

Research article

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A new species of the genus *Leptorchestes* Thorell, 1870 from the Pantalica Natural Reserve (Sicily, Italy) (Araneae: Salticidae)

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Abstract

A new species of ant-mimicking jumping spider, *Leptorchestes elisae* **sp. nov.**, is described from the Pantalica Natural Reserve in Sicily, Italy. This species belongs to the genus *Leptorchestes* Thorell, 1870 (Araneae, Salticidae), a group characterized by morphological adaptations for myrmecomorphy. The new species is diagnosed based on both male and female genital morphology, with the male exhibiting different characters including a short, straight embolus and a small, non-serrated tibial apophysis, while the female displays an M-shaped posterior epigynial notch and laterally positioned copulatory openings. These traits distinguish *L. elisae* **sp. nov.** from its related species, particularly *L. peresi*, *L. mutilloides*, and *L. berolinensis*. The discovery of both sexes at the same locality allows for confident species attribution, a critical factor in a genus where identifications based on females can lead to taxonomic ambiguities. A revised identification key for the genus *Leptorchestes* is provided, along with distributional data. The new species is likely endemic to Sicily but may be more widely distributed in the Mediterranean region. This discovery contributes to a better understanding of the genus and underlines the importance of regional faunistic surveys in revealing hidden biodiversity.

Keywords: jumping spiders, taxonomy, biodiversity, description, conservation biology

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Introduction

Salticidae Blackwall, 1841, also known as jumping spiders, is the largest family of spiders, with 689 genera and 6832 described species (World Spider Catalog 2025), with 478 species belonging to 73 genera known from Europe, North Africa and the Caucasus (Nentwig et al. 2025). In Italy, 144 species and 41 genera of Salticidae are currently known (Pantini & Isaia 2019), representing nearly one quarter of the European fauna. Mediterranean salticids constitute a highly diverse yet insufficiently studied group, with many species known only from their type locality and original description or described from a single sex (about 30% of the European fauna) (Canard 2005; Logunov 2015).

Myrmecomorphy is a characteristic that has evolved several times in different spider families (Cushing 2012; Reiskind & Levi 1967; Reiskind 1970) including the

families Gnaphosidae Banks, 1892 (e.g. genus *Micaria* Westring, 1851), Corinnidae Karsch, 1880 (e.g., genus *Pranburia* Deeleman-Reinhold, 1993, *Myrmecotypus* O. Pickard-Cambridge, 1894), Salticidae (e.g. genus *Leptorchestes*, *Synalgeles* Simon, 1876 and *Myrmarachne* MacLeay, 1839), Phrurolithidae Banks, 1892 (e.g. genus *Phrurolithus* C. L. Koch, 1839), Theridiidae Sundevall, 1833 (e.g. genus *Anatea* Berland, 1927) and Zodariidae Thorell, 1881 (e.g. genus *Zodarion* Walckenaer, 1826). These spiders exhibit adaptations that enable them to closely resemble ants, ranging from color patterns to significant morphological modifications such as narrowed abdomens or cephalothorax, creating an appearance of having more than two body segments (Pekar & Jarab 2011; Reiskind 1972). While some spiders achieve nearly perfect ant mimicry, others resemble ants more generally without imitating a specific species, these are called “imperfect” or

“inaccurate” mimics (Johnstone 2002; Pekar & Jarab 2011, Pekar et al. 2011, 2014). Studies have confirmed that such myrmecomorphic spiders act as Batesian mimics, gaining significant survival benefits, notably a reduced predation risk from visually oriented predators, as highlighted by various studies (Cutler 1991; Durkee et al. 2011; Nelson & Jackson 2006).

Leptorchestes Thorell, 1870 is a genus of ant-like jumping spiders that can be found in Europe and Africa. The genus was established by Thorell (1870) with the type species being *Salticus formicaeformis* Lucas, 1849 (= *Leptorchestes berolinensis* (C. L. Koch, 1846)). There has always been a lot of confusion around the genus *Leptorchestes* and only recently Wesolowska & Szeremeta (2001) have been able to provide a review that has provided some insight into the group. As of 2000, 3 new species have been described (Prószyński 2000; Wesolowska & Szeremeta 2001), showing that this genus is still poorly investigated and that similarities between species often lead to incorrect identification. Originally, *Leptorchestes* was placed within the subfamily Leptorchestinae (*sensu* Simon, 1901), later it was transferred to the subfamily Synagelinae (Petrunkovitch 1928), although this choice has been questioned several times. Leptorchestinae (Leptorchestae) includes a number of unidentate salticid genera and some myrmecomorphic species. As said previously, myrmecomorphy is a characteristic which has developed independently many times (Cushing 2012; Reiskind & Levi 1967; Reiskind 1970), and so it is not a good trait to be able to classify genera. Maddison (2015) divided Salticidae genera in tribes based on molecular data, including the *Leptorchestes* in the tribe Leptorchestini, in which the only known morphological synapomorphy is the loss of retromarginal cheliceral teeth. Finally, Prószyński (2017) proposed a pragmatic classification based on genitalia morphology dividing the different genera in “groups of genera”, including *Leptorchestes* in the Menemerines group together with *Menemerus* Simon, 1868 (sub-cosmopolite) and *Kima* G.W. Peckham & E.G. Peckham, 1902 (from central and southern Africa), which have a small embolous, a large bulbous and a sclerotized epigyne with thick-walled ducts and posteriorly located spermathecae. The genus *Leptorchestes* includes seven species (World Spider Catalog 2025), distributed in Europe and North Africa. Simon (1901) described another species, *L. semirufus* Simon, 1901, from Ecuador (South America) which is now considered *nomen dubium* as the specimen was immature and probably belonging to a different genus (see Wesolowska & Szeremeta 2001). In addition, *L. cinctus* (Dugès, 1836), originally described from France, is also considered *nomen dubium*, or as a possible synonym of *L. mutilloides* (Lucas, 1846) (Bonnet 1957). Other two species, *L. reimoseri* Lessert, 1927 and *L. todillus* Keyserling, 1863, were lately transferred respectively to the genus *Kima* (now *Kima reimoseri* (Lessert, 1927)) by Wesolowska & Szeremeta (2001) and *Synageles* (now *Synageles dalmaticus* (Keyserling, 1863)) by Simon (1876). Lastly,

two other species have been synonymized: *L. chrysopogon* Simon, 1876 (= *L. mutilloides*; Simon 1937), *L. formicaeformis* (Lucas, 1849) (= *L. berolinensis*; Simon 1876) and *L. halogena* Metzner, 1999 (= *L. mutilloides*; Wesolowska & Szeremeta 2001).

In the present study we describe a new species of *Leptorchestes* from Sicily with a new key to the genus for males and females and their geographic distribution, with taxonomic discussion.

Materials and Methods

Material examined

The specimens were caught on the 8th of June 2023 actively on the ground using an aspirator, in the “Riserva Naturale Orientata Pantalica, Valle dell’Anapo e Torrente Cava-grande” protected area, Sicily, Siracusa province (coordinates: 37.129988, 15.023836), Italy (<https://orbs.regione.sicilia.it/aree-protette/riserve-naturali-siciliane/245-la-riserva-naturale-orientata-di-pantalica-valle-dell-anapo-e-torrente-cava-grande.html>). Two males and two females were sampled and preserved in 70% Ethanol. The holotype (male) and three paratypes of *Leptorchestes elisae* sp. nov. are deposited in the Museo di Scienze Naturali “Enrico Caffi” (Bergamo, Italy; MSNBG)

Morphological analyses

The identifications and dissections were performed with Zeiss Discovery.V12 (Carl Zeiss Microimaging GmbH, Jena, Germany) stereomicroscope equipped with Zeiss CL 9000 LED. Dissected specimens were mounted on temporary slides in Lactic acid and examined with an Olympus BX51 (Olympus, Tokyo, Japan) microscope. Optical photographs of slide mounted genitals were taken with an Olympus BX51 microscope equipped with an Olympus om-d e-m5 digital camera (Olympus, Tokyo, Japan) with either a 20× or 40× objectives. Pictures of holotype and female paratype were acquired with a Zeiss Axio Zoom V16 (Carl Zeiss AG; Oberkochen, Germany) and an Axiocam 503 (Carl Zeiss Microimaging GmbH, Jena, Germany) equipped with led dual spot-lights Photonic Optische (Vienna, Austria).

Terminology for general morphology and habitus follows Ramírez (2014); for male and female genitalia, terminology follows Ramírez (2014), Wesolowska & Szeremeta (2001) and Logunov (2004). For leg spination we use the system proposed by Ono (1988).

Abbreviations for morphological characters

Pr: prosoma; **Op:** opistosoma; **Pd:** pedicel; **ALE:** anterior lateral eyes; **AME:** anterior median eyes; **PME:** posterior median eyes; **PLe:** posterior lateral eyes; **Pa:** palp; **Sp:** spinnerets; **OC:** opistosoma constriction; **Ch:** chelicera;

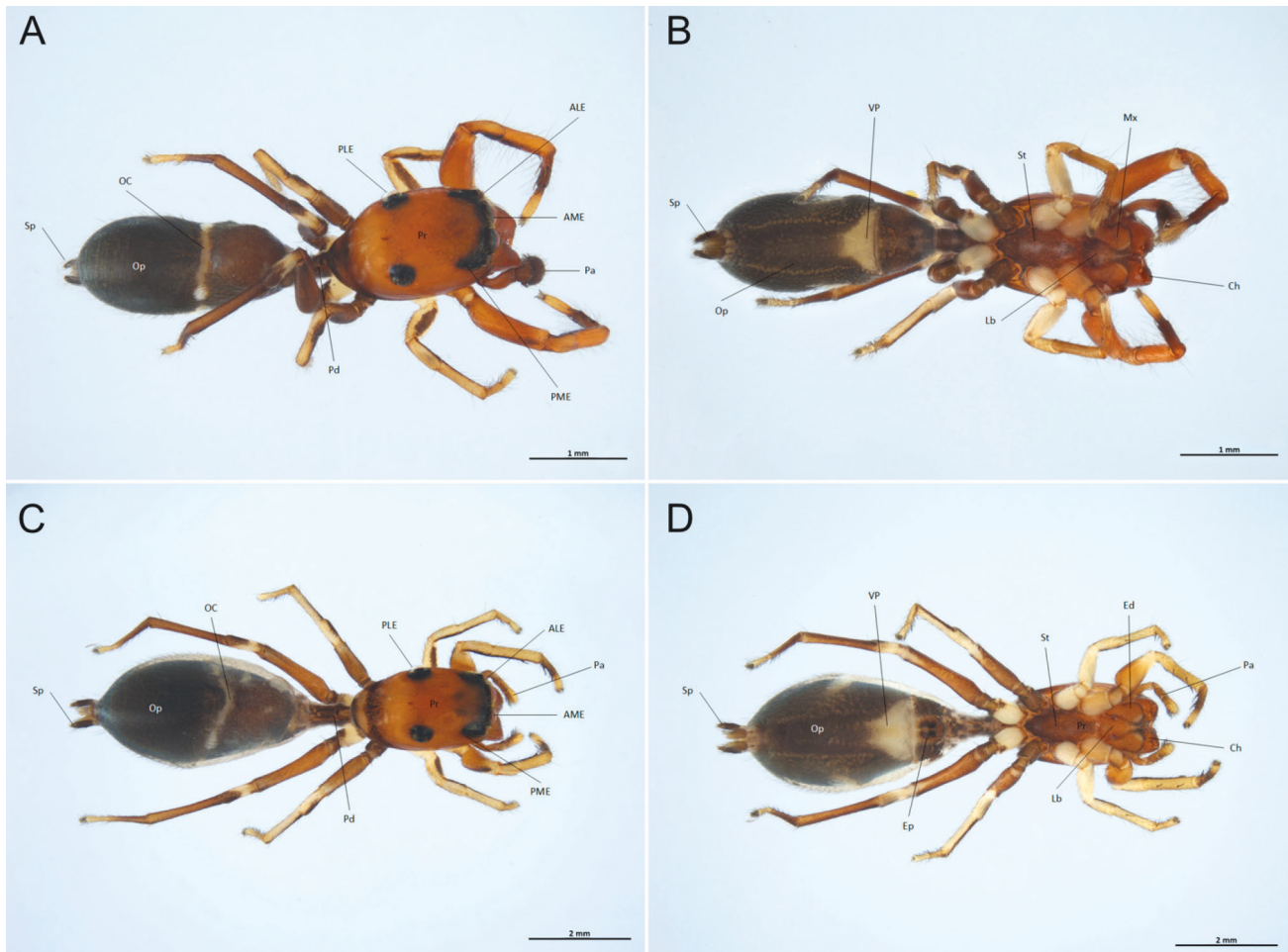


Fig. 1 - *Leptorchestes elisae* sp. nov. habitus; **A**, Male dorsal; **B**, Male ventral; **C**, Female dorsal; **D**, Female ventral.

VP: ventral patch; **Ep:** epigyne; **Lb:** labium; **St:** sternum; **Ed:** endites; **CO:** copulatory openings; **AG:** accessory glands; **CD:** copulatory ducts; **Rec:** receptacles; **PEN:** posterior epigynial notch; **Cb:** cymbium; **EF:** epigastric furrow; **SD:** sperm duct; **RTA:** retrolateral tibial apophyses; **Eb:** embolous; **T:** tegulum; **ATL:** anterior tegular lobe; **Fe:** femur; **Tb:** tibia; **Mt:** metatarsus.

Taxonomic Treatment

Order **Arachnida** Cuvier, 1812

Family **Salticidae** Blackwall, 1865

Genus ***Leptorchestes*** Thorell, 1870

Leptorchestes Thorell 1870: 206; Simon 1901: 525.

Type species: *Leptorchestes berolinensis* C. L. Koch, 1846.

Leptorchestes elisae sp. nov.

(Figs 1-4)

Type series

Holotype. ITALY: 1 ♂; Sicily, Siracusa province, Pantalica Natural Reserve, 240 m a.s.l., 37.129988, 15.023836, 08 Jun

2023, T. Fusco leg.; active capture, on litter (MSNBG). **Paratypes:** ITALY: 1 ♂, 2 ♀; Same data as for holotype.

Diagnosis of *Leptorchestes elisae* sp. nov.

The male of this species is very similar to *L. peresi* (Simon, 1868) but the tip of the embolous is not curved and the tibial apophysis is smaller, without a serrate edge. It is also similar to *L. mutilloides* but may be recognised by tip of the embolous which is not on the same level of the anterior part of the tegulum. The male may be also distinguished from *L. algerinus* Wesołowska & Szeremeta, 2001 by the anterior triangular lobe on the tegulum which does not protrude beyond the cymbium. The female resembles *L. berolinensis* but may be separated by the the epigynial groove which is narrower and by the posterior notch of the epigyne which is M-shaped, while in *L. berolinensis* it is straight or only slightly curved. The female may also be distinguished from *L. peresi* by the copulatory openings which open laterally and not anteriorly.

Description

Holotype (male): Habitus in Figs 1A and 1B.



Fig. 2 - *Leptorchestes elisae* sp. nov. legs. External side (A) and internal side (B).

Measurements: length of prosoma 1.78 mm, width of prosoma 1.05 mm, height of prosoma 0.83 mm, length of opistosoma 2.35 mm, width of opistosoma 1.06 mm, length of eye field 1.03 mm, anterior width of eye field 0.47 mm, posterior width of eye field 0.73 mm.

Prosoma elongated, oval, reddish. Eye field reddish, black only around the eyes, occupying about half carapace length. Eye field separated from thoracic part by a transversal groove. Cuticle of prosoma with short, thin, grey and brownish hairs sparsely scattered, few long bristles near eyes. The posterior dorsal part of the prosoma with dark spots. Clypeus low with a few setae anteriorly directed. Chelicerae long, light brown, two small teeth on promargin, row of long setae on retromargin. Labium light brown, maxillae light brown with pale inner margins and dark outer margins, with triangular lobe on outer side, sternum brown, longer than wide. Pedicel long.

Opistosoma oval, slightly broadened posteriorly, posterior edge rounded. Abdominal dorsolateral constriction

white, slightly anterior to half of the abdomen. Coloration dark brown with anterior part lighter, contrasting with dark posterior half. Short, brown hairs covering abdomen. Venter brown, slightly lighter than dorsum. Large, trap-ezoid, light patch behind epigastric furrow. Spinnerets brown.

Legs (Fig. 2) thin, long, IV longest. Coxae I yellowish, II and IV whitish, III brown. First pair of legs yellowish, only metatarsus brown, with black stripe along the prolateral surface of patella and tibia, dark brown mark dorsally on the femur, distal third of femur whitish. Second legs whitish with dark streak along prolateral surface of segments of femur, patellae and tibia. Leg III, yellowish, but femur brown, with dark stripe along prolateral surface of patella and tibia. Leg IV brown except for tarsus which is yellowish and patella which is whitish, the latter with dark patch at distal end. Brown, sparse hairs on legs. Leg spination: I – Tb pl 1, Mt v 2-2ap, II – Mt pl 1 ap, v 1, III – 0, IV – Mt v 1-0.

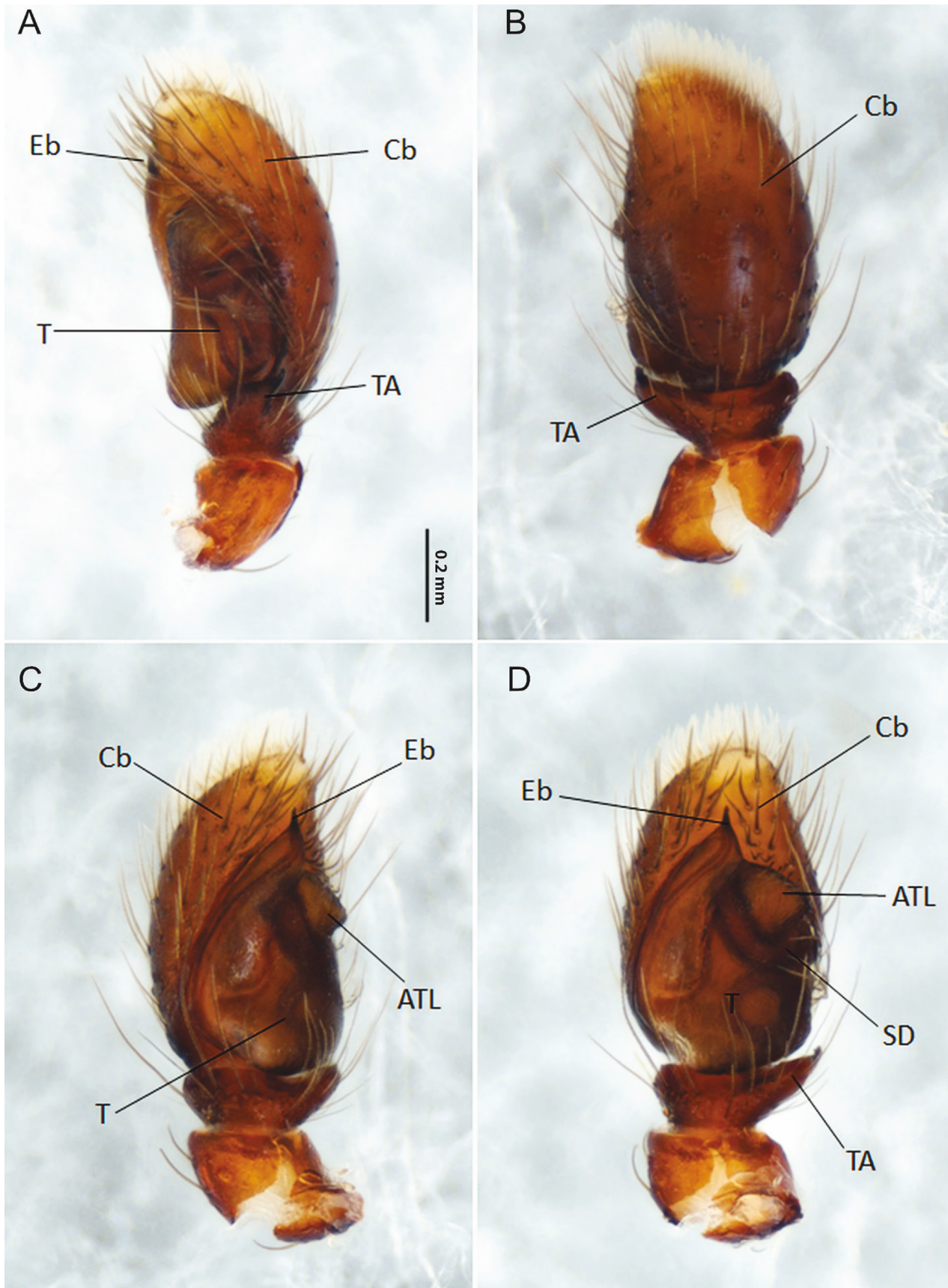


Fig. 3 - *Leptorches elisae* sp. nov. palp; **A**, outer lateral view; **B**, anterior view; **C**, postero lateral view; **D**, posterior view.

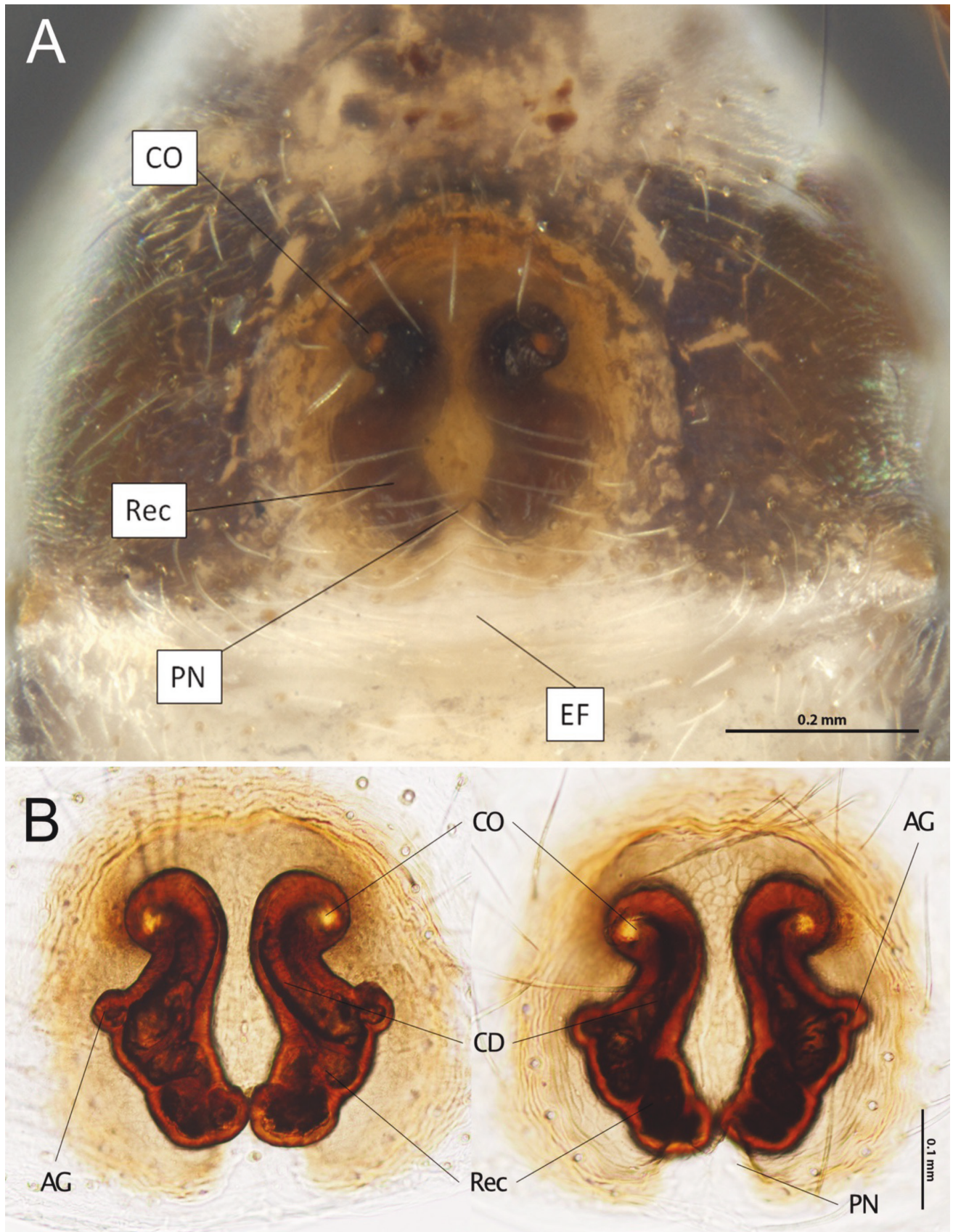


Fig. 4 - *Leptorchestes elisae* sp. nov.; **A**, epigyne; **B**, Vulva dorsal (left) and ventral (right).

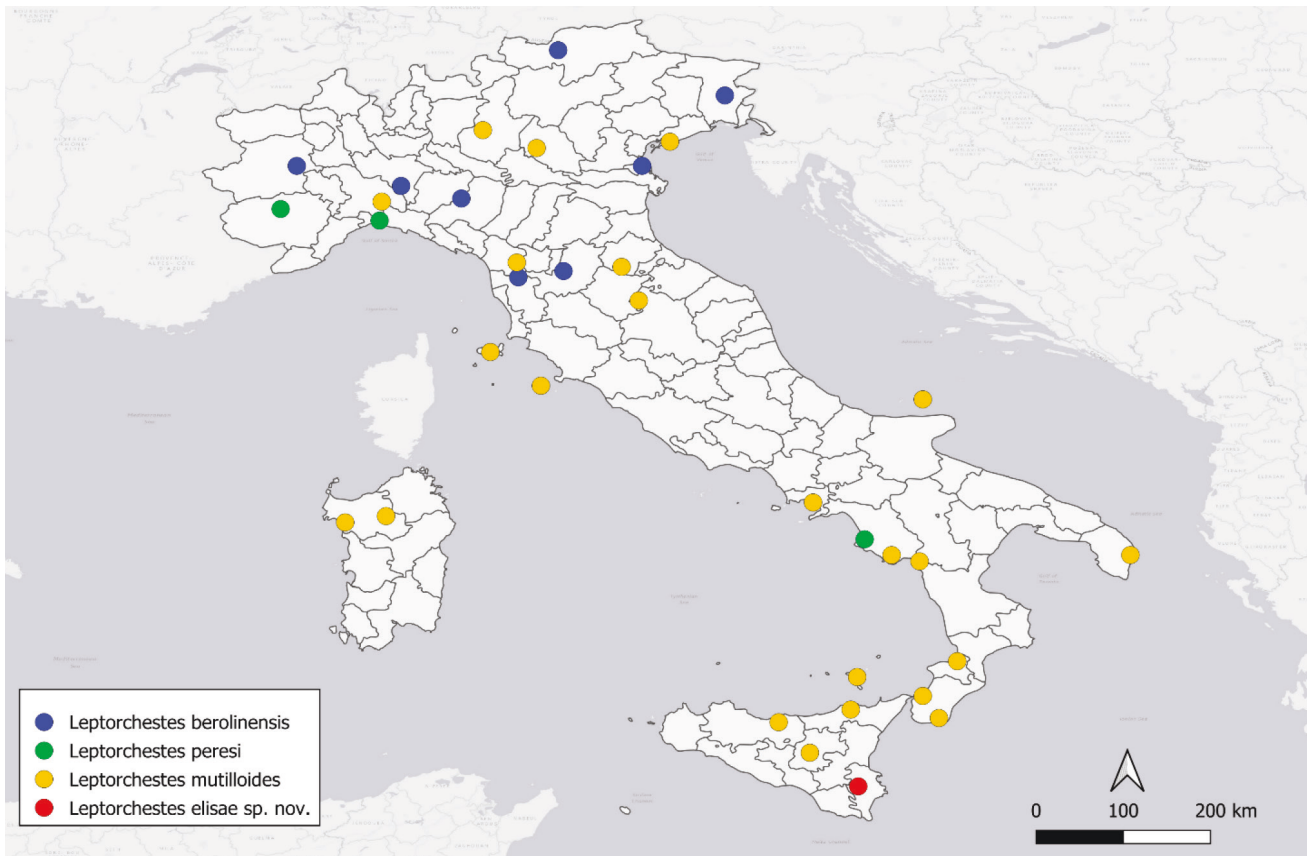


Fig. 5 - Distribution of species of the genus *Leptorchestes* in Italy. Records were taken from the online catalog of Italian spiders (Pantini & Isaia 2019).

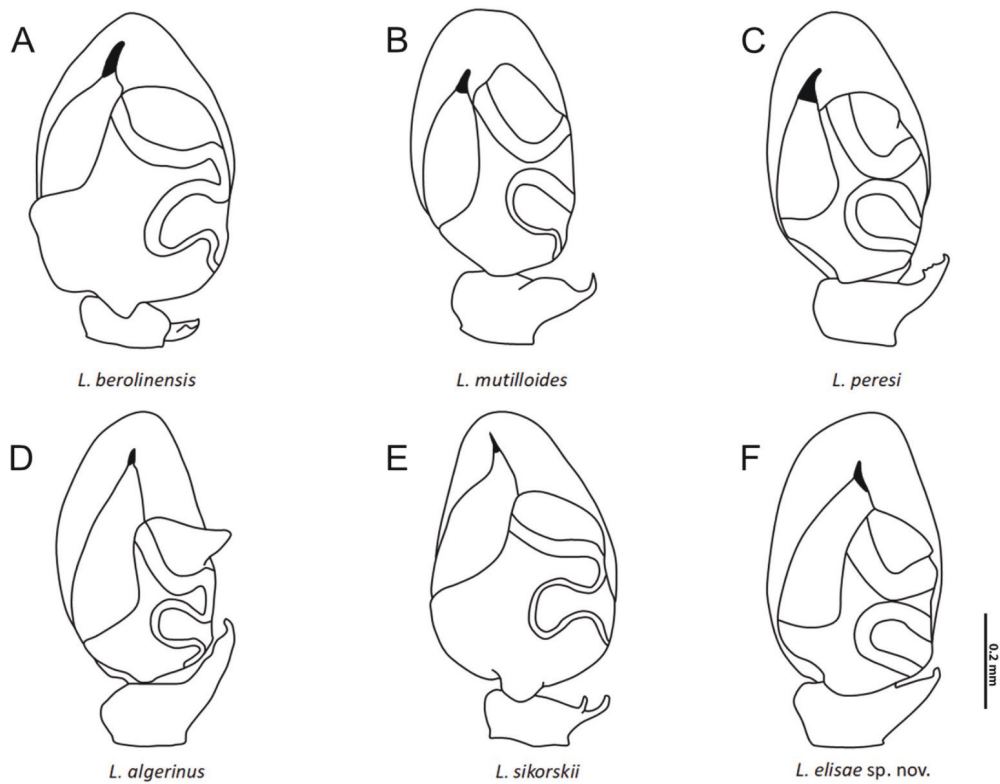


Fig. 6 - Palps of different species of the genus *Leptorchestes*.

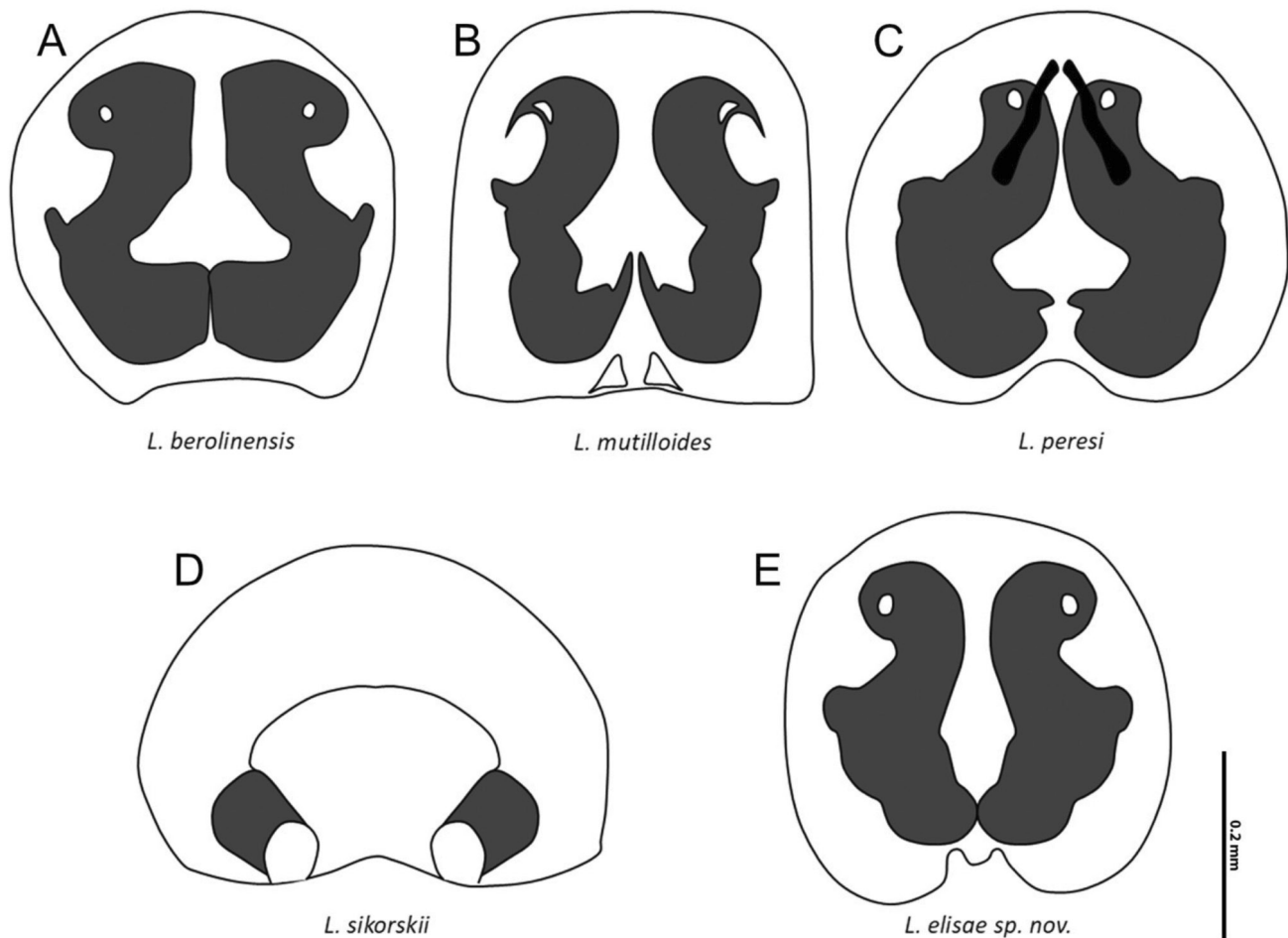


Fig. 7 - Epigyne of different species of the genus *Leptorchestes*.

Pedipalp (Fig. 3) large, light brown, with brown hairs, lighter at tip of cymbium. Structure of palpal organ shown in Fig. 3. Tegulum rounded, with small anterior triangular lobe not protruding beyond the cymbium; sperm duct meandering; embolus tip very short and straight. Furrow separating the terminal hematodocha closer to bulbus base than to tip. Palpal tibia short, with small apophysis, pointed at distal end.

Notes: the holotype and paratype have a slightly different spinal formula, indicating that there may be intraspecific variability for this character regarding certain spines. There is no significant difference in dimensions between male holotype and male paratype.

Other material description

Paratype (female): Habitus in Figs 1C and 1D.

Female paratype measurements: length of prosoma 1.98 mm, width of prosoma 1.28 mm, height of prosoma 0.93 mm, length of opistosoma 3.11 mm, width of opistosoma 1.68 mm, length of eye field 1.08 mm, anterior width of eye field 0.58 mm, posterior width of eye field 0.98 mm.

Prosoma same as in male (Fig. 1C, D).

Opistosoma colour as in male but light patch on ventral surface larger (Fig. 1D); two longitudinal lines composed of white dots beyond this patch. Opistosoma constriction less marked than in male. On ventral surface the end of the constriction stripe distinctly visible.

Legs same as in male. leg spination: I - Tb v 1-2, Mt v 2-2ap, II - Tb v 1-0 Mt v 2-1ap, III - 0, IV - Mt v 1-0.

Epigyne (Fig. 4) not heavily sclerotized, with two rounded depressions anteriorly. Area adjacent to copulatory openings strongly sclerotized; seminal ducts thick-walled, receptacles multichambered, accessory glands long, entering the first receptacle chamber. Posterior epigyne notch M shaped.

Notes: As in male, there seems to be variability in the spinal formula between paratype 1 and paratype 2 in the females. There is no significant differences in dimensions of female paratypes

Etymology

The name of this species is kindly dedicated to Elisa Di Pasquale, a person who is very dear to the first author and who always supported him in his research.

Distribution of species of the genus *Leptorchestes*

Leptorchestes elisae **sp. nov.** is only known for its type locality in Sicily, in Siracusa Province (Italy).

The majority of species of this genus have Mediterranean ranges: *L. peresi* shows a mainly western Mediterranean distribution, *L. sikorskii* Prószyński, 2000 occurs in the eastern Mediterranean, and *L. mutilloides* has a wider distribution across the entire Mediterranean region. *L. berolinensis* is also widely distributed, occurring in most of Central Europe. Only one species, *Leptorchestes separatus* Wesolowska & Szeremeta, 2001, is known from the Afrotropical Region (Namibia).

Fig. 5 shows the distribution of *Leptorchestes* species in Italy.

Identification key of the genus *Leptorchestes*

The key we provide for males and females is updated from Wesolowska & Szeremeta (2001) with the addition of new taxonomic characters.

Males

1. Tegulum with anterior lobe 2
 - Tegulum without anterior lobe 4
2. anterior lobe protruding beyond lateral margins of cymbium (Fig. 6D) *L. algerinus*
 - anterior lobe not protruding beyond lateral margins of cymbium 3
3. Embolous tip very short and slender, straight. Tibial apophysis without small teeth-like processes on dorsal edge (Fig. 6F) *L. elisae* **sp. nov.**
 - Embolous tip strong and distinctly curved towards anterior tegulum. Tibial apophysis with small teeth-like processes on dorsal edge (Fig. 6C) *L. peresi*
4. Tegulum elongated, longer than wide; furrow separating the terminal haematodocha begins closer to bulbus base than to tip 5
 - Tegulum rounded, about as long as wide; furrow separating the terminal haematodocha begins halfway from bulbus base 6
5. Tibial apophysis very wide at its base, protruding from cymbium; Palaearctic species. (Fig. 6B) *L. mutilloides*
 - Tibial apophysis very small, short and narrow, adherent to cymbium; Afrotropical species. *L. separatus*
6. Tibial apophysis forked (Fig. 6E) *L. sikorskii*
 - Tibial apophysis with small tooth only (fig. 6A) *L. berolinensis*

Females

1. Copulatory openings on posterior part of epigyne (Fig. 7D) *L. sikorskii*
 - Copulatory openings on anterior part of epigyne 2

2. venter of abdomen uniformly dark; seminal ducts run initially outside from copulatory openings, in lateral direction; Afrotropical species *L. separatus*
 - venter of abdomen with large light patch; seminal ducts run initially towards epigyne centre; Palaearctic species 3
3. Copulatory openings anterior, sclerotized edge of these openings straight (Fig. 7C) *L. peresi*
 - Copulatory openings lateral, Sclerotized edge of these openings involted 4
4. Presence of two epigynial pockets in front of epigastric furrow (Fig. 7B) *L. mutilloides*
 - No such epigynial pockets 5
5. Epigynine not strongly sclerotized; posterior epigynial notch M shaped (Fig. 7E) *L. elisae* **sp. nov.**
 - Epigynine sclerotized; posterior epigynial notch only slightly curved (arched), nearly straight (Fig. 7A) *L. berolinensis*

Discussion

In this study we describe a new species of *Leptorchestes*, *L. elisae* **sp. nov.**, based mainly on morphology of the genitalia in the two sexes, particularly the male and provide updated keys for both sexes with several diagnostic characters. The main characters for the male are the embolus, which is short and straight, the lobe in the anterior tegulum and the tibial apophysis, while for the female the shape of the posterior epigynial notch is the most important diagnostic character. *L. elisae* **sp. nov.** appears to be related to *L. peresi* due to many similarities such as the lobe of the anterior tegulum in the male and the shape of the epigyne, but in the latter the embolus is not straight and short but curved, and the copulatory openings in the female are placed anteriorly and not laterally. There are also differences in the tibial apophysis that has small teeth-like processes in *L. peresi* which are absent in *L. elisae* **sp. nov.** There are also affinities in the colour pattern of the prosoma, which is dark brown in most species of this genus, but appears reddish in *L. elisae* **sp. nov.** and in some specimens of *L. peresi* found in Eastern Europe (Coşar & Danişman 2021).

The new species shows similarities with the epigyne of *L. berolinensis*, but the former has the two duct systems positioned closer together and a distinctly M-shaped posterior epigynal notch, which is absent in the latter. However, it is challenging to distinguish the different species of this genus based on the females because diagnostic characters are weak, so identification on males which show distinct characters is recommended. In particular, *Leptorchestes mutilloides* and *Leptorchestes peresi* have been misidentified several times or attributed to species that are no longer valid (Metzner 1999; Peckham & Peckham 1892; Simon 1876). The female holotype of *L. mutilloides* had been described

by Lucas (1846) but subsequently information was lost until Logunov (2004) described some females of the genus *Leptorchestes*, that could not be attributed to *L. mutilloides*. Metzner (1999), on the other hand, attributed a female specimen found in Greece at Kallithea (close to Athens) to *L. mutilloides*, that was later moved to *L. peresi* (Nentwig et al. 2025) because the genitals did not appear to correspond. This particular specimen described by Metzner (1999) seems to coincide with *L. elisae* **sp. nov.** and the illustration provided by the author also seems to confirm this hypothesis. The attribution to *L. peresi* also seems to be erroneous since the latter has the copulatory openings placed anteriorly and sclerotized edge of the openings is straight while the specimen from Greece has copulatory openings placed laterally and the sclerotized edge is slightly involuted. Furthermore, *L. mutilloides* was already reported in Greece but on the island of Kos (Strand 1917), quite far away from the collection point of the female specimen collected by Metzner.

From a biogeographical point of view *L. elisae* **sp. nov.** could either be a Sicilian endemic species, or, more likely, it could have a wider Mediterranean distribution (at least Sicily and Greece), similar to most species of the genus (Nentwig et al. 2025) and in some areas potentially being sympatric to *L. mutilloides*, and *L. peresi* (Fig. 5).

Compared to other taxonomic studies which described species based on single sexes or specimens found in different locations, the advantage of the present study is that we found males and females of *L. elisae* **sp. nov.** in the same spot at the same time. In fact, as discussed above, attributing specimens of different sexes to the same species has often been problematic in several previous articles dealing with members of this genus.

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