



Research article

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The genus *Eluma* in the Iberian Peninsula, with the description of a new terrestrial isopod: *Eluma matae* sp. nov. (Oniscidea, Armadillidiidae, Eluminae)

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Abstract. The genus *Eluma* Budde-Lund, 1885, was composed until now by three species, with a Betic-Rif distribution type. In this work a new species of the genus is described, *Eluma matae* sp. nov., from the West region of Portugal. The distribution of the two other known species present in the Iberian Peninsula is updated, and figures of the three Iberian species are provided to facilitate their identification. Finally, a dichotomic key for the entire *Eluma* genus was also created.

Keywords. Terrestrial isopods, taxonomy, new species, Portugal, Spain.

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Introduction

The family Armadillidiidae Brandt, 1833, has 18 genera, and is divided in two subfamilies according to the cephalon structure. The presumably more primitive genera are grouped in the subfamily Eluminae Vandel, 1962, and are characterized by an elumean type cephalon, with only one line, i.e., frontal line, separating the vertex from the front (see Vandel 1944, 1954, 1962). On the other hand, in the subfamily Armadillidiinae Vandel, 1962, are included the presumably more evolved genera, and its members have an armadillidean type cephalon, with two lines separating the vertex from the front, i.e., the frontal line and the postscutellar line.

The genus *Eluma* Budde-Lund, 1885, given the previous description, belongs to the subfamily Eluminae, and according to Vandel (1962), its origin is in the mountain regions of Portugal and South Spain, with a Betic-Rif distribution. Nonetheless, the species *E. caelata* (Miers, 1877) has a wider distribution. Until now, the genus *Eluma* was formed by three species, the already mentioned *E. caelata*, *E. tuberculata* Cruz, 1991 and *E. praticola* Taiti & Rossano, 2015.

Our aims are to provide new data on the distribution of the genus *Eluma* in the Iberian Peninsula, describe a new species from the genus, justify the taxonomic criteria used to its identification, discuss the differences with other species of the genus and provide one identification key of the genus.

Material and methods

The ongoing survey of terrestrial isopods in the Iberian Peninsula provided new data on the distribution of the species that constitute the genus *Eluma*, one of the most primitive genera of the family Armadillidiidae. The specimens from Portugal, including the holotype and paratypes of the new species, are deposited at the isopod collection of InBio Barcoding Initiative (IBI), from Centro de Investigação em Biodiversidade e Recursos Genéticos (CIBIO), Campus de Vairão, University of Oporto (IBI codes start with INV), except 4 paratypes, of which 2 are in the collection of one of the authors (JC) and the other 2 are at the Museo Nacional de Ciencias Naturales de Madrid (MNCN). The data from Spain was obtained by reviewing the specimens deposited at several collections, which are designated by the following acronyms: MNCN; CECOUAL – Centro de Colecciones de la Universidad de Almería; CCZ-UGR – Colección del Departamento de Zoología de la Universidad de Granada, and JC – collection of J. Cifuentes.

The Portuguese specimens resulted from a direct search of several species of Oniscidea Latreille, 1802, in favourable micro-habitats, e.g., below rocks, trunks or litter. All the specimens of the newly described species were found in the denominated West region of Portugal. This region is dominated by sedimentary rocks, namely limestones and clays, from the Pleistocene to Jurassic. There are some scattered incursions of volcanic rocks, namely dolerites, and close to the coast and around the Óbidos lagoon there are sediments from the modern age, namely sand dunes and alluvial zones (Zbyszewski & Moitinho de Almeida 1960). The region has a Mediterranean warm summer climate (Csb - Köppen-Geiger classification), with annual means (1971–2000) of temperature around 14°C and 870 mm of precipitation (Portuguese Institute of the Sea and Atmosphere, IPMA – <http://portaldoclima.pt/>). The region also has frequent advent fogs in the Summer, mainly during mornings. The landscape is composed of urban areas intercalated with agricultural and forest production areas, mainly pear and apple orchards as well as forest plantations of *Pinus pinaster* Aiton and *Eucalyptus globulus* Labill. The landscape also has some areas of natural vegetation, mostly of natural regeneration, dominated by *Quercus faginea* Lam, or *Quercus coccifera* L.

Distribution maps (Fig. 1) were done using Microsoft 3D Maps for Excel, using the coordinates obtained in the field during the capture of the Portuguese specimens. The coordinates for the remaining specimens studied and the bibliographic citations were obtained from google maps (<https://www.google.es/maps/>). To facilitate species identification, different figures of the studied species have been included (Figs 2–4). The drawings (Fig. 4) were prepared with the graphic editor Inkscape (<https://inkscape.org/es/>).

Results

Taxonomic accounts

Class Malacostraca Latreille, 1802
Order Isopoda Latreille, 1817
Suborder Oniscidea Latreille, 1802
Family Armadillidiidae Brandt, 1833
Subfamily Eluminae Vandel, 1962
Genus *Eluma* Budde-Lund, 1885

Eluma caelata (Miers, 1877)

Figs 1A, 2A–C, 4G

Material studied

A total of 233 specimens were analysed, 128 males 90 females and 15 immatures.

PORTUGAL – **Aveiro** • 1 ♀; Grada; 40°17'49" N, 8°28'26" W; 59 m a.s.l.; 2 May 2022; L.P. da Silva leg.; INV16030. – **Beja** • 1 ♀; Mértola; 37°38'26" N, 7°39'59" W; 41 m a.s.l.; 11 Apr. 2022; L.P. da Silva

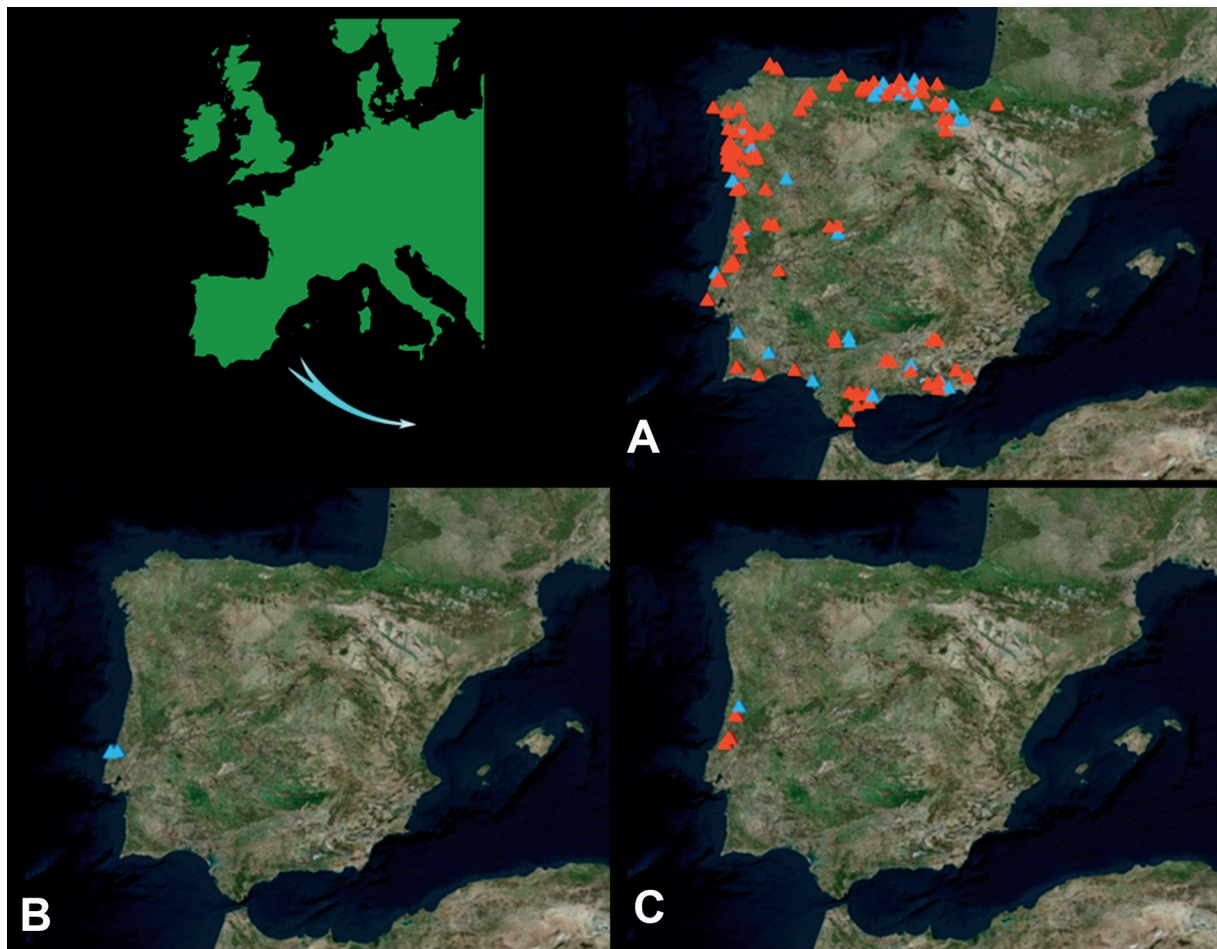


Fig. 1. Map of location of the Iberian Peninsula and maps with the geographic distribution of the species of *Eluma* (bibliographical references with red triangle; material studied with blue triangle). **A.** *E. caelata* (Miers, 1877). **B.** *E. matae* sp. nov. **C.** *E. tuberculata* Cruz, 1991.

leg.; INV16014. – **Bragança** • 1 ♀; Vale Verde; 41°23'22" N, 7°12'02" W; 201 m a.s.l.; 26 Jan. 2022; L.P. da Silva leg.; INV16000. – **Coimbra** • 1 ♀; Vale Soeiro; 40°18'54" N, 8°24'04" W; 112 m a.s.l.; 6 Mar. 2022; L.P. da Silva leg.; INV16003. – **Leiria** • 1 ♀; Eremida de Santo Adrião; 39°22'07" N, 9°09'35" W; 37 m a.s.l.; 12 Mar. 2022; L.P. da Silva leg.; INV16005. – **Porto** • 1 ♀; Areia; 41°19'40" N, 8°43'31" W; 30 m a.s.l.; 7 Feb. 2022; L.P. da Silva leg.; INV16001 • 1 ♂; CIBIO; 41°19'44" N, 8°40'22" W; 107 m a.s.l.; 17 Mar. 2022; L.P. da Silva leg.; INV16008. – **Setúbal** • 1 ♀; Mosqueirão; 38°04'40" N, 8°32'52" W; 216 m a.s.l.; 28 Apr. 2022; L.P. da Silva leg.; INV16022. – **Viana do Castelo** • 1 ♂; Portelinha; 42°03'07" N, 8°10'08" W; 1006 m a.s.l.; 24 Mar. 2022; L.P. da Silva leg.; INV16009.

SPAIN – **Álava** • 1 ♀; Izarra; 42°57'00" N, 2°54'00" W; 634 m a.s.l.; 5 Feb. 1984; J. Cifuentes leg.; JC • 1 ♂; Lagrán; 42°37'35" N, 2°35'02" W; 749 m a.s.l.; 27 May 1983; J. Cifuentes leg.; JC • 1 ♂, 1 ♀; Letona; 42°55'56" N, 2°44'54" W; 580 m a.s.l.; 11 May 1983; J. Cifuentes leg.; JC56. – **Almería** • 3 ♂♂, 1 ♀; Felix; 36°52'07" N, 2°39'28" W; 822 m a.s.l.; 21 Sep. 2018; CECOUAL-Dpto. Biol. Geol. leg.; CECOUAL • 72 ♂♂, 13 ♀♀; same collection data as for preceding; 11 Dec. 2018; CECOUAL • 16 ♂♂, 8 ♀♀; same collection data as for preceding; 11 Mar. 2019; CECOUAL • 4 ♂♂, 9 ♀♀, 2 immatures; same collection data as for preceding; 10 Sep. 2019; CECOUAL • 3 ♂♂, 3 ♀♀; Fondón; 36°58'45" N, 2°51'30" W; 858 m a.s.l.; 17 Sep. 2018; CECOUAL-Dpto. Biol. Geol. leg.; CECOUAL • 6 ♂♂, 9 ♀♀; same collection data as for preceding; 12 Dec. 2018; CECOUAL • 5 ♀♀; same collection data as for preceding; 10 Sep. 2019; CECOUAL. – **Asturias** • 1 ♂, 2 ♀♀; Pombes; 43°07'47" N, 4°44'49" W; 828 m a.s.l.; 5 Aug. 1984; J. Cifuentes leg.; JC. – **Burgos** • 1 ♀; Bocos; 42°58'07" N, 3°32'44" W; 598 m a.s.l.; 2 Jun. 1977; E. Ortíz de Vega leg.; MNCN 20.04/9898. – **Cáceres** • 1 ♀; Jerte; 40°13'11" N, 5°45'21" W; 593 m a.s.l.; 2 May 1985; M. Ortego leg.; JC. – **Cantabria** • 1 ♂, 1 ♀; Monte de Saja; 43°09'14" N, 4°11'27" W; 300 m a.s.l.; 7 Jul. 1954; S.V. Peris leg.; MNCN 20.04/9593 • 3 ♂♂, 9 ♀♀, 1 immature; Puente Viesgo; 43°17'57" N, 3°57'54" W; 70 m a.s.l.; Feb. 1961; J. Ogando leg.; MNCN 20.04/7650 • 1 ♂; Ruente; 43°15'35" N, 4°15'56" W; 189 m a.s.l.; 7 Jul. 1954; W. Steiner leg.; MNCN 20.04/9544 • 2 ♀♀; same collection data as for preceding; MNCN 20.04/9568 • 6 immatures; Santander, San Pedro del Mar; 43°27'40" N, 3°48'29" W; 4 m a.s.l.; 10 Aug. 1963; M.V. Mendiola leg.; MNCN 20.04/8121 • 1 ♂; Suances; 43°25'36" N, 4°02'31" W; 90 m a.s.l.; 6 Oct. 1956; E. Ortiz de Vega leg.; MNCN 20.04/12111 • 1 ♂; Urdón; 43°16'01" N, 4°37'55" W; 75 m a.s.l.; 31 Jul. 1954; S.V. Peris leg.; MNCN 20.04/11978 • 2 ♀♀; Val de San Vicente, Pechón; 43°23'25" N, 4°29'14" W; 32 m a.s.l.; 30 Oct. 1986; E. Ortiz de Vega leg.; MNCN 20.04/9695 • 6 immatures; Villafufre de Villacarriedo; 43°15'58" N, 3°53'36" W; 224 m a.s.l.; 13 Jul. 1954; S.V. Peris leg.; MNCN 20.04/9565. – **Granada** • 1 ♂, 2 ♀♀; Colomera; 37°22'19" N, 3°42'50" W; 885 m a.s.l.; 9 Sep. 2016; P. Barranco leg.; CECOUAL. – **Huelva** • 7 ♀♀; Doñana; 37°01'12" N, 6°26'24" W; 75 m a.s.l.; 14 May 1966; E. Ortiz de Vega leg.; MNCN 20.04/12249. – **Málaga** • 1 ♀; Pinsapar de la Sierra de las Nieves; 36°43'48" N, 4°58'48" W; 1650 m a.s.l.; 14 May 1952; E. Ortiz de Vega leg.; MNCN 20.04/9912 • 1 ♂; same collection data as for preceding; 6 Apr. 1982; José leg.; MNCN 20.04/11480. – **Navarra** • 2 ♂♂, 2 ♀♀; Marañón; 42°37'47" N, 2°26'22" W; 631 m a.s.l.; 27 May 1983; J. Cifuentes leg.; JC. – **Pontevedra** • 1 ♀; Pontevedra; 42°26'01" N, 8°38'53" W; 18 m a.s.l.; 1 Jul. 1952; H. Franz leg.; MNCN 20.04/9948. – **Sevilla** • 1 ♂; Constantina, Fuenfría; 37°52'20" N, 5°37'09" W; 562 m a.s.l.; 25 Apr. 2003; A. Tinaut leg.; CCZ-UGR852 • 1 ♂; same collection data as for preceding; 19 Dec. 2003; CCZ-UGR • 3 ♂♂; same collection data as for preceding; 16 Jan. 2004; CCZ-UGR • 1 ♂; San Nicolás del Puerto, Martinete; 37°59'37" N, 5°39'11" W; 588 m a.s.l.; 16 Jan. 2004; A. Tinaut leg.; CCZ-UGR • 1 ♂; San Nicolás del Puerto, Sima Callejon; 37°59'37" N, 5°39'11" W; 588 m a.s.l.; 14 Dec. 2002; A. Tinaut leg.; CCZ-UGR • 1 ♂, 2 ♀♀; San Nicolás del Puerto, Sima Guardia; 37°59'37" N, 5°39'11" W; 588 m a.s.l.; 19 Jan. 2004; A. Tinaut leg.; CCZ-UGR.

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Spain: A Coruña: Cabo de Finisterre (Schmölzer 1971). Orilla del Rio Tambre (Schmölzer 1971). Punta de la Estaca (Schmölzer 1971). Santiago (Schmölzer 1955a, 1971). Sierra de Barbanza (Schmölzer 1971). Sierra de Outes (Schmölzer 1971). Álava: Lagran (Vivar *et al.* 1984). Letona (Vivar *et al.*, 1984). Zárte (Vivar *et al.* 1984). Almería: Bares (García & Pérez Fernández 2017). Berja (García & Pérez Fernández 2017). Felix y Fondón (Cifuentes *et al.* 2021). Paterna del Río (Vandel 1953). Sorbas (García & Pérez Fernández 2017). Sorbas (García & Pérez Fernández 2017). Asturias: Amieva (Vázquez Felechosa & Anadón 2001). Bosque de Muniellos (Schmölzer 1955a, 1971). Cangas de Onís (Vázquez Felechosa & Anadón 2001). Cangas del Narcea (Vázquez Felechosa *et al.* 2004). Gijón (Vázquez Felechosa & Anadón 2001). Nueva de Llanes (Schmölzer 1971). Oviedo (Schmölzer 1955a). Sierra de Ancres (Schmölzer 1955a). Cádiz: Algeciras (Arcangeli 1936, 1948). Sierra de la Luna (Schmölzer 1955b). Sierra del Pinar (Schmölzer 1955a). Cádiz (Vandel 1954). Cantabria: Liendo (Schmölzer 1971). Monte Aa (Schmölzer 1971). Monte Saja (Schmölzer 1971). Piélagos (Vázquez Felechosa & Anadón 2001). Puerto de la Braguía (Schmölzer 1971). Santa Maria de Naranco (Schmölzer 1971). Santander (Schmölzer 1971). Villafuere (Schmölzer 1971). Córdoba: Cabra (García & Pérez Fernández 2017). Carcabuey (García & Pérez Fernández 2017). Sin loc. (Arcangeli 1936, 1948). Granada: Jubiles (Vandel 1953). Sierra Elvira (Schmölzer 1971). Huelva: Huelva (Cifuentes 2021). Jaén: Cazorla (García & Pérez Fernández 2017). Cazorla (García & Pérez Fernández 2019). La Iruela (García 2013; García & Pérez Fernández 2017). Peal de Becerro (García 2013; García & Pérez Fernández 2017). La Rioja: Nájera (Schmölzer 1971). Lugo: Lugo (Schmölzer 1955a). Puente de Lozera (Schmölzer 1955a, 1971). Sierra de Ancres (Schmölzer 1971). Málaga: Benajon (Arcangeli 1936, 1948). La Hanadilla (Schmölzer 1971). Pinsapar de la Sierra de las Nieves (Cifuentes 2021). Ronda (Vandel 1962). Sierra Bermeja (Schmölzer 1955a, 1971). Sierra de las Nieves (Cifuentes 2021). Sierra del Pinar (Schmölzer 1971). Navarra: Garralda (Schmölzer 1971). Marañon (Cifuentes 1984). Orense: Avión (Gregory *et al.* 2012). Beade (Gregory *et al.* 2012). Beiro (Gregory *et al.* 2012). Los Peares (Schmölzer 1955a, 1971). Lobios (Schmölzer 1971). Pontevedra: Amorin (Gregory *et al.* 2012). As Eiras (Gregory *et al.* 2012). Bayona (Gregory *et al.* 2012). Camposancos (Gregory *et al.* 2012). Cerdedo (Schmölzer 1955a, 1971). Figuerido (Schmölzer 1971). Goján (Gregory *et al.* 2012). Gondomar (Schmölzer 1971). Oia (Gregory *et al.* 2012). Pontevedra (Schmölzer 1955a, 1971). Puerto de Moncelos (Gregory *et al.* 2012). Salamanca: Las Sierras de Béjar y Francia (Marmaneu *et al.* 2019). Valdelageve (Marmaneu *et al.* 2019). Sevilla: Constantina (Dollfus 1892; Cifuentes & Tinaut 2019). San Nicolás del Puerto (Cifuentes & Tinaut 2019). Vizcaya: Carranza (Vivar *et al.* 1984). Lanestrosa (Schmölzer 1971). Orduña (Vivar *et al.* 1984). Urduliz (Vivar *et al.* 1984).

Comments

This is an epigeal species. Its habitat consists of wooded areas of medium or low altitudes. Vandel (1962) indicates a maximum altitude of 1800 m at Alpujarra (Granada, Spain), which is close to the 1650 m site (at Sierra de las Nieves) where a female examined by us was captured. Vandel (1962) considers that the presence of the species in caves, as in Algeria, is related to the destruction of the surrounding woodland, that would be its natural habitat. Nonetheless, in the Iberian Peninsula, *E. caelata* is also found in caves. There are 21 mentions to cavities or caves, among the study material and cited bibliography, though only

one of those is located in the North of the Iberian Peninsula (Cueva del Teleférico, Carranza, Vizcaya; Vivar *et al.* 1984), even in areas with preserved plant cover. Cifuentes *et al.* (2021) also mentioned the species in the Mesovoid Shallow Substratum – MSS (Juberthie *et al.* 1980). The known distribution in the Iberian Peninsula (Fig. 1A) shows its abundant presence in the western part of the peninsula, suggesting larger populations from Lisbon (Portugal) to Galicia (Spain), and subsequent colonization of the east mountain ranges, reaching the Pyrenees, with the most eastern distribution point in Garralda (Navarra). In the south of the Iberian Peninsula, the distribution reaches the province of Almería, but is limited to areas of high environmental humidity (Paterna del Río, Alpujarra; Vandel 1953) or the MSS at Almería, as already mentioned, or in caves. In the centre, its colonization is very modest and always along mountain ranges. The most important factors that seem to be limiting its distribution are climatic, namely temperature and humidity. The lower temperatures in the peninsular centre and Pyrenees, appear to have stopped its progression to the east, and the high temperatures and low humidity, typical of the Mediterranean, have done the same from Almería to Catalonia. This species has been figured several times before, but to allow an easier comparison with the other species from the Iberian Peninsula from the genus, some figures are also provided (Fig. 2A–C).

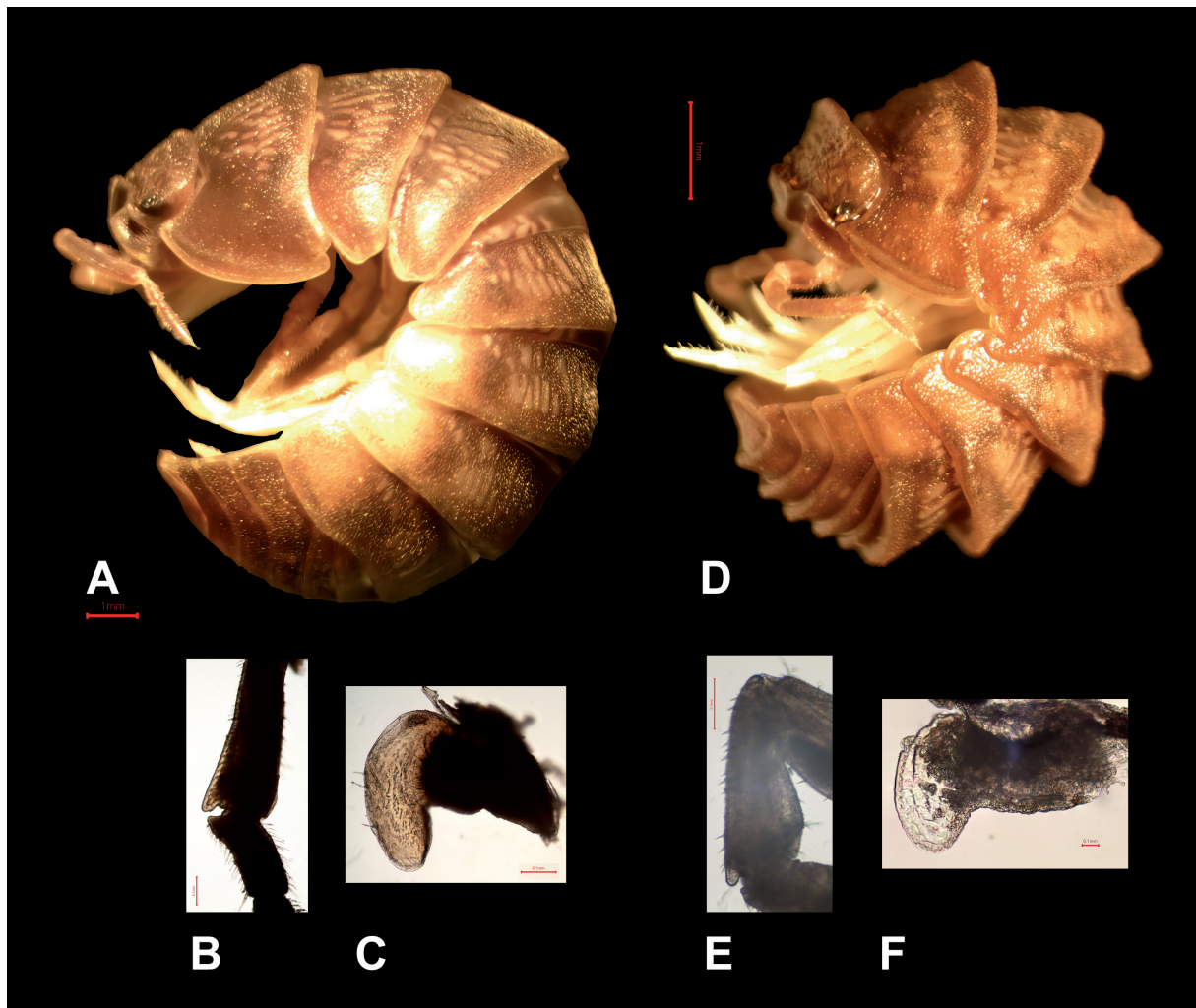


Fig. 2. A–C. *Eluma caelata* (Miers, 1877). A. Habitus, lateral view (INV16000). B. Pereopod 7 male, ischium (JC56). C. Exopod I male (JC56). – D–F. *E. tuberculata* Cruz, 1991. D. Habitus, lateral view (JC605). E. Pereopod 7 male, ischium (INV16031). F. Exopod I male (INV16013). Scale bars: A, D = 1 mm; B–C, E–F = 0.1 mm.

The species is recorded for the first time in the Portuguese districts of Beja, Bragança and Setúbal and the Spanish provinces of Burgos and Cáceres.

***Eluma tuberculata* Cruz, 1991**

Figs 1C, 2D–F, 4H

Material studied

A total of 13 specimens were analysed, 2 males and 11 females

PORTUGAL – **Coimbra** • 1 ♀; Vale Soeiro; 40°18'50" N, 8°24'08" W; 104 m a.s.l.; 20 Feb. 2022; L.P. da Silva leg.; JC605 • 1 ♀; Vale Soeiro; 40°18'47" N, 8°24'09" W; 98 m a.s.l.; 20 Feb. 2022; L.P. da Silva leg.; INV16002 • 1 ♀; Vale Soeiro; 40°18'50" N, 8°24'08" W; 104 m a.s.l.; 6 Mar. 2022; L.P. da Silva leg.; INV16004 • 1 ♂; same collection data as for preceding; 105 m a.s.l.; 7 Apr. 2022; INV16013 • 1 ♀; same collection data as for preceding; INV16010 • 1 ♀; same collection data as for preceding; INV16011 • 1 ♀; same collection data as for preceding; INV16012 • 1 ♂; Vale Soeiro; 40°18'47" N, 8°24'08" W; 95 m a.s.l.; 24 Apr. 2022; L.P. da Silva leg.; INV16031 • 1 ♀; same collection data as for preceding; INV16017 • 1 ♀; same collection data as for preceding; INV16018 • 1 ♀; same collection data as for preceding; INV16019 • 1 ♀; same collection data as for preceding; INV16020 • 1 ♀; same collection data as for preceding; INV16021.

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Portugal: Leiria: Estremenho Massif (Reboleira *et al.* 2015). Sicó Massif (Reboleira *et al.* 2015). Santarém: São Mamede (Cruz 1991).

Comments

This small epigeal species, endemic to Portugal (Fig. 1C), is also known from caves and MSS (Reboleira *et al.* 2015). This species is much less known than *E. caelata*. Although Cruz (1991) and Reboleira *et al.* (2015) have already illustrated it, we consider useful to provide some figures of the species (Fig. 2D–F), some from anatomical aspects not yet described, valuable to compare with other species of the genus.

The species is recorded for the first time in Coimbra district.

***Eluma matae* sp. nov.**

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Figs 1B, 3, 4A–F, I–Q

Diagnosis

Dorsum of pereon and pleon are smooth with circular or oval depressions covered with hair like structures formed by scale-setae of diverse shapes and sizes. The volvation is of the euspheric type. The eye apparatus is formed by a large ocellus. The cephalon is of the elumean type and has a large schisma on the side edge of the first pereonite. In the male, the carpus of the pereopod I has a brush of setae and hyaline scales on the ventral side; the ischium of the 7th pereopod has a caudal crest ending in a rounded dilation.

Etymology

This species is dedicated to Dr Vanessa A. Mata, from CIBIO-InBIO/BIOPOLIS, University of Porto, Portugal, for her support during the work that allowed the discovery and description of this new species.

Type material

A total of 15 specimens were analysed, 4 males and 11 females

Holotype

PORTUGAL • ♂; Leiria, Ermida de Santo Antão; 39°22'25" N, 9°09'46" W; 56 m a.s.l.; 1 May 2022; L.P. da Silva leg; INV16027.

Paratypes

PORTUGAL – **Leiria** • 1 ♀; A-da-gorda; 39°20'53" N, 9°09'30" W; 55 m a.s.l.; 13 Apr. 2022; L.P. da Silva leg; INV16015 • 1 ♀; A-da-gorda; 39°20'54" N, 9°09'31" W; 52 m a.s.l.; 13 Apr. 2022; L.P. da Silva leg; INV16016 • 1 ♂; Ermida de Santo Antão; 39°22'15" N, 9°09'39" W; 57 m a.s.l.; 12 Mar. 2022; L.P. da Silva leg; INV16006 • 1 ♂; same collection data as for holotype; JC636 • 1 ♀; same collection data as for holotype; INV16029 • 1 ♀; same collection data as for holotype; INV16026 • 1 ♀; same collection data as for holotype; MNCN 20.04/20266 • 1 ♀; same collection data as for holotype; INV16028 • 1 ♂; Óbidos; 39°21'48" N, 9°09'22" W; 48 m a.s.l.; 30 Apr. 2022; L.P. da Silva leg; MNCN 20.04/20265 • 1 ♀; same collection data as for preceding; INV16023 • 1 ♀; Óbidos; 39°21'48" N, 9°09'21" W; 42 m a.s.l.; 30 Apr. 2022; L.P. da Silva leg; INV16024 • 1 ♀; Óbidos; 39°21'47" N, 9°09'21" W; 44 m a.s.l.; 30 Apr. 2022; L.P. da Silva leg; INV16025 • 1 ♀; same collection data as for preceding; JC635. – **Santarém** • 1 ♀; Mata de Baixo; 39°22'39" N, 8°58'20" W; 176 m a.s.l.; 13 Mar. 2022; L.P. da Silva leg; INV16007.

Description

Maximum length: 12 mm.

General coloration purplish brown to dark green, muscle attachments very marked (Fig. 3A–D); pereon with large whitish spot at limit of epimera (Fig. 3C); same pattern repeated in pleon.

Integumentary characters

– Dorsum of cephalon, pereon and pleon smooth, with large number of circular or oval depressions (Fig. 3E) and small striated scales.

– Scale-setae: body covered by hair like structures composed by large number of scale-setae of various shapes, some with Y shape with different sizes (Figs 3E, 4A–D), always long or very long and sharp or dilated at tip; others very wide, with rectangular appearance (Fig. 4E) and finally some very characteristic scale-setae, long (0.14 mm), wide and mace-shaped (Figs 3F, 4F), very visible in specimens (Fig. 3A–D), these scale-setae arranged in five or six rows on cephalon and on first tergite of pereon (Fig. 3A–B), three rows between 2nd and 7th segments, one row in 1st and 2nd segments of pleon, 2 rows in segments 3rd to 5th and 3 rows in telson (Fig. 3D). Among them is rest of scale-setae types.

Somatic characters

– Body: volvation of euspheric type (Fig. 3A).

– Eye apparatus formed by large ocellus with very refringent cornea (Fig. 3C).

– Cephalon (Figs 3B, 4I): elumean type, without post-scutellar line, posterior edge of cephalic shield directly continuous with frontal line. Cephalic shield big and wide, and frontal cephalic lamina clearly stands out above vertex. Antennal lobes very salient and have very short posterior segment. Posterior edge not raised.

– Pereon (Fig. 3A–C): tergites posterior edge not raised. First tergite with edge very sinuous and lateral edge has large schisma, which two very differentiated lobes, with lower standing out in relation to upper

lobe and large separating groove between both edges. Remain epimera almost vertical until upper side and quadrangular with rounded edges, except fourth epimera, more triangular.

– Pleon (Fig. 3D): ogival shape, with slightly oblique neopleurons.

– Telson (Fig. 3D): triangular with straight edges and slightly rounded tips.

Appendages

– Mouth apparatus as the rest of species of *Eluma*.

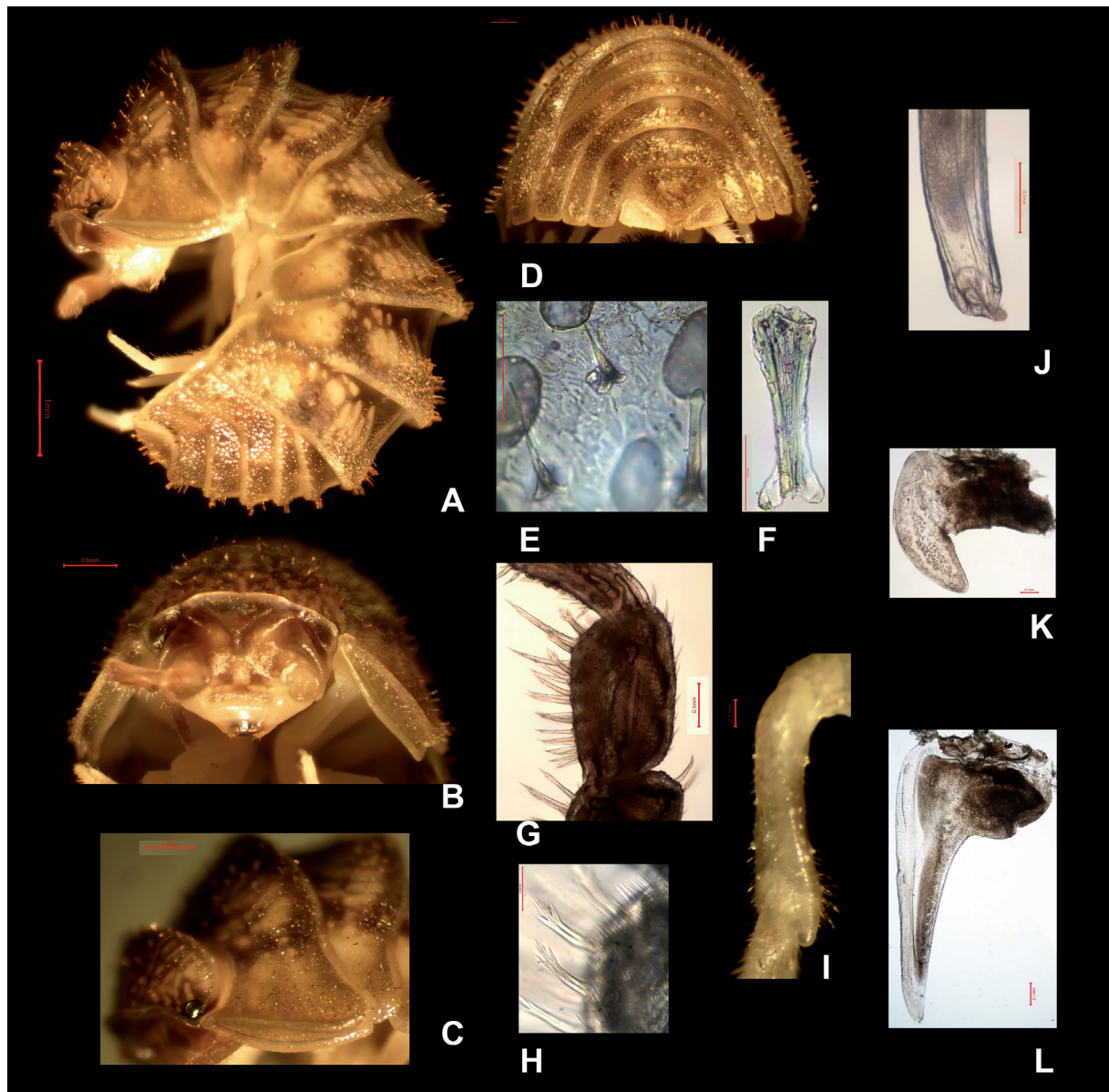


Fig. 3. *Eluma matae* sp. nov., paratype, ♂ (INV16006). **A.** Habitus, side view. **B.** Cephalon and first pereonite, frontal view. **C.** First pereonite, side view. **D.** Pleon, telson and uropods. **E.** Dorsal tegument and scale-setae. **F.** Scale-setae, detail. **G.** Carpus of the pereopod 1. **H.** Carpus of the pereopod 1, setae. **I.** Pereopod 7, ischium. **J.** Tip of endopod I. **K.** Exopod I. **L.** Exopod II. Scale bars: A = 1 mm; B–D = 0,5 mm; E, F, H = 0.05 mm; G, I–L = 0.1 mm.

– Antennules (Fig. 4J): three segments, second smaller than other two; third has group of small aesthetascs at tip.

– Antennae (Fig. 4K): long and thin, and fifth segment longer than antennal flagellum. Second flagellum segment two and a half times as long as first and has three groups of very small aesthetascs.

– Uropods (Fig. 4D): endopods cylindrical and exceed end of telson. Exopods trapezoidal and much wider than long.

Male sexual characters

– Pereopod 1 (Figs 3G–H, 4L): carpus with lax brush of long setae and numerous hyaline scales on ventral side.

– Pereopod 7 (Figs 3I, 4M): ischium very long, with straight sternal margin and terminal crest ending in large dilatation with rounded tip. Merus lacks differentiation.

– Pleopod I: endopod (Figs 3J, 4N) long and curves slightly outwards in middle, ending in very wide point with several folds. Exopod (Figs 3K, 4O) has very marked inner tip, triangular, curved, with inner side broadly rounded and outer side straight.

– Pleopod II: endopod (Fig. 4P) very long, fine and exceeds extreme of exopod. Exopod (Figs 3L, 4Q) triangular, with rectangular base and very large triangular inner tip.

Ecology

All specimens were found in limestone areas from the Jurassic Period, below rocks, usually with a high amount of plant debris. They were also found only in places with natural vegetation, namely with *Q. faginea*. Most specimens were captured together with *Ctenoscia minima* (Dollfus, 1892) and *Porcellio dispar* Verhoeff, 1901.

Key to the species of the genus *Eluma*

The genus *Eluma* currently includes four species that can be distinguished with the help of the following dichotomic key:

1. Integuments without hair like structures and with granulations *E. tuberculata* Cruz, 1991
– Integuments with hair like structures and without granulations 2
2. Male pereopod 7 with protrusions on ischium and merus *E. caelata* (Miers, 1877)
– Male pereopod 7 with protrusions only on ischium 3
3. Integuments with scale-setae long and triangular, male exopod I with short and rounded inner tip .
..... *E. praticola* Taiti & Rossano, 2015
– Integuments with scale-setae long triangular, rectangular and mace shaped, male exopod I with long and sickle shaped inner tip *E. matae* sp. nov.

Discussion

The genus *Eluma*, as previously mentioned, was composed until now by three species: *E. caelata* (Miers, 1877), *E. tuberculata* Cruz, 1991 and *E. praticola* Taiti & Rossano, 2015. *Eluma caelata* (Fig. 2A–C) was initially described as *Armadillidium caelatum* by Miers (1877) from Cayenne, from the Overseas Department of French Guiana, but this record represents an introduction according to Schmalfuss (2003), since its origin seems to be the mountain ranges of Portugal and South Spain (Vandel 1962). Nowadays,

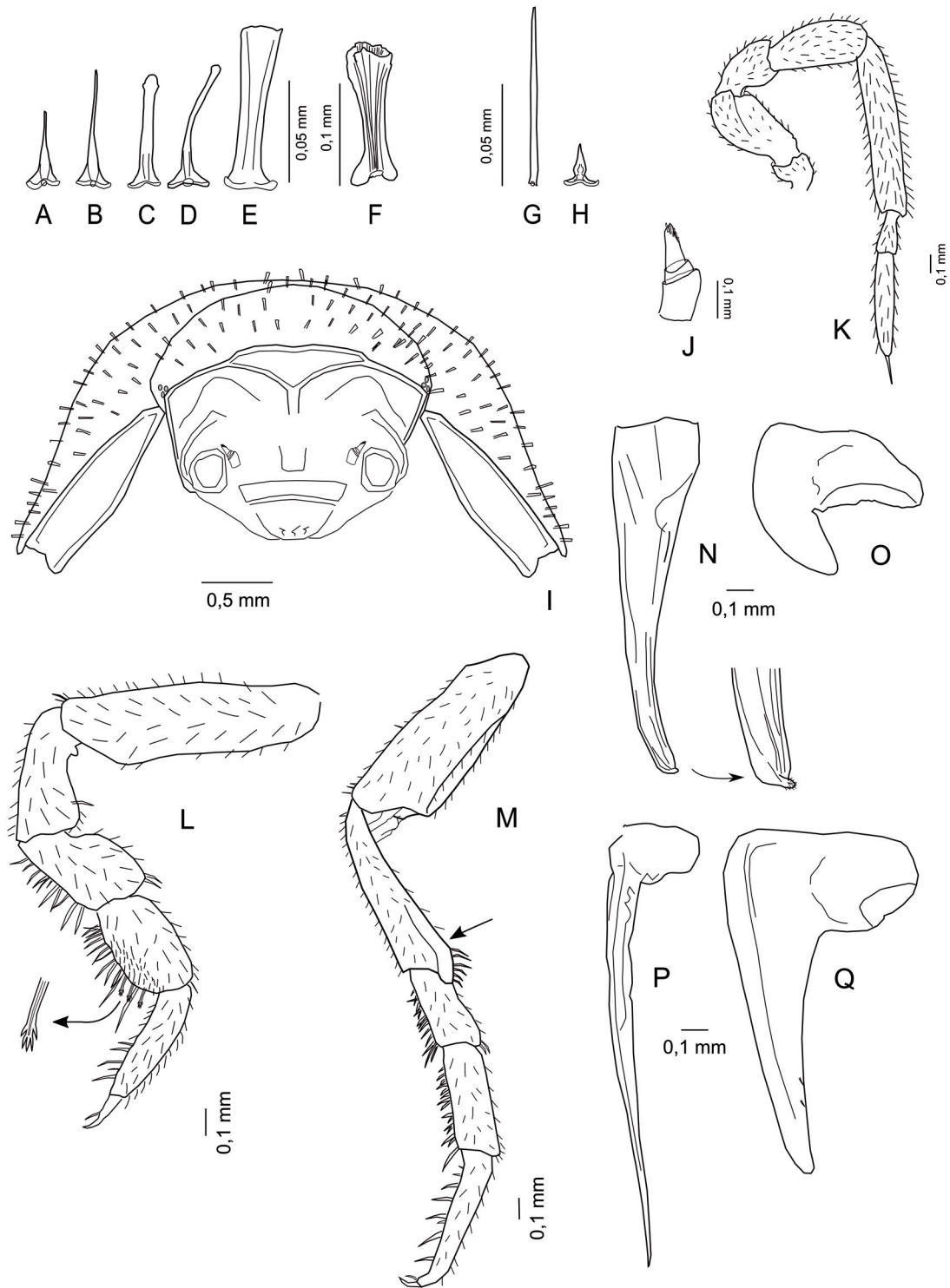


Fig. 4. *Eluma matae* sp. nov. A–F, I, K–Q. Paratype, ♂ (INV16006). J. Paratype, ♀ (INV16007). A–F. Scale setae. G. *E. caelata* (Miers, 1877), ♂ (CCZ-UGR852), scale setae. H. *E. tuberculata* Cruz, 1991, ♀ (INV16004), scale setae. I. Cephalon and first pereonite, frontal view. J. Antennule. K. Antenna. L. Pereopod 1. M. Pereopod 7. N. Endopod I. O. Exopod I. P. Endopod II. Q. Endopod II.

its known distribution extends through the Iberian Peninsula, as previously mentioned, North Africa, the Atlantic islands of the Azores, Canaries and Madeira, and from the west of France to the British Isles (see Vandel 1944, 1946, 1962; Schmalfuss 2003; Séchet & Noël 2015), having also been introduced in Tasmania (Schmalfuss 2003). *Eluma tuberculata* (Fig. 2D–F) was described from São Mamede, Fátima (Portugal) by Cruz (1991), and afterwards was only mentioned in the MSS of the Estremenho Massif and one cave in the Sicó Massif in Portugal (Reboleira *et al.* 2015). Reboleira *et al.* (2015) also illustrate the male's 1st and 7th pereopods and pleopods I and II, that were not known until their work. Finally, *E. praticola* described by Taiti & Rossano (2015), is only known from its type locality in Oued Laou, Morocco. The new species, described in this work, *E. matae* sp. nov., is integrated in the genus *Eluma*, following Vandel (1962), because its eye apparatus is formed by one large ocellus, has an elumean type cephalon, i.e., without a postscutellar line, and the volvation is of the euspheric type with one schisma in the first epimera. Three of the four species that currently form this genus have hair-like structures, with long scale-setae in *E. caelata* (Fig. 4G) and *E. matae* sp. nov. (Figs 3A–E, 4A–F), that in the later are so apparent they can be recognized by the naked eye, while in *E. praticola* they are much smaller (see Taiti & Rossano 2015: 2125). On the other hand, the scale-setae of *E. tuberculata* are very small and triangular (Fig. 4H), and it is the only one of the four species that presents granulations that are more or less developed in different specimens, but on all of them the posterior cephalon border and the tergites of the pereon, but mainly the first, present a raised crest in relation to the rest of the tergite (Fig. 2D), giving it a very characteristic appearance. The pereopod 7 of the male of *E. caelata* has two strong conical protrusions, one in the ischium and another in the merus, that look like a clamp (Fig. 2B), while *E. praticola* (see Taiti & Rossano 2015), *E. tuberculata* (Fig. 2E) and *E. matae* sp. nov. (Figs 3I, 4M) only have a small protrusion on the ischium. Finally, in the male pleopod I of *E. praticola* (see Taiti & Rossano 2015) the exopod has a small and rounded inner tip. On the other hand, in *E. caelata* (Fig. 2C), *E. tuberculata* (Fig. 2F) and *E. matae* sp. nov. (Figs 3K, 4O) the exopod has a large triangular inner tip, much more marked, and in the case of the *E. matae* sp. nov., with a strongly rounded outer edge and a straight inner edge, giving it the appearance of a sickle.

The results of this work endorse the origin of the genus *Eluma* in the mountain ranges of Portugal and from the South of Spain, as stated by Vandel (1962), since three of the four known species are present in this area (Fig. 1A–C), and two are endemic to Portugal. *Eluma caelata* is mentioned for the first time for the Portuguese districts of Beja, Bragança and Setúbal, and for the Spanish provinces of Burgos and Cáceres. *Eluma tuberculata* is mentioned for the first time from Coimbra district, Portugal.

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