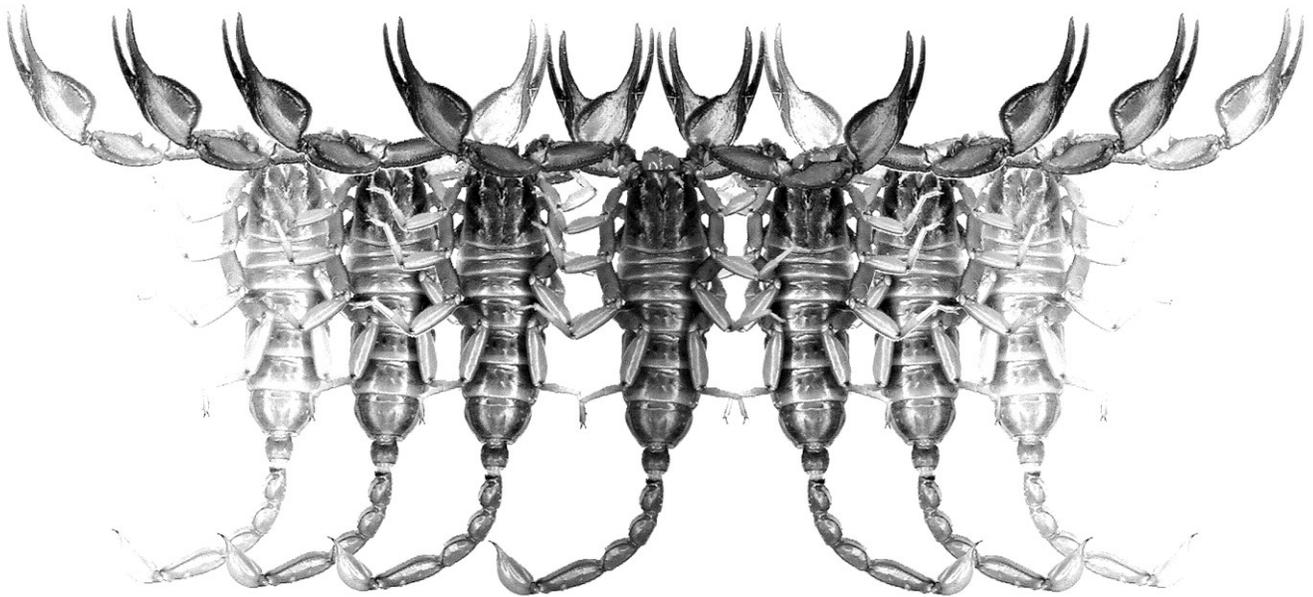


# *Euscorpium*

Occasional Publications in Scorpiology



**A New Species of *Euscorpium* Thorell, 1876 from  
Naples Province, Italy (Scorpiones: Euscorpidae)**

**Gioele Tropea, Aristeidis Parmakelis,  
Nikolett Sziszkosz, Katerina Balanika & Adam Boudierka**

**February 2014 — No. 182**

# *Euscorpius*

## Occasional Publications in Scorpiology

EDITOR: Victor Fet, Marshall University, 'fet@marshall.edu'

ASSOCIATE EDITOR: Michael E. Soleglad, 'soleglad@znet.com'

*Euscorpius* is the first research publication completely devoted to scorpions (Arachnida: Scorpiones). *Euscorpius* takes advantage of the rapidly evolving medium of quick online publication, at the same time maintaining high research standards for the burgeoning field of scorpion science (scorpiology). *Euscorpius* is an expedient and viable medium for the publication of serious papers in scorpiology, including (but not limited to): systematics, evolution, ecology, biogeography, and general biology of scorpions. Review papers, descriptions of new taxa, faunistic surveys, lists of museum collections, and book reviews are welcome.

### *Derivatio Nominis*

The name *Euscorpius* Thorell, 1876 refers to the most common genus of scorpions in the Mediterranean region and southern Europe (family Euscorpiidae).

*Euscorpius* is located at: <http://www.science.marshall.edu/fet/Euscorpius>  
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**A new species of *Euscorpius* Thorell, 1876 from Naples  
Province, Italy  
(Scorpiones: Euscorpiidae)**

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<http://zoobank.org/urn:lsid:zoobank.org:pub:276E6CB6-ACF0-4088-82C8-A49BB9A17F88>

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## Summary

A new scorpion species, *Euscorpius parthenopeius* **sp. n.**, is described from Naples Province, Italy. It is characterized by long-limbed overall appearance, medium size, light to medium brown to reddish color, and a typical trichobothrial count ( $Pv = 8-9$ ,  $et = 6$ ,  $em = 4$ , and  $eb = 4$ ). Due to its morphological ambiguity, it cannot be included in any of the described subgenera of the genus. We include in the new species three specimens from Capri Island described among syntypes of *E. carpathicus ilvanus* Di Caporiacco, 1950.

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## Introduction

The genus *Euscorpius* Thorell, 1876 is one of the most studied taxa of scorpions, very common in southern Europe and Anatolia. Its species occupy diverse habitats from the sea level up to over 2,000 m a.s.l. Taxonomy of this genus is complicated and still unresolved throughout its range, due to inaccurate old descriptions, lost type specimens, and lack of specimens from many areas. In addition, taxonomic studies are hindered by existence of cryptic species complexes, which are difficult to resolve even with phylogenetic analysis based on DNA markers. Populations of *Euscorpius* from Italy have been studied extensively by several researchers, but undoubtedly Lodovico Di Caporiacco was the one who wrote more about them. He studied populations from most of Italy, as well as from neighboring countries, and described many subspecies, some of which have been elevated to species status while others have been synonymized with different species. This is the case, for example, of the subspecies *E. carpathicus ilvanus* Di Caporiacco, 1950. Its syntypes originated mainly from the Tuscan Archipelago – a group of islands between Tuscany and Corsica, of which the largest and most known is the Elba, which gave its name to the subspecies (*Ilva* is Latin for Elba). Di

Caporiacco also included in the syntypes of this subspecies three specimens from Capri Island, Campania. Fet et al. (2003) synonymized *E. c. ilvanus* with *E. sicanus* (C.L. Koch, 1837), and assigned a lectotype from Giannutri Island (Tuscan Archipelago). At the same time, Fet et al. (2003: 371) moved part of syntypes of *E. c. ilvanus* originating from Elba and Capri Islands to *E. tergestinus* (C.L. Koch, 1837). Vignoli et al. (2005) elevated *E. concinnus* (C.L. Koch, 1837) to species status (it was previously synonymized with *E. tergestinus* by Fet & Soleglad, 2002), and reported this species from Elba Island. In this paper, specimens of *E. c. ilvanus* from Capri Island are included in the new species described herein from the city of Naples and Ischia Island, *E. parthenopeius* **sp. n.**

## Materials and Methods

### *Material examined*

The specimens were collected during day time by searching under stones, branches and barks, and during the night by careful inspection of vertical and horizontal surfaces using a UV light. Five specimens from Ischia were kept dry and only recently preserved in ethanol, all the others were preserved in 95% ethanol.

A total of 27 specimens of *Euscorpius parthenopeius* **sp. n.** have been examined (see *Type material*). The specimens and species listed below have also been examined for comparison:

*E. aquilejensis* (C.L. Koch, 1837): Italy, Latium, Rome, Via delle Isole Cursolane, May 2013, leg. P. Crucitti, 1 ♀ (GTC 316); Italy, Rome, Via Cosseria 2, 3 October 2013, leg. S. Tropea, 1 ♂ (GTC 421); Italy, Ancona, Genga, Ponte Chiaradovo, 43.42545° N, 12.99003° E to 43.42340° N, 12.99135° E, 14 September 2013, leg. G. Tropea, 6 ♀ (GTC 359–364); Italy, Umbria, Perugia, Città della Pieve, 508 m, 2010, leg. C. M. Legittimo, 2 ♀ (GTC 77, 78); Abruzzo, L'Aquila, Celano, 9 July 2011, leg. G. Tropea, 2 ♀ (GTC 422, 423); *E. concinnus* (C.L. Koch, 1837): Italy, Tuscany, Siena, near to SP408 between Ponte a Bozzone and San Giovanni a Cerreto, 12 August 2013, leg. G. Tropea & S. Tropea, 1 ♂, 1 ♀ (GTC 352, 358); Italy, Tuscany, Elba Island, pinewood, leg. A. Parisi (GTC 462); *E. oglasae* Di Caporiacco, 1950: Italy, Tuscany, Montecristo Island, 1879, leg. G.B. Toscanelli, 1 ♂, 1 ♀ (MZUF 5974, 5975), Italy, Tuscany, Montecristo Island, 3 February 1979, leg. M. Zapparoli, 2 ♂, 1 ♀ (MZUR 37-39); *E. sicanus* (C.L. Koch, 1837): Italy, Latium, Latina, Ponza Island, Piana d'Incenso, 1 ♀ (MZUR 97); Italy, Latium, Latina, reef to S of Palmarola Island, 1878, leg. G.B. Toscanelli, 1 ♂, 1 ♀ (MZUF 5758, 5759); Italy, Puglia, Foggia, Gargano, Foresta Umbra, Summer 2000, leg. M. Salvi, 1 ♂, 1 ♀ (GTC 282, 283); Italy, Grosseto, Giglio Island, Giglio Castle, 20 August 1976, leg. G.P. Rallo, 1 ♀ (MSNV); Italy, Grosseto, Giannutri Island, 1879, leg. G.B. Toscanelli, 1 ♂ (MZUF 5745, lectotype of *E. carpathicus ilvanus* Di Caporiacco, 1950), 1 ♀ (MZUF 5744, paralectotype of *E. c. ilvanus*); *E. tergestinus* (C.L. Koch, 1837): Italy, Friuli-Venezia Giulia, Aurisina, 14 September 1963, leg. A. Valle & R. Bianchi, 1 ♂, 3 ♀♀ (MSNB 2123, 2124, 2126, 2313); Croatia, Sukošan, 2012, 3 ♀ (GTC); Mali Halan, 11 August 1970, leg. A. Valle & R. Bianchi, 3 ♀ (MSNB 8173–8175).

### Abbreviations

Abbreviations: *V*: trichobothria on pedipalp chela manus ventral surface; *Pv*: trichobothria on patella ventral surface; *Pe*: trichobothria on pedipalp patella external surface; *et*: external terminal; *est*: external subterminal; *em*: external medium; *esb*: external supra-basal; *eba*: external basal a; *eb*: external basal; *db*: dorsal basal trichobothrium on fixed finger; *Dp*: pectinal teeth number; *L*: length; *H*: height; *Lchel*: chela length; *Wchel*: chela width; *Lcar*: carapace length; *Wcar*: carapace width; *Lfem*: femur length; *Lpat*: patella length; *Lmet*: metasoma length; *met.seg*: metasomal segment; *CarA-CarP* %: average ratio of distances from center of median eyes to anterior and posterior margins of the

carapace; *DPS*: dorsal patellar spur; *DD*: distal denticle; *MD*: median denticles; *OD*: outer denticles; *ID*: inner denticles; *IAD*: inner accessory denticles; GTC: private collection of Gioele Tropea, Rome, Italy; MSNB: Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy; MSNV: Museo di Storia Naturale di Venezia, Venice, Italy; MZUF: Museo Zoologico "La Specola" dell'Università di Firenze, Florence, Italy; MZUR: Museo di Zoologia "Charles Darwin" dell'Università di Roma "La Sapienza", Rome, Italy.

### Systematics

#### Family Euscorpiidae Laurie, 1896 Genus *Euscorpius* Thorell, 1876 Subgenus *Incertae Sedis*

*Euscorpius parthenopeius* Tropea, Parmakelis,  
Sziszkosz, Balanika et Boudierka, **sp. n.**  
(Figs. 1–16, Table 1)

<http://zoobank.org/urn:lsid:zoobank.org:act:AB7206C5-5011-45E3-8185-2C3A34B837E7>

#### REFERENCES:

- Euscorpius carpathicus ilvanus* (in part; Capri Island): Di Caporiacco, 1950: 196; Bartolozzi et al., 1987: 297; Fet & Sissom, 2000: 364.  
*Euscorpius tergestinus* (in part; Capri Island): Fet et al., 2003: 371.

*Type material*. *Holotype*: ♂, Italy, Campania, Naples Province, Naples, Posillipo, on a stone wall, 40° 48'28.60" N 14° 11'46.14" E, September–October 2012, leg. A. Boudierka & G. Perrotti (GTC 438).

*Paratypes*: 1 ♀, Italy, Campania, Naples Province, Naples, in a classroom of the Palizzi Art Institute, 29 May 2011, leg. A. Boudierka (GTC 185); 3 ♂, 8 ♀, Italy, Campania, Naples Province, Naples, Posillipo, on a stone wall, 40° 48'28.60" N 14° 11'46.14" E, September–October 2012, leg. A. Boudierka & G. Perrotti (GTC 434–437, 439–445); 1 ♀, Italy, Campania, Naples Province, Ischia Island, under stone in a pine wood in western part of island, 2012, leg. C. Del Gaudio (GTC 433); 1 ♂, 4 ♀, Italy, Campania, Naples Province, Ischia Island, one under stone and the others under fallen bark, in two pine woods in western part of the island, 40° 43.609' N 13° 56.036' E to 40° 44.226' N 13° 57.134' E, 2012, leg. C. Del Gaudio (GTC 472–476); 5 ♀, Italy, Campania, Naples Province, Naples, areas of Santa Lucia and Posillipo, 40° 49'55.08" N 14° 14'53.87" E to 40° 48'28.60" N 14° 11'46.14" E, 1 ♂, 2 ♀, Italy, Campania, Naples Province, Capri Island, 31 July 1879, leg. Corio (MZUF 5752–5754, part of syntypes of *E. c. ilvanus*). A pair of paratypes will be deposited in MSNB and another pair, in MZUR.



Figures 1-2: *Euscorpium parthenopeius* sp. n., male, dorsal and ventral views.

**Geographic distribution:** Italy, Campania, Naples Province: Naples, Ischia Island, Capri Island (see map in Fig. 19).

**Etymology:** The specific epithet refers to one of the ancient names of Naples (Gr. Παρθενόπη, Lat. *Parthenōpe*).

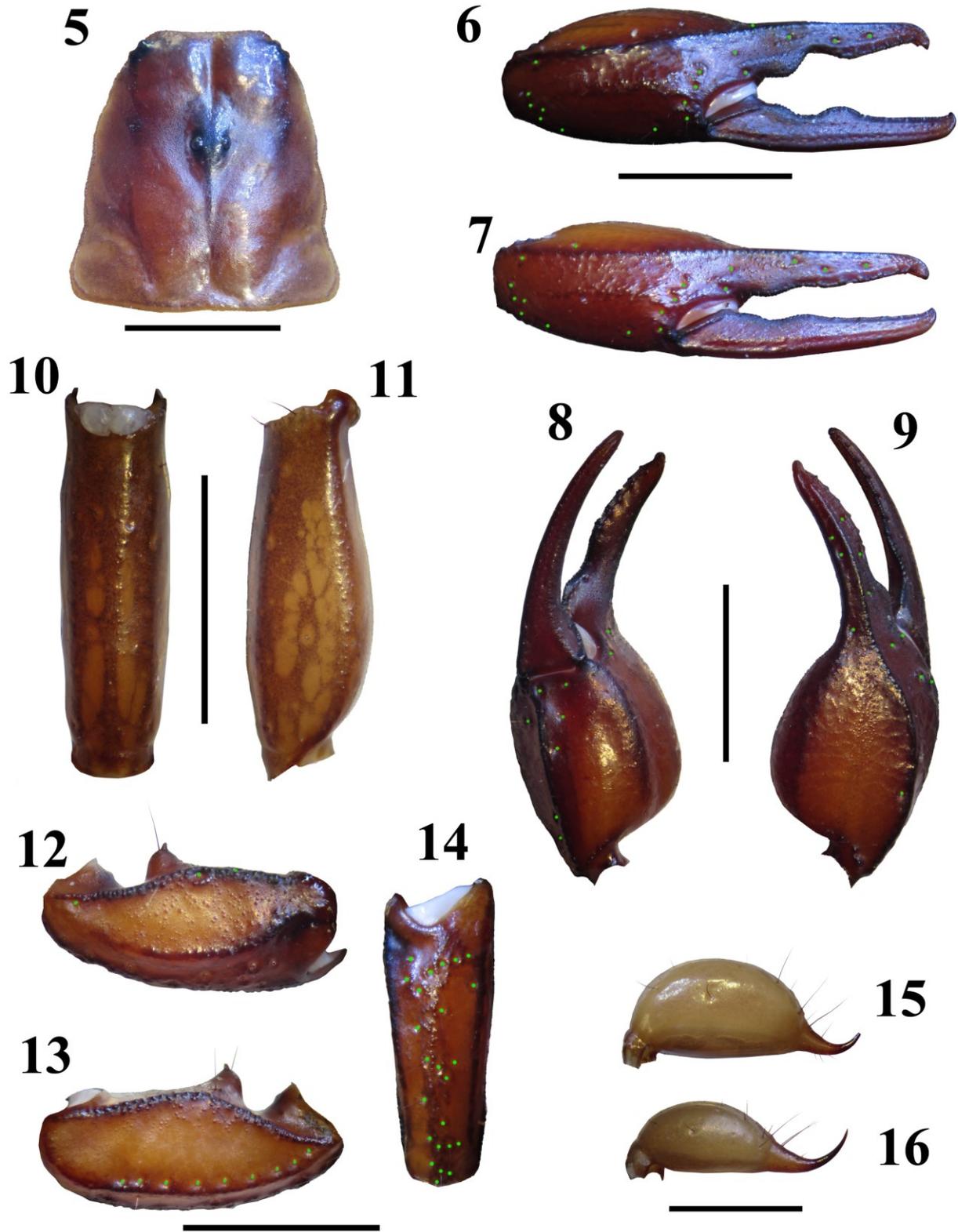
**Diagnosis:** A medium *Euscorpium* species, total length 30–37 mm. Color of adults light to medium brown-reddish, carapace and pedipalps darker reddish. Weak to very marked reticulation or marbling on chelicerae, carapace, mesosoma, metasoma, and legs. Poorly granulate metasomal carinae. Number of trichobothria on pedipalp manus ventral surface is 4 (3 *V*



**Figures 3-4:** *Euscorpius parthenopeius* sp. n., female, dorsal and ventral views.

+  $Et_1$ ). Number of trichobothria on the pedipalp patella ventral surface usually is 8 to 9 (9 in 64.81 % and 8 in 22.22 % of pedipalps examined). Number of trichobothria on pedipalp patella external surface is:  $eb = 4$ ,  $eb_a = 4$ ,  $esb = 2$ ,  $em = 4$ ,  $est = 4$ ,  $et = 5$  to 7 (series  $et = 6$  in 77.78 %, 7 in 11.11 % and 5 in 11.11 % of pedipalps examined). Pectinal teeth count is 8 to 7 in males (8 in 75% and 7 in 25% of the pectines examined) and usually

6 to 8 in females (7 in 75 % of the pectines examined).  $Lchel/Wchel$  ratio is 2.598 in males and 2.781 in females. Dorsal patellar spur well-developed. Femur slightly shorter than patella or as long as it;  $Lfem/Lpat$  ratio is 0.984. Carapace usually longer than wide in males and as long as wide or slightly shorter in females; average ratio  $Lcar/Wcar$  1.058 in males and 0.972 in females; average distance from center of median eyes to



**Figures 5-16:** *Euscorpium parthenopeius* sp. n. **5.** Carapace. **6.** External view of the chela of adult male. **7.** External view of the chela of adult female. **8.** Ventral view of the chela. **9.** Dorsal view of the chela. **10.** Ventral view of the metasomal segment V. **11.** Lateral view of the metasomal segment V. **12.** Dorsal view of pedipalp patella. **13.** Ventral view of pedipalp patella. **14.** External view of pedipalp patella. **15.** Telson of adult male. **16.** Telson of adult female.

<i>Euscorpius parthenopeius</i> sp. n.			
		<i>Holotype</i> ♂	<i>Paratype</i> ♀
<b>Total</b>	<b>Length</b>	34.95	31.37
<b>Carapace</b>	<b>Length</b>	5.58	5.16
	<b>Posterior width</b>	5.28	5.28
<b>Metasoma</b>	<b>Length</b>	13.83	12.16
<b>Segment I</b>	<b>Length</b>	1.74	1.59
	<b>Width</b>	1.86	1.79
<b>Segment II</b>	<b>Length</b>	2.16	1.86
	<b>Width</b>	1.65	1.47
<b>Segment III</b>	<b>Length</b>	2.40	2.10
	<b>Width</b>	1.62	1.44
<b>Segment IV</b>	<b>Length</b>	2.82	2.47
	<b>Width</b>	1.50	1.32
<b>Segment V</b>	<b>Length</b>	4.71	4.14
	<b>Width</b>	1.44	1.31
<b>Telson</b>	<b>Length</b>	5.40	4.08
<b>Vesicle</b>	<b>Length</b>	4.02	2.64
	<b>Width</b>	2.04	1.32
	<b>Height</b>	2.28	1.33
<b>Aculeus</b>	<b>Length</b>	3.83	1.44
<b>Femur</b>	<b>Length</b>	4.56	4.44
	<b>Width</b>	1.68	1.68
<b>Patella</b>	<b>Length</b>	4.63	4.50
	<b>Width</b>	1.92	1.86
<b>Chela</b>	<b>Length</b>	9.42	8.94
	<b>Width</b>	3.57	3.18
<b>Movable finger</b>	<b>Length</b>	5.82	5.34
<b>Ratio</b>	<i>CarA – CarP (%)</i>	39.78 – 60.22	40.70 – 59.30
	<i>Lcar/Wcar</i>	1.057	0.976
	<i>Lcar/Lpat</i>	1.204	1.146
	<i>Lcar/Ltel</i>	1.033	1.263
	<i>Lchel/Wchel</i>	2.638	2.806
	<i>L/W met.seg I</i>	0.935	0.886
	<i>L/W met.seg II</i>	1.309	1.265
	<i>L/W met.seg III</i>	1.481	1.458
	<i>L/W met.seg IV</i>	1.884	1.873
	<i>L/W met.seg V</i>	3.271	3.165
	<i>Lmet/ met.seg V</i>	2.937	2.937
	<i>Lmet/Lcar</i>	2.480	2.357
	<i>Lfem/Lpat</i>	0.984	0.986

**Table 1:** Measurements (mm) and morphometric ratios of *E. parthenopeius* sp. n.



Figures 17-18: *Euscorpium parthenopeius* sp. n. Ventral and lateral view of leg III tarsus.

anterior margin of the carapace is 40.22 % of the carapace length. Average distance from center of median eyes to posterior margin of the carapace is 59.78 % of the carapace length. Average ratio of  $L_{met}/L_{car}$  is 2.546 in males and 2.326 in females.

**Trichobothrial and pectinal teeth count variation:**

Variation observed in 27 studied specimens (6 males, 21 females) is given below.

*Pectinal teeth, males* (n=6): 7/8 (1), 8/7 (2), 8-8 (3); in total, 8 in 75 % and 7 in 25 %; mean = 7.75, SD = 0.43.

*Pectinal teeth, females* (n=21): ?/? (1), 6/6 (1), 6/7 (3), 7/7 (13), 8/7 (1), 8/8 (1), 8/9 (1); in total, 7 in 75 %, 6 in 12.50 %, 8 in 10%; mean = 7.02, SD = 0.57.

*Pedipalp manus, ventral trichobothria V + Et<sub>1</sub>* (n=27): 3/3 (1), 4/4 (26).

*Pedipalp patella, ventral trichobothria Pv* (n=27): 6/7 (1), 8/8 (3), 8/9 (5), 9/8 (4), 9/9 (13), 10/10 (1); in total, 9 in 64.81 % and 8 in 22.22 %; mean = 8.66, SD = 0.66.

*Pedipalp patella, external trichobothria Pe* (n=27):  $et = 5/5$  (1),  $5/6$  (3),  $6/5$  (1),  $6/6$  (19),  $7/7$  (3), in total, 6 in 77.78 %, 7 in 11.11 %, and 5 in 11.11 %; mean = 6, SD = 0.47;  $est = 4/4$  (22);  $em = 4/4$  (22);  $esb = 2/2$  (22);  $eb_a = 3/4$  (1),  $4/4$  (21);  $eb = 4/4$  (22).

**Description of the male holotype**

**Coloration:** Total color light brownish to brownish-reddish with carapace darker; marbling on chelicerae, tergites, metasoma and femur and patella of legs III and IV; sternites light brownish, pectines and genital operculum whitish/light brownish; chelicerae very light, ivory/light brownish with darker fingers and much darker finger denticles, palms with marbling; telson yellowish, with a longitudinal dark line and dark reddish aculeus tip; darker blackish carinae.



**Carapace:** Length 5.58, posterior width 5.28; fine granulation on whole surface, except the area between the lateral eyes, which is smooth, while the anterior lateral area behind the lateral eyes has larger granules; anterior edge from slight granulate to granulate in lateral area and more or less straight; very deep posterior lateral furrows; two pairs of lateral eyes (with a larger anterior eye), and a pair of median eyes, situated distally of the middle; length from center of median eyes to anterior margin is 39.78% of carapace length; length from center of median eyes to posterior margin is 60.22% of the carapace length.

**Mesosoma:** Tergites very finely granulated; sternites glossy and finely punctuated; small spiracles inclined to about 45° downward towards outside; area of overlap between sternites paler.

**Metasoma:** Dorsal carinae on segment I with few and spaced granules, on segments II–IV with spaced granules; dorsolateral carinae on segments I barely traceable with very few, small, spaced granules, on segments II–V absent or obsolete; ventrolateral carinae absent on segment I, absent or obsolete on segments II–IV, slightly and finely granulated on segment V; ventromedian carina absent on segments I–IV, with few, spaced and very small granules on segment V; intercarinal spaces smooth, only the dorsal surface has a very fine granulation.

**Telson:** Vesicle with a few scattered, very small granules to rough, with ventral setae of different size, especially near the vesicle/aculeus juncture;  $L/H$  ratio of the vesicle 1.763.

**Pectines:** teeth count 7/8 or 8/8 (the right pecten has two teeth almost completely fused); 5/5 middle lamellae; several microsetae on proximal area of teeth, marginal lamellae, middle lamellae and fulcra.

**Genital operculum:** The genital operculum is formed by two longitudinally separate subtriangular sclerites; genital papillae distally slightly protruding; a few microsetae present.

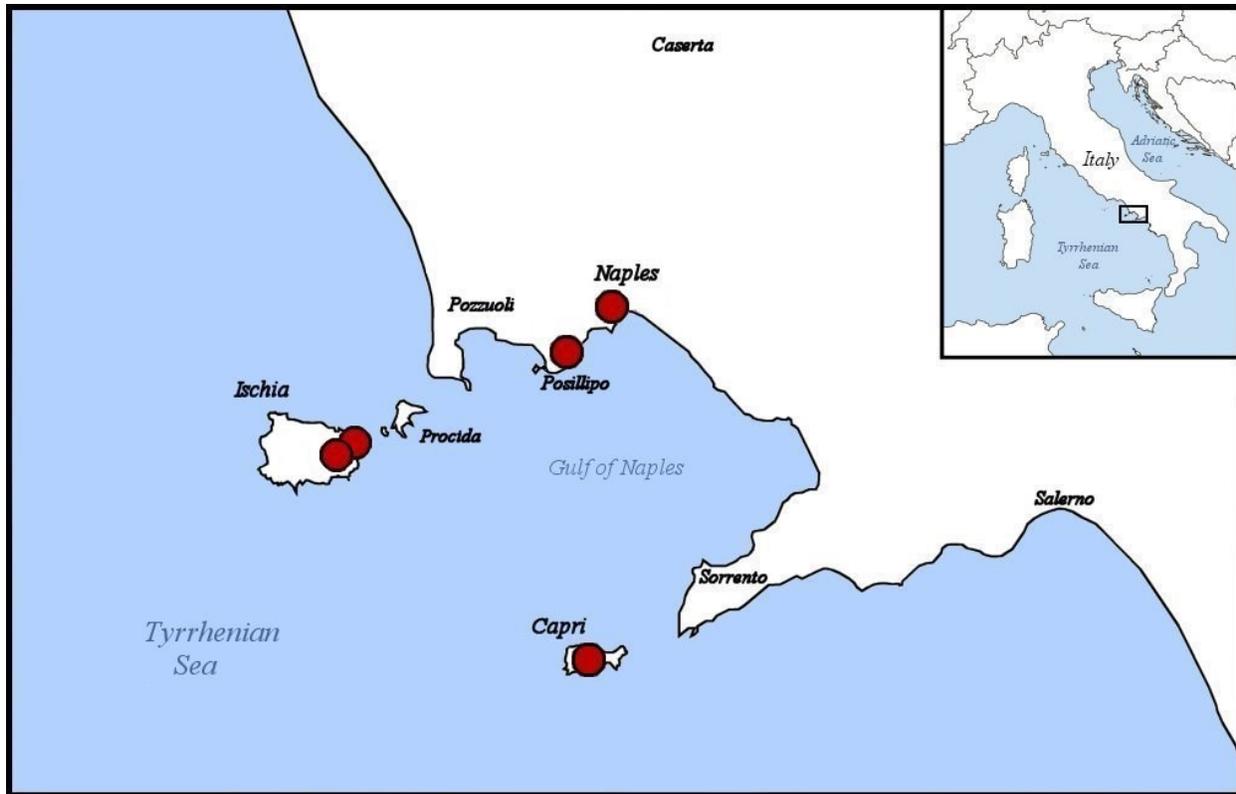


Figure 19: Localities of the studied specimens of *Euscorpius parthenopeius* sp. n. (red circles).

**Sternum:** Pentagonal shape, type 2; longer than wide, with a deep posterior emargination.

**Pedipalps:** Coxa and trochanter with tuberculate carinae. Femur: dorsal internal carinae tuberculate; dorsal external carinae formed by tubercles slightly spaced; external median carinae serrulate; ventral internal carinae tuberculate; ventral external carinae formed by spaced tubercles, well formed only in the proximal 1/3; anterior median formed by about ten spaced, conical tubercles, varying in size, of which three are great and well marked with a macroseta each, while the others are small; dorsal intercarinal spaces uniformly granulated; ventral intercarinal spaces not uniformly granulated, with larger granules near the ventral carinae. Patella: dorsal internal carinae tuberculate to granulated; dorsal external carinae rough with a few granules; ventral external carinae rough with a few granules; ventral internal carinae tuberculate to lightly serrulate; dorsal intercarinal surface uniformly granulated; ventral intercarinal surface with few scattered minute granules, especially near ventral internal carinae. Dorsal patellar spur highly developed. Chelal carina  $D1$  is distinct, strong, dark and from smooth to rough;  $D4$  is rounded and rough;  $V1$  is distinct, strong, dark and rough to lightly crenulate;  $V3$  rounded, dark and lightly and finely granulated; external carina granulated; intercarinal tegu-

ment rough to finely granulated with very minute scattered granules. Typical *Euscorpius* chela finger dentition;  $L/W$  ratio of the chela 2.638;  $L_{fem}/L_{pat}$  ratio is 0.984.

**Trichobothria:** Chela: trichobothria on the pedipalp manus ventral surface is 4/4 ( $V_{1-3} + Et_1$ ). Patella: ventral ( $Pv$ ): 9/9; patella external ( $Pe$ ):  $et = 6/6$ ,  $est = 4/4$ ,  $em = 4/4$ ,  $esb = 2/2$ ,  $eba = 4/4$ ,  $eb = 4/4$ . Femur: trichobothrium  $d$  is slightly proximal to  $i$ , while trichobothrium  $e$  is distal to both  $d$  and  $i$ ; it is situated on dorsal external carina but is shifted toward its dorsal surface.

**Legs:** Legs with two pedal spurs; no tarsal spur; ventral row of tarsus III with a total of 7 spinules, of increasing size from proximal to distal, ending with a decentralized spinule; 3 flanking pairs of tarsal setae adjacent to the ventral spinules row. Granulation well present on dorsal and ventral surface of leg femora, mostly marked and dark ventrally; legs III and IV with dark marbling.

**Chelicerae:** Smooth, with dark marbling on anterior part, with darker apical portion of denticles. Movable finger: the dorsal distal denticle is much smaller than the ventral distal denticle; ventral edge is smooth with brush-like setae on the inner part; dorsal edge has five denticles: one large distal, one medium and one small

subdistal, one large median and a small basal. Fixed finger with four denticles: one distal, one subdistal, one median and one basal, the last two in a fork arrangement; the internal surface has brush-like setae.

## Comparisons

*E. parthenopeius* sp. n. is sympatric with *E. (Tetratrachobothrius) flavicaudis* (De Geer, 1778) (Tropea, unpublished data). These two species can be easily distinguished since *E. parthenopeius* sp. n. is related to the subgenus *Euscorpius*, thus the number of trichobothria on the pedipalp manus ventral surface is 4 versus 5 in *E. flavicaudis*. In addition, *E. flavicaudis* exhibits a more tapered telson and a very dark brown/black color.

*E. sicanus* complex, probably present in Campania near the border with Basilicata and Puglia, is found in almost all the islands in the Tyrrhenian Sea, including not very distant Ponziane Islands. We have no definite information on the presence or absence of *E. sicanus* complex on Phlegrean Islands (Ischia and Procida) but from Capri, Valle (1975) reported a population with  $eb=5$  ( $B2=8$ ), and Fet et al. (2003) independently mentioned specimens of *E. sicanus* complex. However, *E. sicanus* can be easily distinguished from *E. parthenopeius* sp. n. because it has  $eb = 5$  versus 4 in *E. parthenopeius* sp. n.

Another species that occurs in the region of Campania, but not in sympatry with the new species, is *E. concinnus* (Di Caporiacco, 1950; Vignoli et al., 2005; Vignoli & Salomone, 2008), which can be distinguished since it has the median eyes more proximally located compared to *E. parthenopeius* sp. n. (on average 43% vs. 40% respectively; Tropea, unpublished data). *E. concinnus* is dark brown/blackish and is more stocky in all its segments.

*E. aquilejensis* is not registered in Campania; probably the closest populations of this species can be found in the area around southern borders of Latium and Abruzzo. *E. aquilejensis* could be confused at first sight with some specimens of *E. parthenopeius* sp. n., because they may be similar in coloration, carapace granulation, and proportions of carapace, metasoma, and telson as well as same trichobothrial and pectinal teeth count, trichobothria position on fixed finger, and tarsal spination. However, these two species can be distinguished since: (1) *E. aquilejensis* has no marbling on the body, while *E. parthenopeius* sp. n., may have from weak to very marked marbling on chelicerae, carapace, mesosoma, metasoma, and legs; (2) *E. aquilejensis* has more elongated chelae with an average  $Lche/Wche$  ratio of 2.79 in males and 2.89 in females vs. 2.60 in males and 2.78 in females of *E. parthenopeius* sp. n.; (3) in *E. aquilejensis*, femur is normally longer than the patella while *E. parthenopeius* sp. n. has the femur slightly

shorter than the patella, or as long as it; (4) in *E. aquilejensis*, carapace is longer than wide in both sexes, while in *E. parthenopeius* sp. n. it is longer than wide in males and slightly shorter or as long as wide in females, and (5) in *E. aquilejensis*, all carinae are well-formed and marked while in *E. parthenopeius* sp. n. they are less pronounced and developed, especially on the metasoma.

Two other species present in Italy belonging to the subgenus *Euscorpius* or related to it, are *E. oglasae* and *E. tergestinus*. The first species is endemic to Montecristo Island (Tuscan Archipelago) and its trichobothrial and pectinal teeth counts are lower than in *E. parthenopeius* sp. n.;  $Pv = 7$ ,  $et = 5$  and  $Dp = 7$  in males and 6 in females of *E. oglasae* compared to  $Pv = 9$ ,  $et = 6$  and  $Dp = 8$  in males and 7 in females in *E. parthenopeius* sp. n.

*E. tergestinus* in Italy occurs only along the border between Italy and Slovenia (Tropea, 2013) and is easily distinguished by trichobothrial and pectinal teeth count higher than in *E. parthenopeius* sp. n. ( $Pv = 10-11$ ,  $et = 7-8$  and  $Dp = 9$  in males and 7-8 in females). Also, *E. tergestinus* is more stocky in all its segments, with average distance from center of median eyes to anterior margin of the carapace 43.20% of the carapace length vs 40.22% in *E. parthenopeius* sp. n.

## Ecology

As many other *Euscorpius* species, *E. parthenopeius* sp. n. is anthropotolerant; it was collected in inhabited areas such as in the city of Naples, inside a classroom of an art institute and in the ruins made of tuff bricks (Fig. 21). It occurs in lapidicolous and corticolous habitats, and it was found on stone walls (Fig. 20) or under stones but also under bark in pinewoods. It is likely that this species has a limited distribution, restricted to Naples Province or just beyond, without going inland much, but staying on the coast and islands of the Gulf of Naples. In these areas, the climate is typically Mediterranean, thus the new species probably prefers humid microclimate in the warmer and drier coast, rather than cooler and humid climate in the hills and forests further inland (where *E. flavicaudis* and *E. concinnus* are found). In Naples, Ischia and Capri *E. parthenopeius* sp. n. is sympatric with *E. flavicaudis*, which is the species most widely distributed and abundant in the province of Naples; also, *E. parthenopeius* sp. n. appears to be sympatric with a form of *E. sicanus* complex on Capri.

## Discussion

Taxonomy of the genus *Euscorpius* is complicated, and for many areas and species complexes remains unresolved. In Italy, *Euscorpius* populations are among



**Figures 20-21:** Two sites in Naples where *E. parthenopeius* sp. n. was collected. **20.** Walls on two sides of a street in Posillipo, Naples. **21.** Walls of the ruins in the area of Santa Lucia, Naples.

the most studied; however, they need a further thorough investigation, and most probably in the near future, many Italian populations will be subjected to taxonomic changes.

Di Caporiacco (1950) has studied a large number of specimens from all over Italy and surroundings, trying to obtain for the first time a general overview of the taxonomic status of the genus *Euscorpius*. He was the first to show the great variability of this genus. However, within some subspecies he described, different forms were found, sometimes morphologically and genetically very distant from each other. One of these cases regards the subspecies *E. carpathicus ilvanus* Di Caporiacco, 1950. This subspecies has been described mainly from Tuscan Archipelago, a group of islands between Tuscany and Corsica, of which the largest and most famous is the Island of Elba, which gave its name to this subspecies (*Ilva* is a Latin name of Elba). In the end of the description of this subspecies, Di Caporiacco wrote “three specimens from Capri leave me perplexed”, however, he decided to also include these three specimens from Capri, which is located about 325 km from the closest island of the Tuscan Archipelago. Later studies indicated that the type specimens to this subspecies actually belong to the *E. sicanius* complex, *E. concinnus* and *E. parthenopeius* sp. n. *E. c. ilvanus* has rarely been taken into consideration since the study of Di Caporiacco (1950). Valle (1975) for the first time referred to this subspecies, and emphasized that the population from the Island of Elba belonged to a group different from that of the populations from the islands of Gorgona, Giglio and Giannutri without specifying a subspecies, but only indicating for the first time the

importance of the pedipalp patella external series *B2* (series *eb* according to Vachon, 1975) reporting  $B2=6$  ( $eb=4$ ) for Elba and  $B2=8$  ( $eb=5$ ) for Gorgona, Giglio, and Giannutri. Valle (1975) reports a population from Capri with  $B2=8$ , which means that it should belong to *E. sicanius* complex, but the three specimens studied by Di Caporiacco have  $eb=4$ . Unfortunately, Valle does not go into detail of the population from Capri as he does with the other populations mentioned; in addition, these specimens have been searched for in MSNB, but have not been found. *E. sicanius* complex inhabits almost all the islands of the Tyrrhenian Sea, but we have no definite information on the presence or absence of *E. sicanius* complex on Phlegrean Islands (Ischia and Procida). It is also true that in the small Italian islands it is difficult to find two species of the subgenus *Euscorpius* or related to it (e.g. on the islands of the Tuscan Archipelago, Gorgona, Giglio and Giannutri, *E. sicanius* complex occurs, while on Elba and Montecristo *E. concinnus* and *E. oglasae* are found, respectively), while it is often possible to find one belonging to the subgenus *Euscorpius* together with *E. flavicaudis*. Presence of *E. flavicaudis* and *E. parthenopeius* sp. n. together on small islands reduces the possibility of a third species being present, however, also Fet et al. (2003) mentioned two specimens of *E. sicanius* complex from Capri.

After Valle (1975), the only study in which *E. c. ilvanus* was mentioned was that of Fet et al. (2003). These authors studied the syntypes from Elba, Giannutri, Cerboli, Capraia, and Capri Islands, and concluded that the specimens from Elba and Capri belonged to *E. tergestinus* (*sensu* Fet & Söleglad, 2002), while those from the remaining islands belonged to *E. sicanius*.

Later, Vignoli et al. (2005) elevated *E. c. concinnus* to species status (previously synonymized with *E. tergestinus* by Fet & Soleglad, 2002), and reported this species from Elba Island. Most recently, Tropea (2013a) redescribed *E. tergestinus* (restricting its presence in Italy only in the extreme northeast near the border with Slovenia), which is easily distinguishable from *E. parthenopeius* sp. n. (see *Comparisons*).

Since Fet et al. (2003) studied the specimens from Capri Island, this population has not been further investigated. Considering that Fet et al. (2003) have assigned the lectotype for *E. c. ilvanus* to a specimen from Giannutri (correctly since most of the specimens of *E. c. ilvanus* fall within the *E. sicanus* complex), the poorly represented population of Capri (only three specimens out of 79 syntypes of *E. c. ilvanus*), and therefore also those of Ischia and Naples, according to the ICZN do not have a name. Therefore herein, we described this form from Naples Province as a new species that is endemic to Italy, *Euscorpius parthenopeius* sp. n.

In this work, we studied 27 specimens from Naples Province (including three *E. c. ilvanus* syntypes from Capri studied by Di Caporiacco), which are morphologically distinct from other known species. However, we are uncertain about its subgeneric position due to some characters that may be shared by species recently found to be outside of the subgenus *Euscorpius* s. str. (Tropea, 2013a, 2013b; Parmakelis et al., 2013). In fact, the new species is morphologically closer to *E. aquilejensis* or *E. balearicus* Di Caporiacco, 1950 than to *E. concinnus* and *E. sicanus*. The perplexities derived from the morphological data are also reflected in an ongoing genetic study that involves several populations of *Euscorpius*. Based on a preliminary phylogenetic analysis using 16S rRNA and COI mtDNA sequence data, we found that the phylogeny based on these two molecular markers cannot provide a conclusive result regarding the affinities of this species with *E. sicanus*, *E. concinnus*, *E. balearicus*, and *E. aquilejensis*.

In recent years, numerous morphological and molecular studies have been performed in an effort to resolve taxonomic ambiguities present in the genus *Euscorpius*, and much progress has been accomplished. In the molecular phylogenetic study of Parmakelis et al. (2013) that included multiple populations and species of this genus and involved four different molecular markers, it was further demonstrated that the taxonomy of *Euscorpius* is very complex, especially due to the existence of several species complexes and cryptic forms. For these reasons, we do not currently assign the new species to any subgenus.

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### References

- BARTOLOZZI, L., S. VANNI & S.W. MASCHERINI. 1988. Catalogo del Museo Zoologico "La Specola" (Sezione del Museo di Storia Naturale) dell'Università di Firenze. 5. Arachnida Scorpiones: tipi. *Atti della Società Toscana dei Naturalisti, Memorie*, B, 94: 293–298.
- DI CAPORIACCO, L. 1950. Le specie e sottospecie del genere "*Euscorpius*" viventi in Italia ed in alcune zone confinanti. *Memorie/Atti della Accademia Nazionale dei Lincei*, serie VIII, vol. II, sez. III, fasc. 4: 159–230.
- FET, V. & W.D. SISSOM. 2000. Family Euscorpiidae. Pp. 355–381 in: FET, V., W.D. SISSOM, G. LOWE & M.E. BRAUNWALDER. *Catalog of the Scorpions of the World (1758-1998)*. New York: New York Entomological Society, 690 pp.
- FET, V. & M.E. SOLEGLAD. 2002. Morphology analysis supports presence of more than one species in the "*Euscorpius carpathicus*" complex (Scorpiones: Euscorpiidae). *Euscorpius*, 3: 1–51.
- FET, V., M.E. SOLEGLAD, B. GANTENBEIN, V. VIGNOLI, N. SALOMONE, E.V. FET & P.J. SCHEMBRI. 2003. New molecular and morphological data on the "*Euscorpius carpathicus*" species complex (Scorpiones: Euscorpiidae) from Italy, Malta, and Greece justify the elevation of *E. c. sicanus* (C. L. Koch, 1837) to the species level. *Revue suisse de Zoologie*, 110(2): 355–379.
- PARMAKELIS, A., I. STATHI, P. KOTSAKIOZI, S. POULIKARAKOU & V. FET. 2013. Hidden diversity of *Euscorpius* (Scorpiones: Euscorpiidae) in Greece revealed by multilocus species-delimitation approaches. *Biological Journal of the Linnean Society*, 110: 728–748.
- TROPEA, G. 2013a. Reconsideration of the taxonomy of *Euscorpius tergestinus* (Scorpiones: Euscorpiidae). *Euscorpius*, 162: 1–23.
- TROPEA, G. 2013b. A new species of *Euscorpius* Thorell, 1876 from the western Balkans (Scorpiones: Euscorpiidae). *Euscorpius*, 174: 1–10.

- VACHON, M. 1975. Recherches sur les Scorpions appartenant ou déposés au Muséum d'Histoire naturelle de Genève. I. Contribution à une meilleure connaissance des espèces et des sous-espèces de Scorpions du genre *Euscorpius* Thorell, 1876 (Fam. des Chactidae). *Revue suisse de Zoologie*, 82(3): 629–645.
- VALLE, A. 1975. Considerazioni intorno alle sottospecie di *Euscorpius carpathicus* (L.) (Scorpiones, Chactidae). *L'Ateneo Parmense Acta Naturalia*, 11(1): 209–234.
- VIGNOLI, V. & N. SALOMONE. 2008. A review of and additions to the current knowledge of the scorpion genus *Euscorpius* Thorell, 1876 (Scorpiones, Euscorpiidae). *Fragmenta entomologica*, 40(2): 189–228.
- VIGNOLI, V., N. SALOMONE, T. CARUSO & F. BERNINI. 2005. The *Euscorpius tergestinus* (C. L. Koch, 1837) complex in Italy: Biometrics of sympatric hidden species (Scorpiones: Euscorpiidae). *Zoologischer Anzeiger*, 244: 97–113.