



Received: 12 October 2024 • Accepted: 17 February 2025 • Published: 27 January 2026

Topic editor: 17 February 2025 • Section editor: Fabio Stoch • Desk editor: Eva-Maria Levermann, Mike Van der Brug

## Research article

[urn:lsid:zoobank.org:pub:EF4A6EC8-2A1B-4FE2-858B-4F4FA4CF9517](https://zoobank.org/pub:EF4A6EC8-2A1B-4FE2-858B-4F4FA4CF9517)

# The genus *Trichoniscoides* Sars, 1899 (Isopoda: Oniscidea: Trichoniscidae) from Portugal, with descriptions of three new species

Julio CIFUENTES<sup>1,\*</sup>   & Luis P. DA SILVA<sup>2</sup>  

<sup>1</sup>Departamento de Biología (Zoología), Facultad de Ciencias, Universidad Autónoma de Madrid, 28049 Cantoblanco, Madrid, Spain.

<sup>2</sup>CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto-InBIO, Universidade do Porto, Campus de Vairão, Rua Padre Armando Quintas, 4485-661 Vairão, Portugal.

<sup>2</sup>BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Campus de Vairão, 4485-661 Vairão, Portugal.

\*Corresponding author: [jcifcol@gmail.com](mailto:jcifcol@gmail.com)

<sup>2</sup>Email: [lfpascoals@cibio.up.pt](mailto:lfpascoals@cibio.up.pt)

**Abstract.** The genus *Trichoniscoides* Sars, 1899, is exclusively European and comprises 58 species, with 39 occurring on the Iberian Peninsula. Most species in this region are troglolithic, but recent studies have identified several new species of this genus that are not associated with caves. We describe three new epigeal species from northwestern Portugal. All three have a granulated dorsal integument and a hook-like process on the merus of the male pereopod 7. *Trichoniscoides castanheirensis* sp. nov. is also distinguished by a lanceolate and ciliated tip on the male endopod of pleopod I, *Trichoniscoides cordovensis* sp. nov. by a male endopod of pleopod II with a pointed tip reinforced by a chitinous shaft, and *Trichoniscoides oloensis* sp. nov. by a large triangular expansion on the male exopod of pleopod I, which is unique within the genus, along with its ciliated rami. Additionally, we provide distribution maps and a key for all Portuguese species.

**Keywords.** Identification key, Iberian Peninsula, new species, taxonomy, terrestrial isopods, woodlice.

Cifuentes J. & Da Silva L.P. 2025. The genus *Trichoniscoides* Sars, 1899 (Isopoda: Oniscidea: Trichoniscidae) from Portugal, with descriptions of three new species. *European Journal of Taxonomy* 1034: 271–305.

<https://doi.org/10.5852/ejt.2026.1034.3169>

## Introduction

The family Trichoniscidae Sars, 1899 comprises 86 genera, following Bokyo *et al.* (2024), and 524 recognized species, making it the second most diverse family within the Oniscidea Latreille, 1802, after the family Armadillidae Brandt, 1831, which contains 81 genera and 649 species (Bokyo *et al.* 2024). To date, within the Trichoniscidae, the richest genera are *Trichoniscus* Brandt, 1833, with 103 species, and *Trichoniscoides* Sars, 1899, which includes 55 species (Bokyo *et al.* 2024; Cifuentes *et al.* 2024).

The latter is particularly diverse in Western Europe, with the majority of species occurring on the Iberian Peninsula (Schmalfuss 2003).

During ongoing research on terrestrial isopods in Portugal (e.g., Cifuentes & Da Silva 2023b; Cifuentes & Da Silva 2024), we collected several specimens of *Trichoniscoides*. The objectives of this study are: (i) to describe the newly identified species; (ii) to discuss the morphological characters that distinguish the new species from their congeners; (iii) to provide distribution maps for the known species of this genus in Portugal; and (iv) to create an identification key for the species found in Portugal.

## Material and methods

The identification of the studied specimens was based on bibliographic descriptions. The specimens were collected from various locations in Portugal between February 2022 and July 2024, through direct searches and hand capture in suitable microhabitats. Some specimens were preserved in 96% ethanol for future molecular analysis, while the rest were preserved in 70% ethanol. Some studied specimens from the University of Barcelona (Spain) were also preserved in 70% ethanol. The specimens were deposited in different public and private collections.

Distribution maps were generated using the Free and Open Source QGIS Desktop 3.22.2. The coordinates of localities in Portugal, where the specimens were collected, were recorded in the field. Coordinates for the remaining studied specimens and bibliographic citations, when unavailable, were obtained from Google Maps (<https://www.google.com/maps>) based on the provided location descriptions.

Each studied species has been figured to facilitate future identification, with most being illustrated for the first time. The illustrations were prepared using the graphic editor Inkscape (<https://inkscape.org/es>). The photos used to create the figures and illustrations were captured using a microscope and a stereo microscope (Gundlach), equipped with a 12 MP digital camera (C2CMOS).

## Institutional abbreviations

- CRBA = Centre de Recursos de Biodiversitat Animal de la Universitat de Barcelona, Spain  
JC = Julio Cifuentes' private collection, Madrid, Spain  
LPS = InBio Barcoding Initiative, Centro de Investigação em Biodiversidade e Recursos Genéticos, Universidade do Porto, Portugal  
MNCN = Museo Nacional de Ciencias de Madrid, Spain

## Results

### Taxonomy

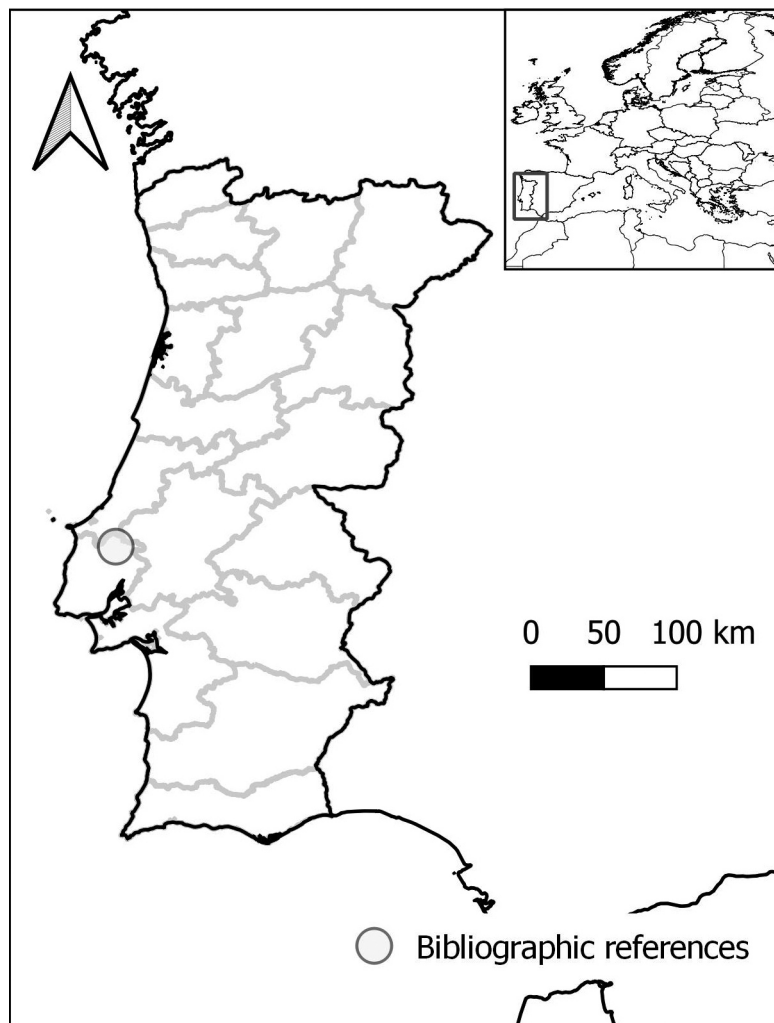
Class Malacostraca Latreille, 1802  
Order Isopoda Latreille, 1817  
Suborder Oniscidea Latreille, 1802  
Family Trichoniscidae Sars, 1899  
  
Genus *Trichoniscoides* Sars, 1899

### Type species

*Trichoniscoides sarsi* Patience, 1908.

*Trichoniscoides bellesi* Reboleira & Taiti, 2015  
Fig. 1; Table 1

*Trichoniscoides bellesi* Reboleira & Taiti, 2015: 9, figs 4–6.



**Fig. 1.** Location of Portugal in Europe and distribution of *Trichoniscoides bellesi* Reboleira & Taiti, 2015. Black lines represent country borders and grey lines mark districts of Portugal.

### Remarks

This species is characterized by a granulated dorsal integument, antennae with tubercles bearing scale-setae, and pereopod 7 without sexual dimorphism (Table 1). The male pleopod I endopod lacks a distal lobe, and the exopod is triangular with a rounded external edge and without any notch at the base of the two equal ciliated rami. The male pleopod II endopod has a distal segment  $2.2 \times$  the length of the basal segment, which is very thick with a tapered tip. This is a troglobiotic species (Table 1).

### Distribution

This species is only known from a single cave in Portugal, Algar do Javali (Lisbon, Montejunto Massif) (Reboleira *et al.* 2015; Fig. 1).

*Trichoniscoides broteroi* Vandel, 1946

Figs 2A, 3A, 4; Table 1

*Trichoniscoides broteroi* Vandel, 1946: 178, figs 22–26.

### Material examined

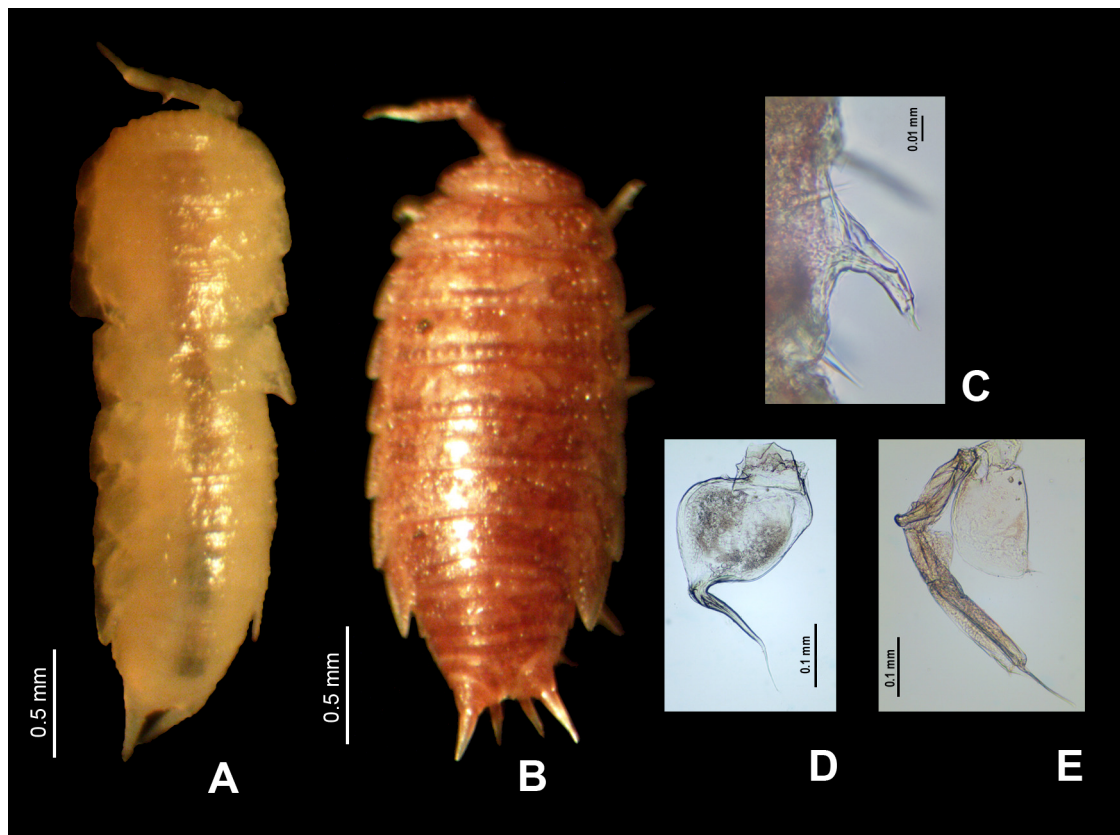
PORTUGAL – Aveiro • 1 ♂; Gruta Maior da Fujaca, Pampilhosa do Botão; 26 Feb. 1987; Antoni Serra leg.; Antonio Cruz coll.; CRBA-86807.

### Remarks

This species is characterized by a granulated dorsal integument (Fig. 2A), antennae with tubercles bearing scale-setae, male pereopod 7 sexually dimorphic, merus with a short hook-like process that has a terminal spine in the middle of the sternal edge (Fig. 3A; Table 1). The male pleopod I endopod has a very long distal lobe, triangular with a rounded tip, and the exopod is sub-quadrangular with a rounded external edge and with a prominent notch at the base of the two nearly equal ciliated rami, with the internal ramus slightly thinner than the external one (Table 1). The male pleopod II endopod has a distal segment  $3.6\times$  the length of the basal segment, with the distal segment being thin and ending in a curved point with a rounded tip, surrounded by a hyaline membrane; exopod II is trapezoidal (Table 1). This is a troglobiotic species (Table 1).

### Distribution

This species was recorded from Gruta dos Alqueves (Coimbra) in Portugal by Vandel (1946, 1952). The present work extends the known distribution of *Trichoniscoides broteroi* to approximately 15 km north (Fig. 4).



**Fig. 2.** A. *Trichoniscoides broteroi* Vandel, 1946, ♂ (CRBA-86807), habitus. B–E. *Trichoniscoides gallaecus* Cifuentes & Da Silva, 2023. B. ♀ (JC668), habitus. C–E. ♂ (JC667). C. Pereopod 7 merus. D. Exopod I. E. Endopod and exopod II.

*Trichoniscoides gallaecus* Cifuentes & Da Silva, 2023

Figs 2B–E, 3B–F, 5; Table 1

*Trichoniscoides gallaecus* Cifuentes & Da Silva, 2023a: 2, figs 2–3.

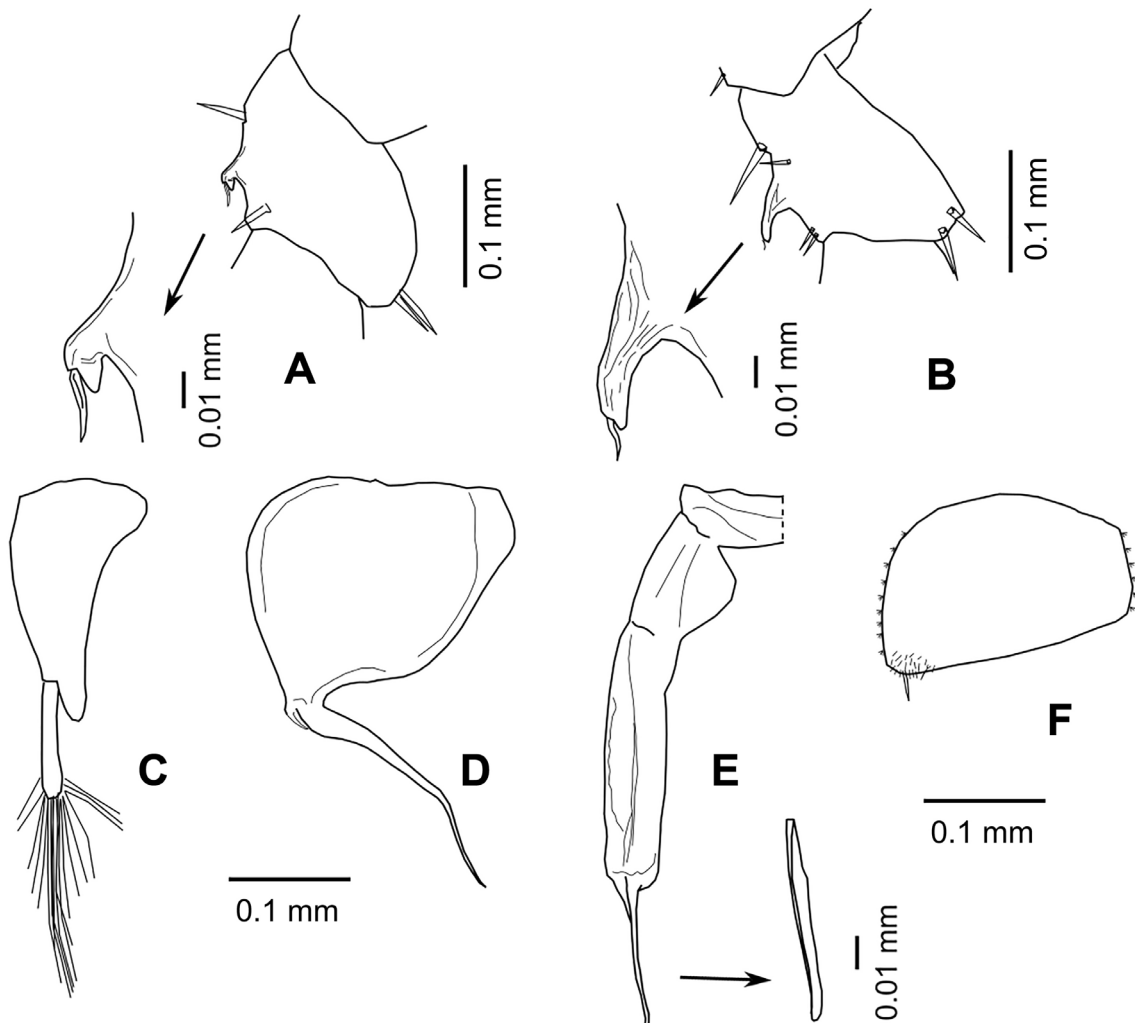
**Type material examined**

**Paratypes**

PORTUGAL – **Braga** • 1 ♂, Fradelos; 41.3545° N, 8.6063° W; 27 May 2022; L.P. Da Silva leg.; paratype, cited by Cifuentes & Da Silva (2023a); JC667 (ex. LPS332) • 1 ♀; same data as for preceding; paratype, cited by Cifuentes & Da Silva (2023a); JC668 (ex. LPS333c).

**Other material examined**

PORTUGAL – **Viana do Castelo** • 2 ♂♂; Bárrio; 41.8400° N, 8.5845° W; 12 Nov. 2023; L.P. Da Silva leg.; LPS785a • 2 ♀♀; same data as for preceding; LPS785b • 1 ♀; Bárrio; 41.8401° N, 8.5843° W; 12 Nov. 2023; L.P. Da Silva leg.; LPS784 • 4 ♂♂; same data as for preceding; LPS787 • 1 ♂, Castanheira,



**Fig. 3.** A. *Trichoniscoides broteroi* Vandel, 1946, ♂ (CRBA-86807), pereopod 7 merus. B–F. *Trichoniscoides gallaecus* Cifuentes & Da Silva, 2023, ♂ (JC667). B. Pereopod 7 merus. C. Endopod I. D. Exopod I. E. Endopod II. F. Exopod II.

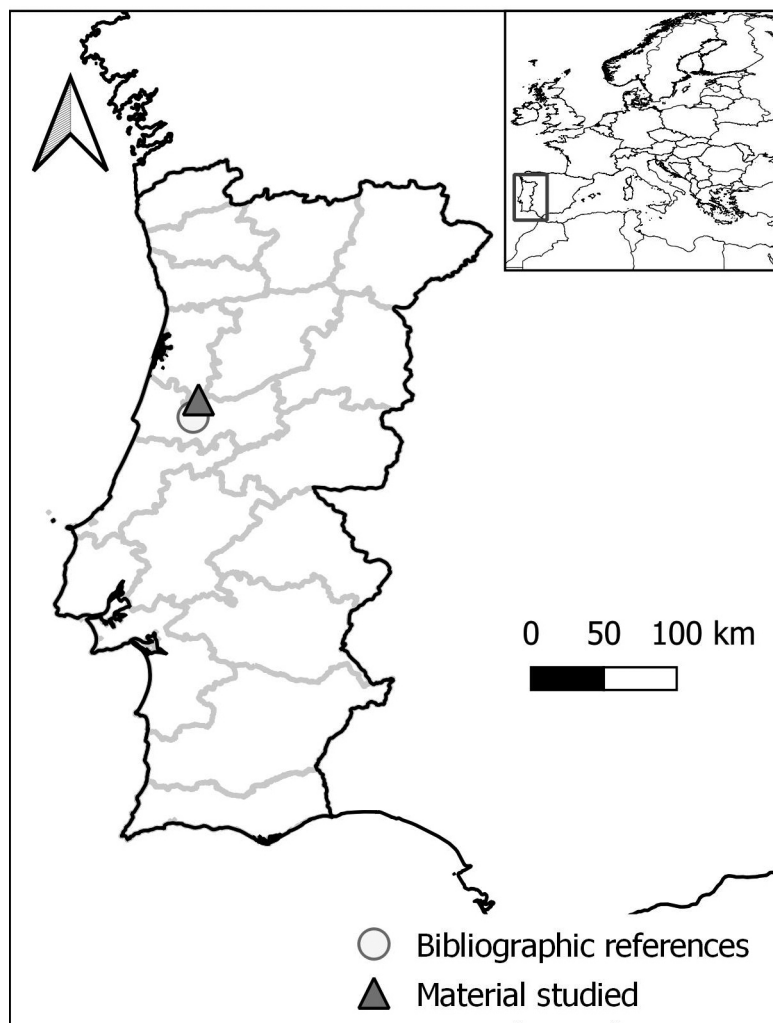
41.9025° N, 8.5482° W; 12 Nov. 2023; L.P. Da Silva leg.; LPS789a • 3 ♀♀, same data as for preceding; LPS789b.

### Remarks

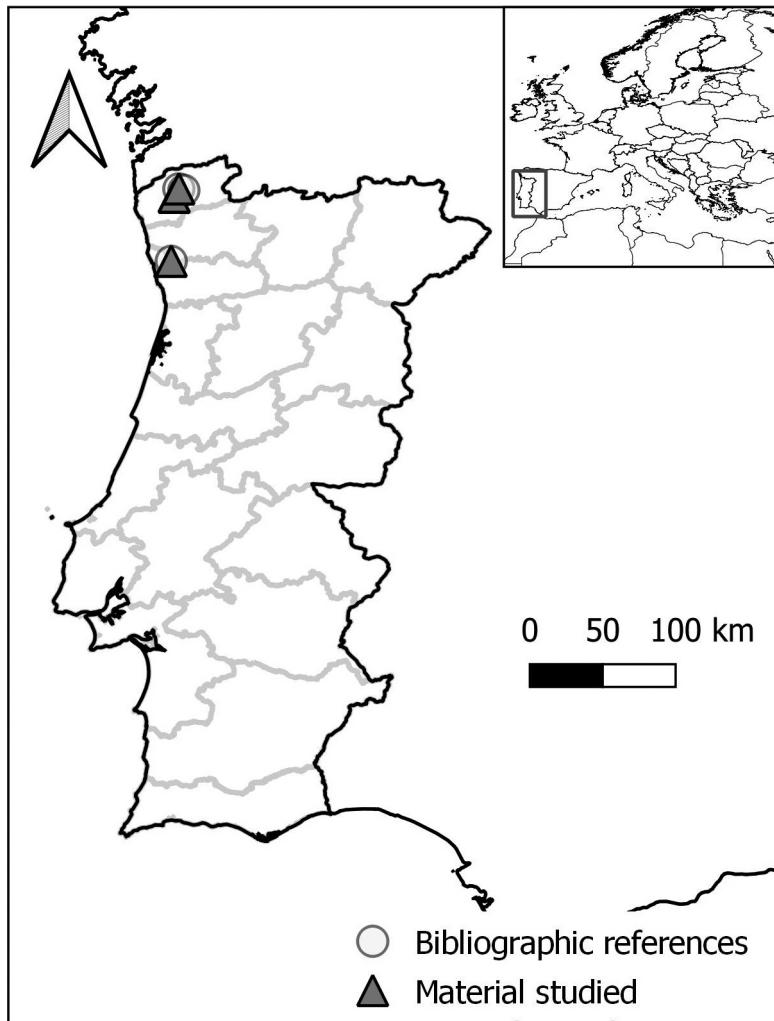
This species is characterized by a granulated dorsal integument (Fig. 2B), antennae with tubercles bearing scale-setae, male pereopod 7 sexually dimorphic, merus with a hook-like process that has a terminal spine in the middle of the sternal edge (Figs 2C, 3B, Table 1). The male pleopod I endopod has a large triangular distal lobe (Fig. 3C), and the exopod is triangular (Figs 2D, 3D) and without any notch at the base of the two very unequal ciliated rami, with the internal ramus nearly vestigial and the external one very long. The male pleopod II endopod (Figs 2E, 3E) has a distal segment 3 × the length of the basal segment, the distal segment broad for the first two-thirds and narrows abruptly to a pointed tip, and the exopod II is trapezoidal (Fig. 3F). This is an epigeic species (Table 1).

### Distribution

This Iberian Peninsula endemic species is known from Portugal at Fradelos in Braga (Cifuentes & Da Silva 2023a), and as ‘*Trichoniscoides* species A’ from Castanheira and Vascões in Viana do Castelo (Fig. 5), and from Avión (Orense) in Spain (Gregory *et al.* 2012).



**Fig. 4.** Distribution of *Trichoniscoides broteroi* Vandel, 1946 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.



**Fig. 5.** Distribution of *Trichoniscoides gallaecus* Cifuentes & Da Silva, 2023 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

*Trichoniscoides lusitanus* Vandel, 1946

Figs 6–8; Table 1

*Trichoniscoides lusitanus* Vandel, 1946: 165, figs 2–6.

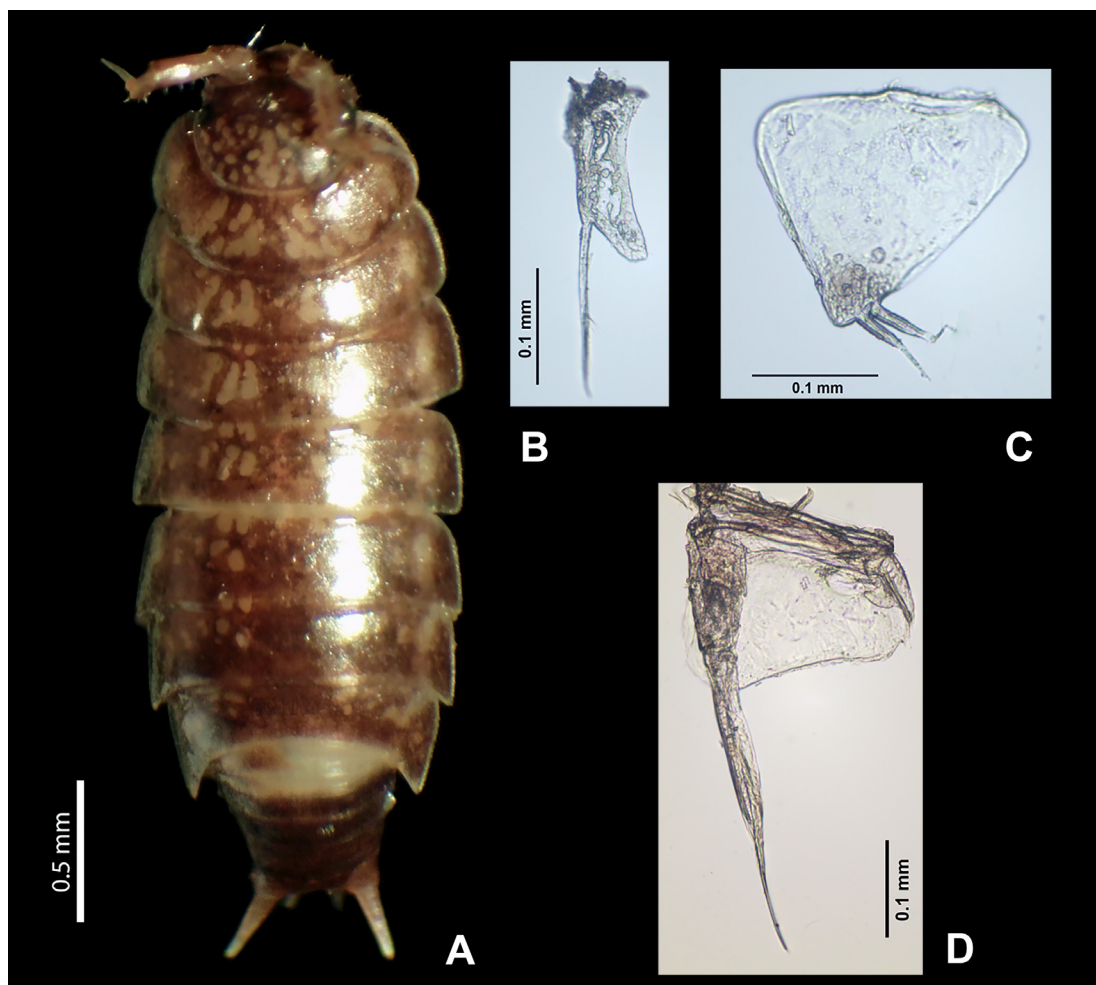
**Material examined**

PORTUGAL – **Leiria** • 1 ♀; A-da-Gorda; 39.3482° N, 9.1587° W; 13 Apr. 2022; L.P. Da Silva leg.; LPS262 • 1 ♀; Alvaiázere; 39.8264° N, 8.4135° W; 15 Mar. 2022; L.P. Da Silva leg.; LPS172. – **Porto** • 4 ♀♀; Macieira da Maia; 41.3416° N, 8.6872° W; 3 Jul. 2022; L.P. Da Silva leg.; LPS430 • 1 ♀; Macieira da Maia; 41.3408° N, 8.6926° W; 3 Jul. 2022; L.P. Da Silva leg., LPS432b • 1 ♀; Macieira da Maia; 41.3404° N, 8.6924° W; 3 Jul. 2022; L.P. Da Silva leg.; LPS433 • 3 ♀♀; Sabariz; 41.3492° N, 8.6780° W; 28 Jun. 2022; L.P. Da Silva leg.; LPS410b • 1 ♂; Sabariz; 41.3493° N, 8.6780° W; 28 Jun. 2022; L.P. Da Silva leg.; LPS413b • 3 ♀♀; same data as for preceding; LPS413c • 3 ♀♀; Sabariz; 41.3511° N, 8.6821° W; 28 Jun. 2022; L.P. Da Silva leg.; LPS415 • 1 ♀; Sabariz; 41.3510° N, 8.6818° W; 28 Jun. 2022; L.P. Da Silva leg.; LPS416 • 3 ♀♀; same data as for preceding; LPS417 • 2 immatures;

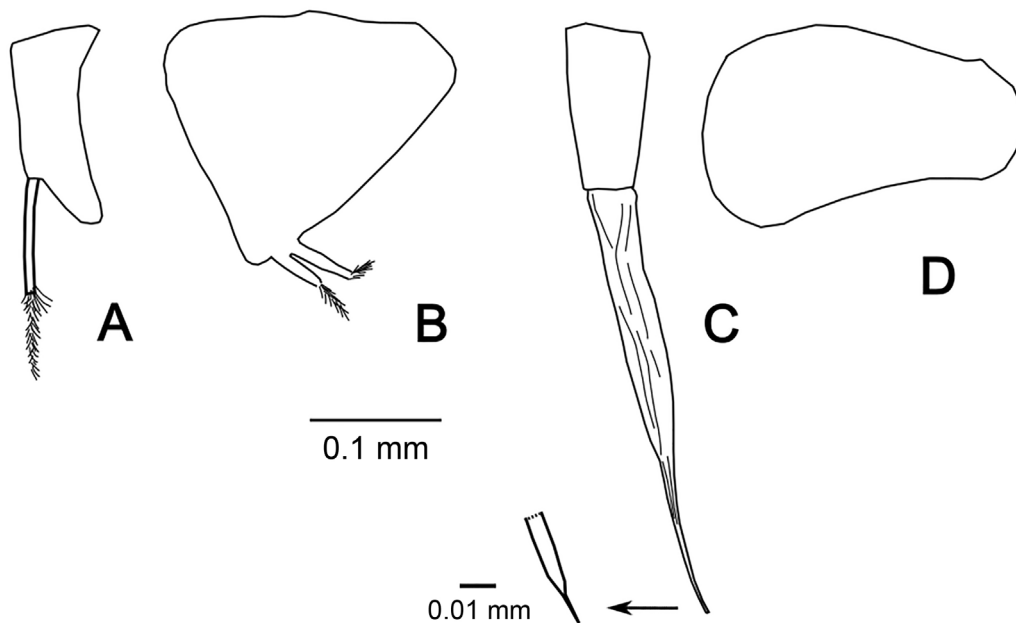
same data as for preceding; LPS419 • 1 ♂; Santo Estêvão de Barrosas; 41.3427° N, 8.2889° W; 1 Oct. 2022; L.P. Da Silva leg.; JC686 (ex. LPS464a) • 4 ♀♀; same data as for preceding; LPS464b. – **Viana do Castelo** • 1 ♀; Bário; 41.8401° N, 8.5846° W; 12 Nov. 2023; L.P. Da Silva leg.; LPS788 • 1 ♂; Castanheira; 41.9025° N, 8.5483° W; 12 Nov. 2023; L.P. Da Silva leg.; LPS791 • 1 ♂; same data as for preceding; LPS793a • 1 ♂; same data as for preceding; JC1054 (ex. LPS793c) • 2 ♀♀; same data as for preceding; LPS793b • 1 ♀; Gondarém; 41.9214° N, 8.7606° W; 11 Jun. 2022; L.P. Da Silva leg.; LPS364 • 3 ♀♀; same data as for preceding; LPS366 • 1 ♀; Gondarém; 41.9213° N, 8.7606° W; 11 Jun. 2022; L.P. Da Silva leg.; JC1052 (ex. LPS365a) • 3 ♀♀; same data as for preceding; LPS365b • 1 ♀; Trás-Âncora; 41.7962° N, 8.7382° W; 10 Jun. 2022; L.P. Da Silva leg.; LPS345 • 6 ♀♀; Trás-Âncora; 41.7960° N, 8.7383° W; 10 Jun. 2022; L.P. Da Silva leg.; LPS346 • 2 ♀♀; Trás-Âncora; 41.7961° N, 8.7384° W; 10 Jun. 2022; L.P. Da Silva leg.; LPS347.

### Remarks

This species is characterized by a smooth integument (Fig. 6A), antennae without tubercles bearing scale-setae, and pereopod 7 without sexual dimorphism (Table 1). The male pleopod I endopod has a long and triangular lobe (Figs 6B, 7A), and the exopod is triangular (Figs 6C, 7B), with almost no notch and two nearly equal ciliated rami, with the external ramus slightly thinner and longer than the internal.



**Fig. 6.** *Trichonisoides lusitanus* Vandel, 1946. **A.** ♀ (LPS430), habitus. **B–D.** ♂ (LPS413b). **B.** Endopod I. **C.** Exopod I. **D.** Endopod and exopod II.



**Fig. 7.** *Trichoniscoides lusitanus* Vandel, 1946. ♂ (LPS413b). **A.** Endopod I. **B.** Exopod I. **C.** Endopod II. **D.** Exopod II.

The male pleopod II endopod (Figs 6D, 7C) has a distal segment  $3.5 \times$  the length of the basal segment, ending in a thin tip covered by a hyaline membrane, and the exopod II is trapezoidal (Figs 6D, 7D). This is an epigean species (Table 1).

### Distribution

In Portugal, the species is recorded from the districts of Braga (Albergaria, Serra do Gerez), Porto (Fragas do Diabo) and Viana do Castelo (Carvoeiro, Castanheira, central Lindoso, Mantelães, Vascões) (Vandel 1946; Gregory *et al.* 2012). In Spain, it is known from the provinces of A Coruña (Santiago), Cantabria (Ruento, Saja), León (Río Duerna, Posada), Orense (Avión, Beade, Beiro, Lobios) and Pontevedra (Amorín, As Eiras, Cangas, Gondomar, Marín, Oia, Puerto de Moncelos) (Schmölzer 1955, 1971; Gregory *et al.* 2012; Cifuentes 2019b). It is recorded for the first time in the district of Leiria, which is the southernmost record of this species in Portugal (Fig. 8).

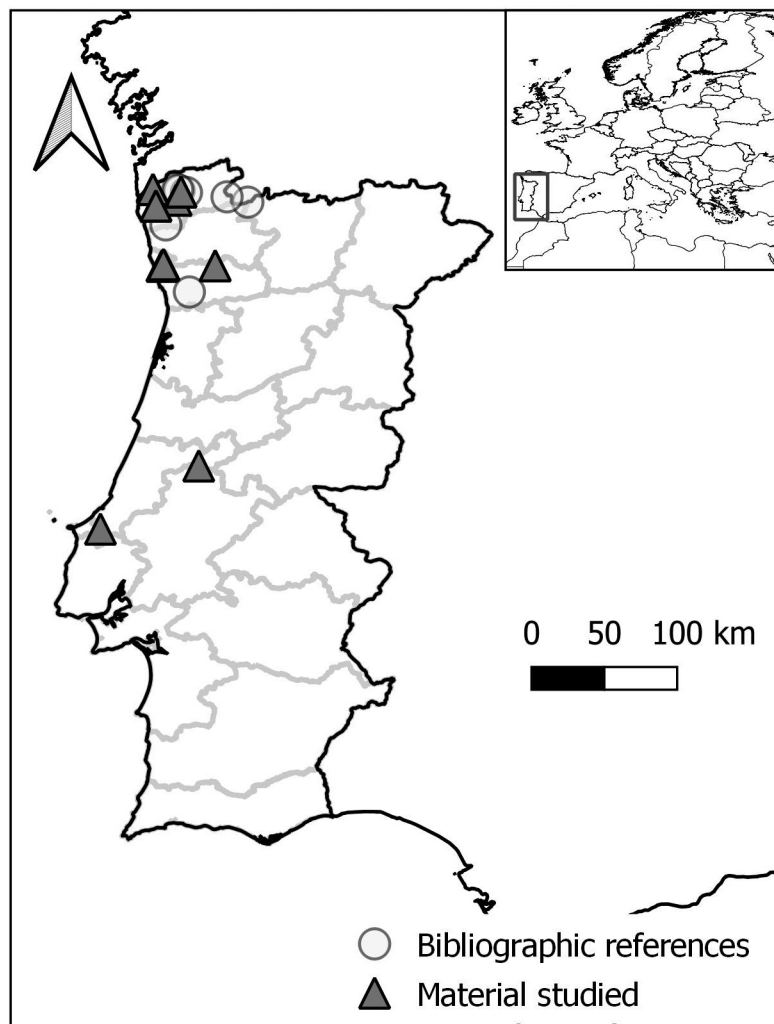
### *Trichoniscoides machadoi* Vandel, 1946

Figs 9–11; Table 1

*Trichoniscoides machadoi* Vandel, 1946: 168, figs 8–12.

### Material examined

PORTUGAL – **Aveiro** • 1 ♀; Grada; 40.2995° N, 8.4644° W; 5 Mar. 2022; L.P. Da Silva leg.; LPS121 • 1 ♂; Mealhada; 40.3805° N, 8.4573° W; 20 Feb. 2022; L.P. Da Silva leg.; LPS102. – **Coimbra** • 1 ♂; Algar da Dona Justa; 40.0361° N, 8.5077° W; 29 Dec. 2023; L.P. Da Silva leg.; LPS871a • 4 ♀♀; same data as for preceding; LPS871b • 1 ♂; same data as for preceding; LPS871c • 1 ♀; Gruta d’el Rey, Portunhos; 40.2943° N, 8.5470° W; 21 Jul. 2024; L.P. Da Silva leg.; LPS932 • 1 ♂; same data as for preceding; LPS933 • 1 ♂; same data as for preceding; LPS934 • 2 ♀♀; Porto de Carros; 40.3321° N, 8.5116° W; 21 May 2022; L.P. Da Silva leg.; LPS315 • 1 ♂; Porto de Carros; 40.3320° N, 8.5116° W;

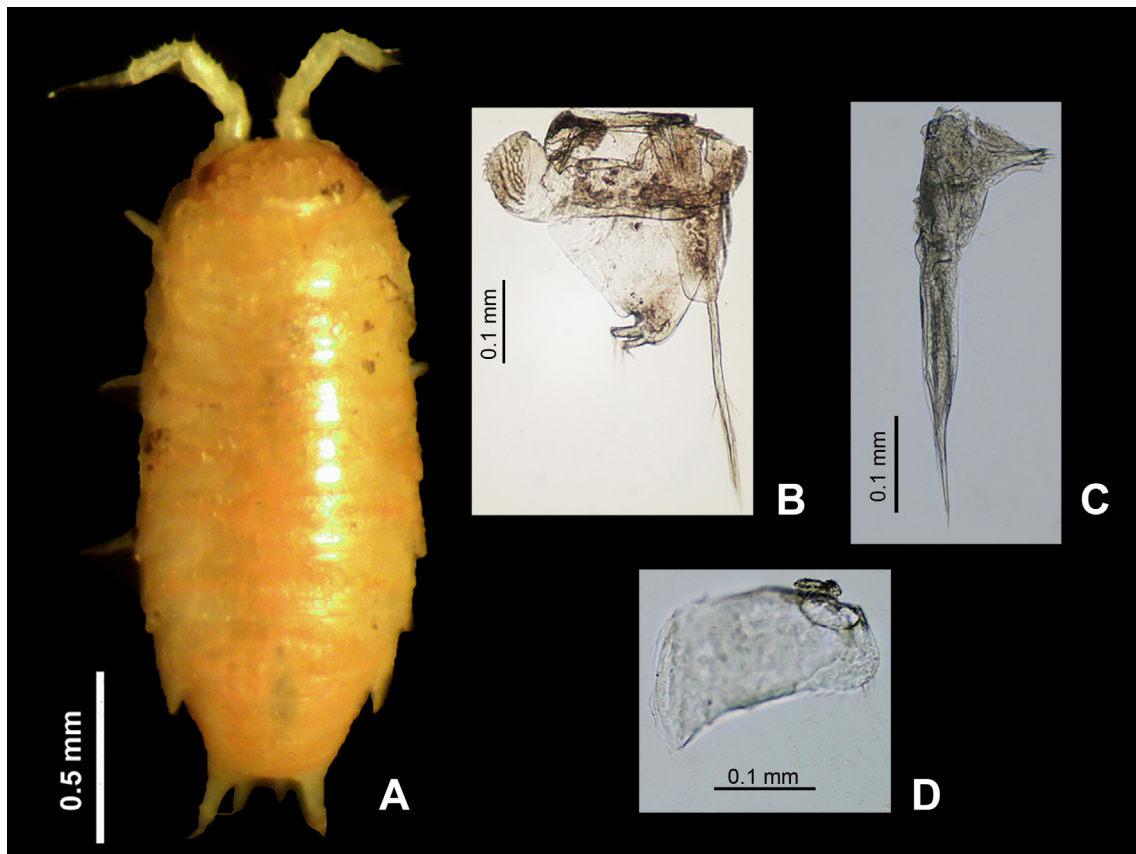


**Fig. 8.** Distribution of *Trichonisoides lusitanus* Vandel, 1946 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

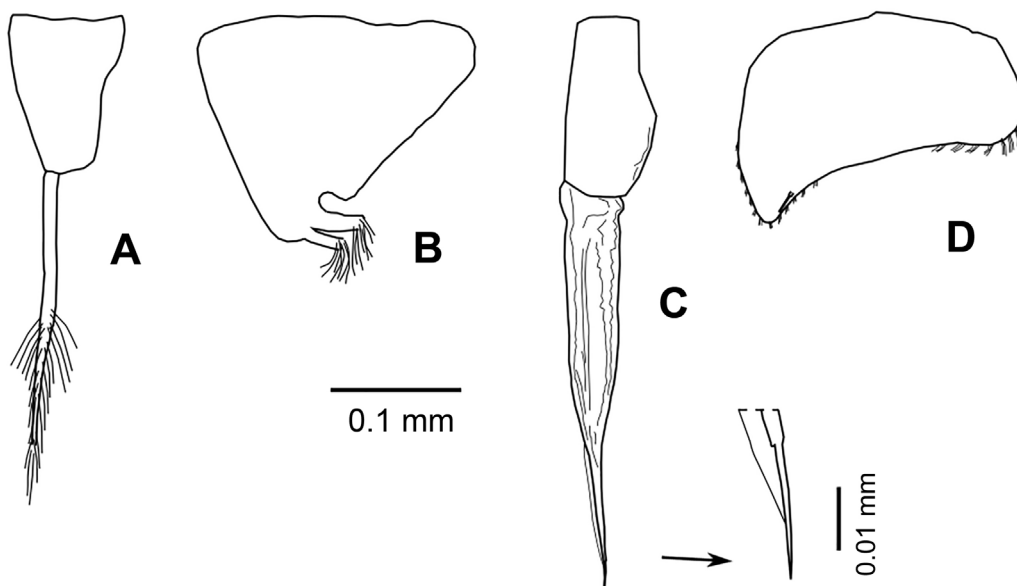
21 May 2022; L.P. Da Silva leg.; JC654 (ex. LPS317) • 2 ♂♂, Serra da Boa Viagem; 40.1960° N, 8.9043° W; 26 Dec. 2022; L.P. Da Silva leg.; JC 1055 (ex. LPS633a) • 1 ♀; same data as for preceding; LPS633b • 5 ♂♂, same data as for preceding; LPS633c • 1 ♂; Vale Soeiro; 40.3130° N, 8.4023° W; 23 Dec. 2022; L.P. Da Silva leg.; LPS621. – **Leiria** • 1 ♀; A-da-Gorda; 39.3483° N, 9.1587° W; 31 Dec. 2022; L.P. Da Silva leg.; LPS728 • 1 ♂; A-da-Gorda, 39.3482° N, 9.1586° W; 31 Dec. 2022; L.P. Da Silva leg.; LPS729a • 1 ♀; same data as for preceding; LPS729b • 1 ♂; A-da-Gorda; 39.3482° N, 9.1588° W; 31 Dec. 2022; L.P. Da Silva leg.; LPS730a • 1 ♀; same data as for preceding; LPS730b • 1 ♀; A-da-Gorda; 39.3483° N, 9.1588° W; 31 Dec. 2022; L.P. Da Silva leg.; LPS731 • 1 ♂; A-da-Gorda; 39.3483° N, 9.1587° W; 31 Dec. 2022; L.P. Da Silva leg.; LPS732 • 1 ♀; A-da-Gorda; 39.3485° N, 9.1587° W; 31 Dec. 2022; L.P. Da Silva leg.; LPS733 • 1 ♂; Alvaiázere; 39.8263° N, 8.4133° W; 9 Nov. 2023; L.P. Da Silva leg.; LPS781a • 1 ♀; same data as for preceding; JC1057 (ex. LPS781b) • 2 ♀♀; same data as for preceding; LPS781c.

### Remarks

This species is characterized by a smooth integument (Fig. 9A), antennae with tubercles bearing scale-setae, and pereopod 7 without sexual dimorphism (Table 1). The male pleopod I endopod (Figs 9B, 10A) lacks a distal lobe, with the posterior edge truncated or gently curved, and the exopod I is triangular



**Fig. 9.** *Trichoniscoides machadoi* Vandel, 1946, ♂ (LPS317). A. Habitus. B. Endopod and exopod I. C. Endopod II. D. Exopod II.



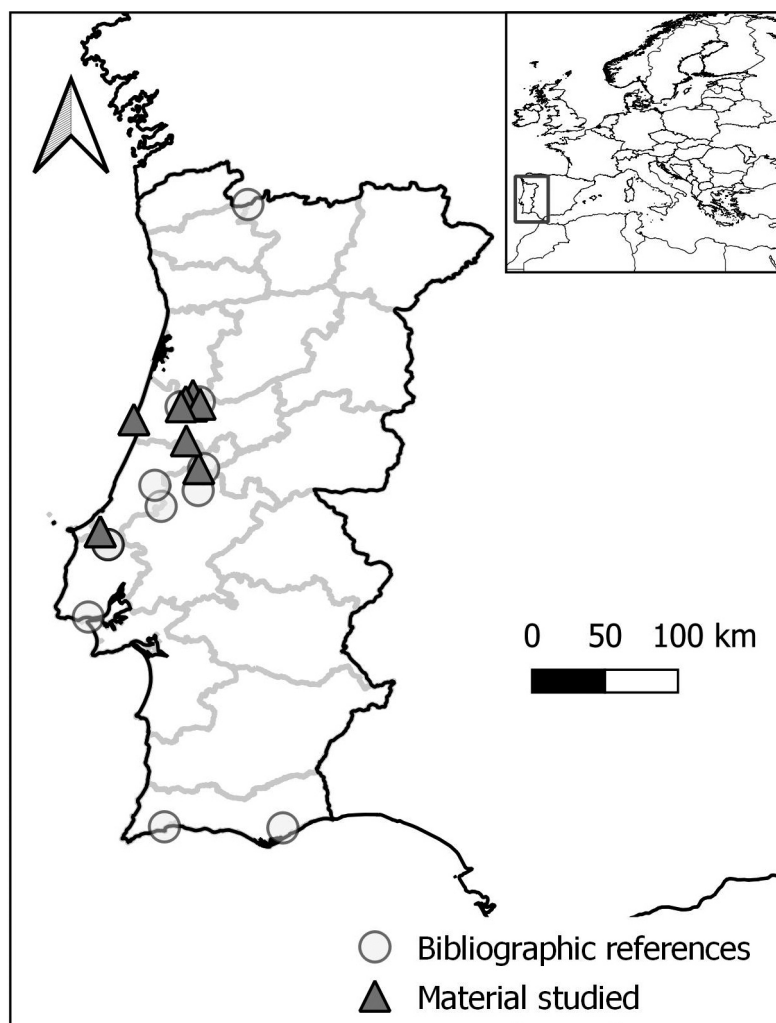
**Fig. 10.** *Trichoniscoides machadoi* Vandel, 1946, ♂ (LPS317). A. Endopod I. B. Exopod I. C. Endopod II. D. Exopod II.

(Figs 9B, 10B), with a rounded external edge and a pronounced notch at the base of the two subequal ciliated rami, with the internal ramus slightly shorter and equally or slightly thinner. The male pleopod II endopod (Figs 9C, 10C) has a distal segment that is  $4 \times$  the length of the basal segment and narrows to a very thin tip covered by a hyaline membrane, and the exopod II is trapezoidal, with a pronounced posterior internal tip (Figs 9D, 10D). Epigeal species, but facultative in some caves (troglomorphic).

Vandel (1946) noted that individuals preserved in alcohol were completely white and lacked an ocular apparatus. However, the specimens we collected are orange to reddish, except for some found inside caves, which are predominantly white, with a reddish ocellus. They lose their pigmentation when preserved in alcohol.

### Distribution

The species is only known in Portugal and has been recorded from the districts of Algarve (Algarve Massif, Gruta da Senhora; Lagos, Gruta do Algar), Aveiro (Pampilhosa do Botão), Braga (Terras de Bouro), Coimbra (Cantanhede, Portuhos, Gruta d'el Rey), Leiria (Alvaiázere, Algar de Serra; Pôrto de Mós; Sicó Massif, Gruta Abrigo Tomar I; Soutocico, Algar de Rocha) and Lisboa (Cadaval, Algarve da



**Fig. 11.** Distribution of *Trichoniscoides machadoi* Vandel, 1946 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

Terra da Bôlha, Algarve nº1 da Senhora das Neves, Senhora das Neves, Montejunto; Buracos Mineiros; Cruz Quebrada) by Vandel (1946) and Reboleira *et al.* (2015; Fig. 11).

*Trichoniscoides meridionalis* Vandel, 1946

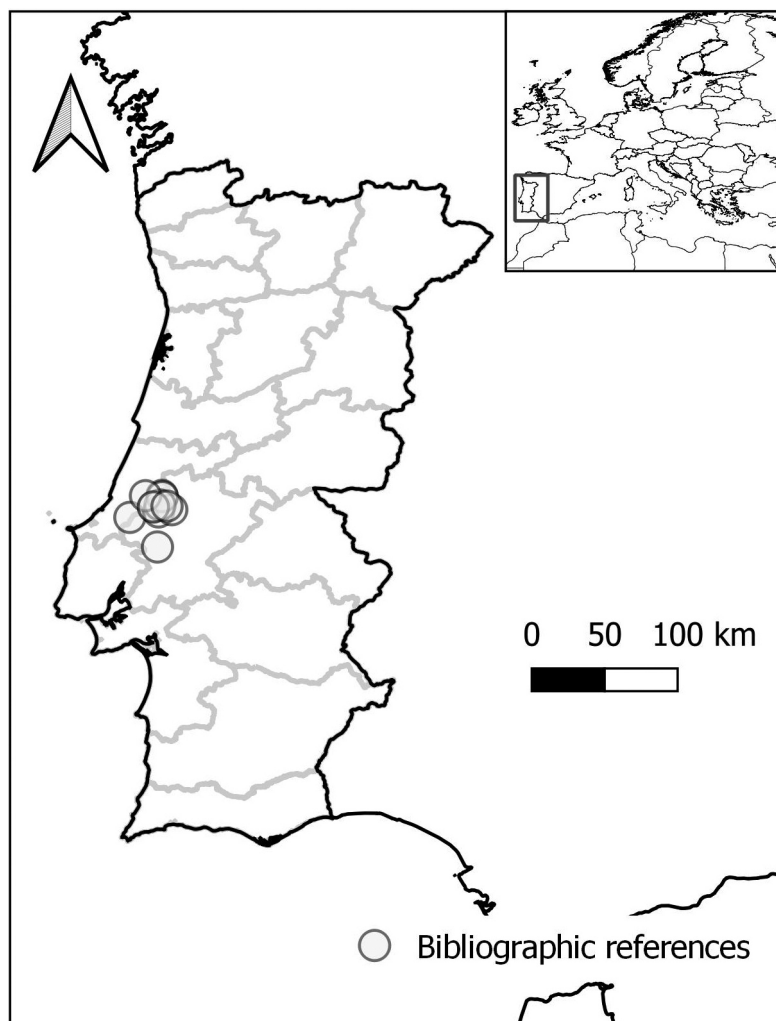
Fig. 12; Table 1

*Trichoniscoides pseudomixtus meridionalis* Vandel, 1946: 175, figs 16–19.

*Trichoniscoides meridionalis* – Vandel 1952: 266, figs 2, 13.

**Remarks**

This species is characterized by an integument with very weak granulations, antennae with tubercles bearing scale-setae, and pereopod 7 without sexual dimorphism (Table 1). The male pleopod I endopod lacks a distal lobe, and the exopod is rectangular, without a notch at the base of the two unequal ciliated rami (internal one thicker). The male pleopod II endopod has a distal segment  $3.6 \times$  the length of the basal segment, and it ends in a long, slender tip. This is a troglobiotic species (Table 1).



**Fig. 12.** Distribution of *Trichoniscoides meridionalis* Vandel, 1946 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

### Distribution

This Portuguese endemic species has been recorded from the districts of Leiria (Pôrto de Mós, Algar do Burro, Algar do Ladoeiro, Algar do Vale da Pena, Algar do Zé de Braga, Gruta do Almonda, Gruta do Papagaio, Gruta dos Moinhos Velhos, Lapa dos Ladoeiros, Lapa de Chá de Cima) and Santarém (Minde, Lapa da Ovelha and Gruta das Alcobertas) by Vandel (1946, 1952) and Reboleira *et al.* (2015; Fig. 12).

### *Trichoniscoides ouremensis* Vandel, 1946

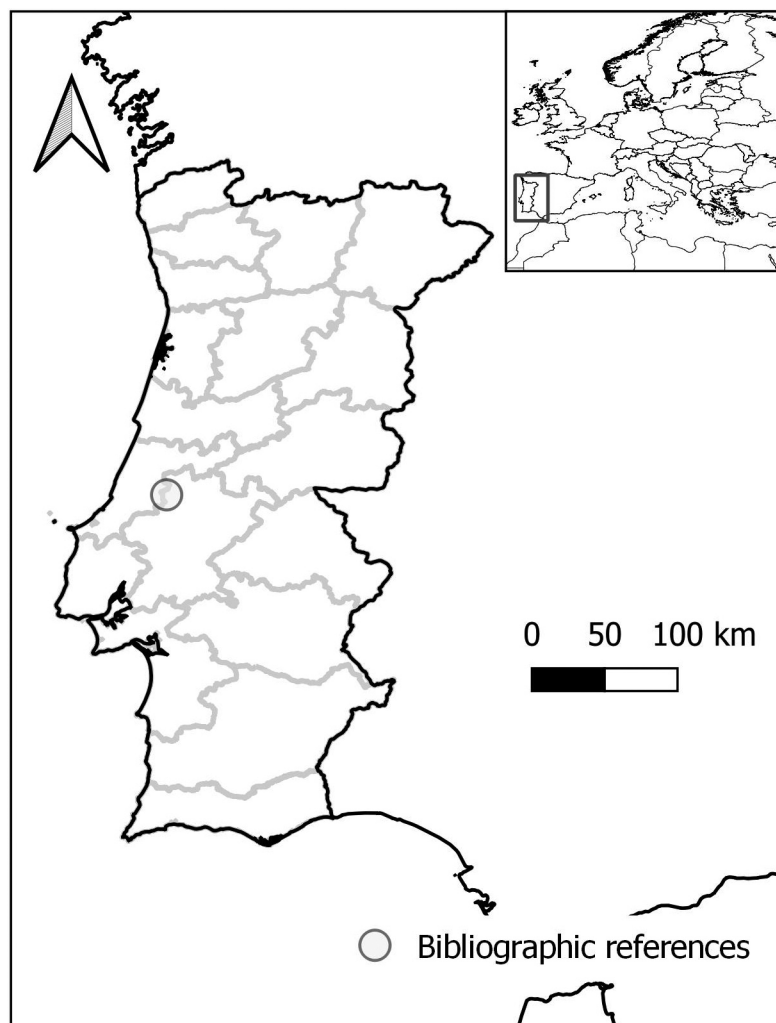
Fig. 13; Table 1

*Trichoniscoides pseudomixtus ouremensis* Vandel, 1946: 177, figs 20–21.

*Trichoniscoides ouremensis* – Vandel 1952: 263, figs 2, 10.

### Remarks

This species is characterized by an integument with weak granulations, antennae with tubercles bearing scale-setae, and pereopod 7 without sexual dimorphism (Table 1). The male pleopod I endopod lacks a



**Fig. 13.** Distribution of *Trichoniscoides ouremensis* Vandel, 1946 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

distal lobe, and the exopod is triangular with a notch at the base of the two equal ciliated rami. The male pleopod II endopod has a distal segment  $3 \times$  the length of the basal segment, ending in a long, slender and slightly curved tip, the exopod II is trapezoidal. This is a troglolithic species (Table 1).

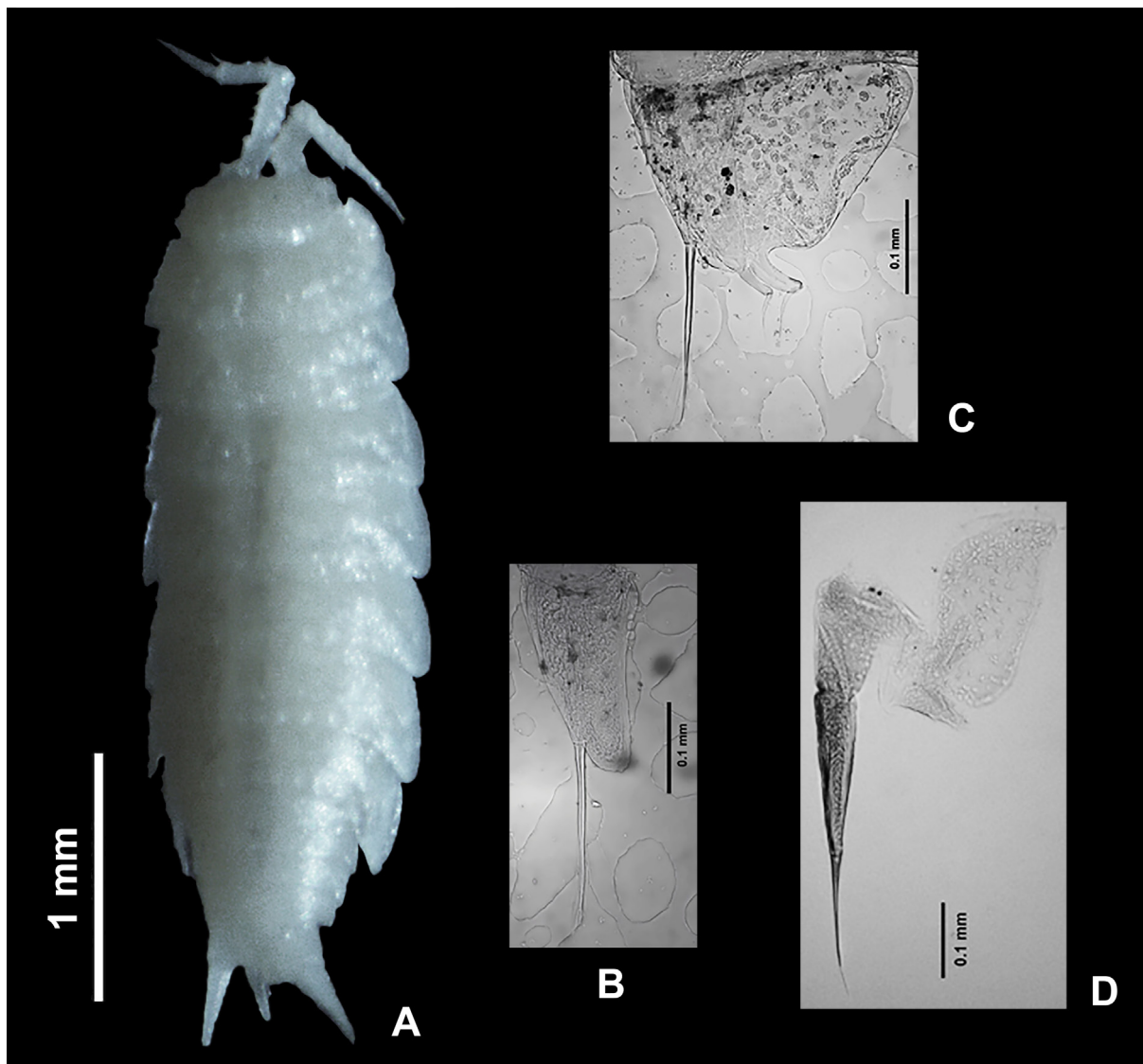
#### Distribution

This Portugal endemic species is only known from its type locality, Lapa Salgada in Fátima, Santarém district (Vandel, 1946; Fig. 13).

#### *Trichoniscoides serrai* Cruz, 1993

Figs 14–16; Table 1

*Trichoniscoides serrai* Cruz, 1993: 18, figs 2a–h.



**Fig. 14.** *Trichoniscoides serrai* Cruz, 1993. **A.** Paratype, ♂ (CRBA-86827), habitus. **B.** Holotype, ♂ (CRBA-86825), endopod I. **C–D.** Paratype, ♂ (CRBA-86827). **C.** Exopod I. **D.** Endopod and exopod II.

### Type material examined

#### Holotype

PORTUGAL – **Bragança** • ♂; Miranda do Douro, Grutas de Santo Adrião; 24 Feb. 1987; Antoni Serra leg.; Antonio Cruz col.; CRBA-86825.

#### Allotype

PORTUGAL – **Bragança** • ♀; same data as for holotype; Antonio Cruz col.; CRBA-86824.

#### Paratypes

PORTUGAL – **Bragança** • 6 ♀♀, same data as for holotype; Antonio Cruz col.; CRBA-86826 • 2 ♂♂; same data as for holotype; Antonio Cruz col.; CRBA-86827.

### Other material examined

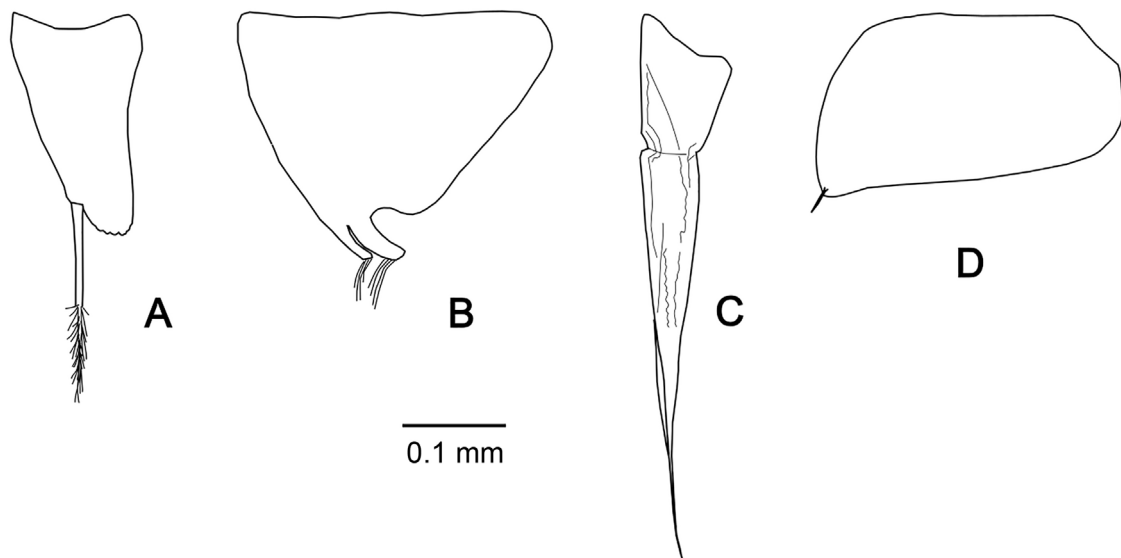
PORTUGAL – **Bragança** • 1 ♀; Miranda do Douro, Grutas de Santo Adrião; 41.5298° N, 6.4734° W; 29 Feb. 2024; L.P. Da Silva leg.; LPS879.

### Remarks

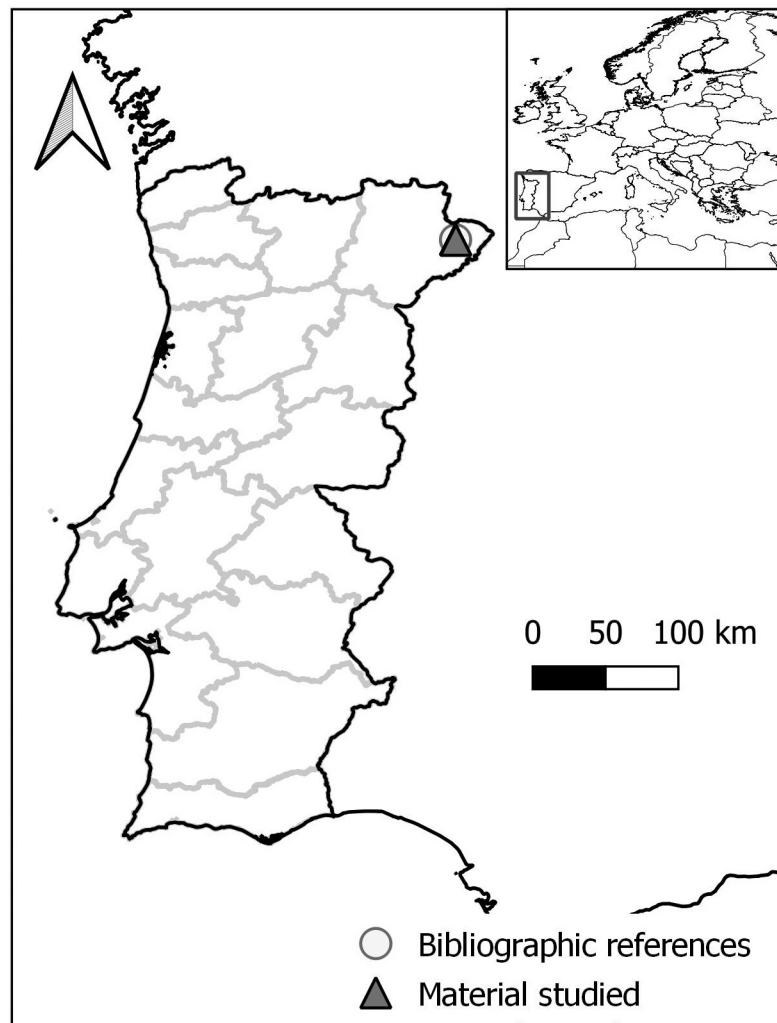
This species is characterized by a granulated dorsal integument (Fig. 14A), antennae with tubercles bearing scale-setae, and pereopod 7 without sexual dimorphism (Table 1). The male pleopod I endopod (Figs 14B–C, 15A) has a short, wide and rounded distal lobe with a sinuous edge, and the exopod is triangular (Figs 14C, 15B), with a notch at the base of the two unequal ciliated rami, with the internal ramus thinner than the external. The male pleopod II endopod (Figs 14D, 15C) has a distal segment 1.8× the length of the basal segment, ending in a long, slender tip with a chitinous shaft accompanied by a hyaline membrane, and the exopod II is trapezoidal (Figs 14D, 15D). This is a troglobiotic species (Table 1).

### Distribution

This Iberian Peninsula endemic species is known from two caves: Gruta de Santo Adrião in Miranda do Douro (Bragança, Portugal) (Cruz 1993; Fig. 16) and Cueva de Valporquero in Vegacervera (León, Spain; Cifuentes, 2019a), which are 166 km apart.



**Fig. 15.** *Trichonisoides serrai* Cruz, 1993. **A.** Holotype, ♂ (CRBA 8682), endopod I. **B–D.** Paratype, ♂ (CRBA 86827). **B.** Exopod I. **C.** Endopod II. **D.** Exopod II.



**Fig. 16.** Distribution of *Trichoniscoides serrai* Cruz, 1993 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

*Trichoniscoides sicoensis* Reboleira & Taiti, 2015

Figs 17–19; Table 1

*Trichoniscoides sicoensis* Reboleira & Taiti, 2015: 13, figs 7–9.

**Material examined**

PORTUGAL – **Leiria** • 1 ♂; Algar da Lagoa; 39.9279° N, 8.5247° W; 29 Dec. 2023; L.P. Da Silva leg.; LPS868 • 1 ♂; same data as for preceding; LPS869a • 1 ♂; same data as for preceding; JC1124 (ex. LPS870a).

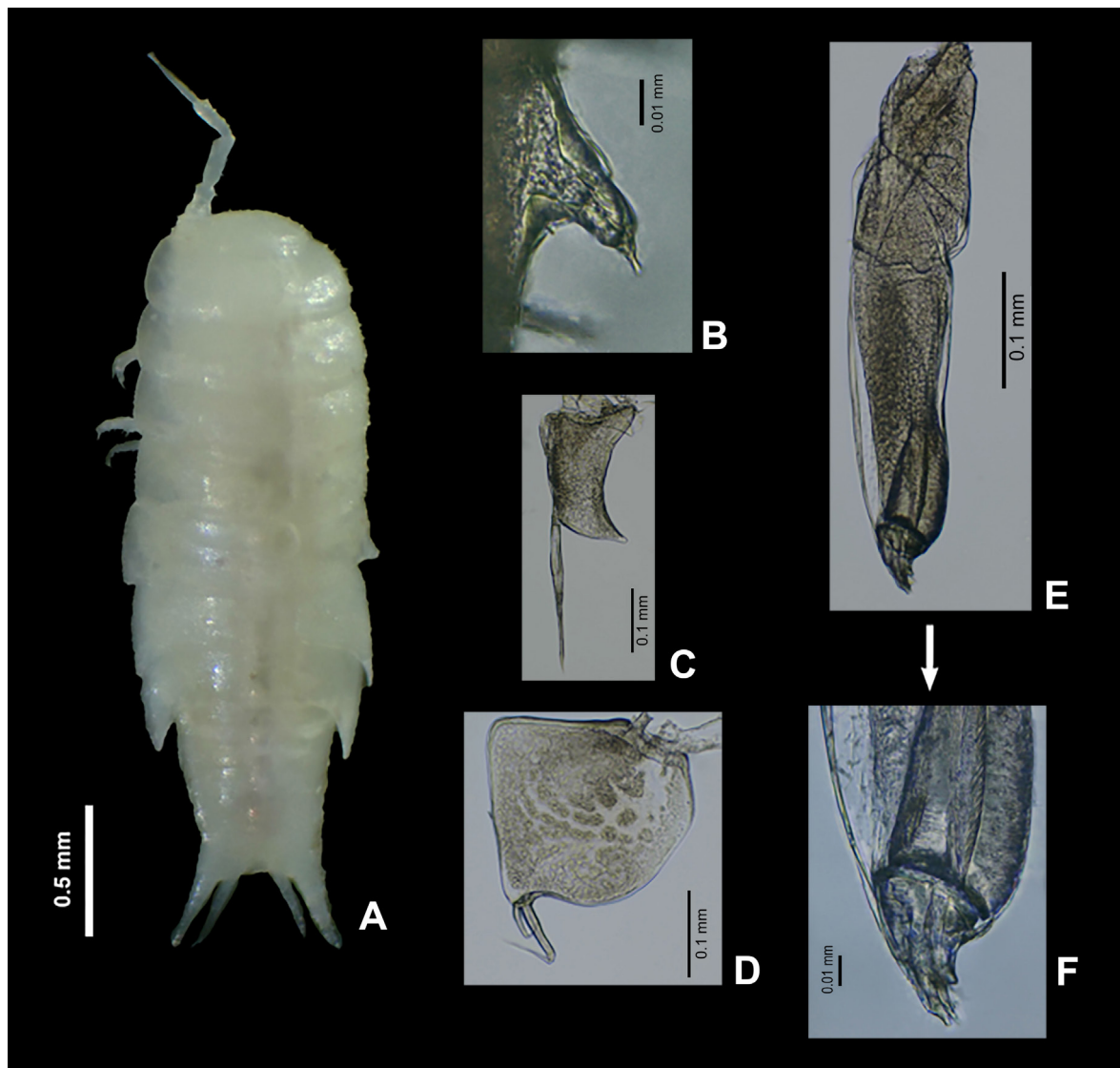
**Remarks**

This species is characterized by a smooth integument (Fig. 17A), antennae with tubercles bearing scale-setae, and male pereopod 7 with sexual dimorphism (Table 1), merus bears a short process with a terminal spine in the middle of the sternal edge (Figs 17B, 18A). The male pleopod I endopod (Figs 17C, 18B) has a short triangular distal lobe, and the exopod (Figs 17D, 18C) is quadrangular with a rounded outer

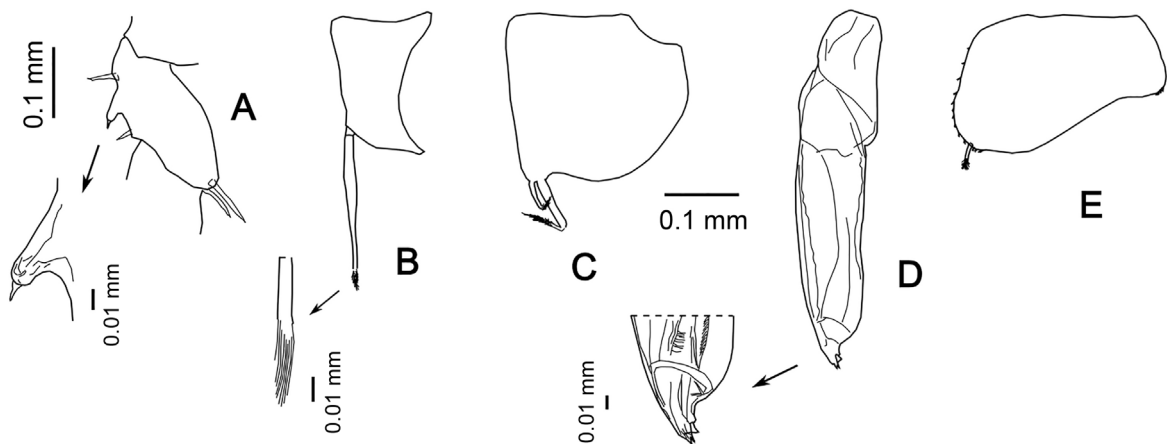
edge and lacks a notch at the base of the two unequal ciliated rami, with the internal ramus shorter and thinner than the external. The male pleopod II endopod (Figs 17E–F, 18D) has a distal segment 1.5 × the length of the basal segment, terminating in a bifurcated and complex tip with two terminal spines, and the exopod (Fig. 18E) is trapezoidal, with a broadly rounded posterior internal tip. This is a troglobiotic species (Table 1).

### Distribution

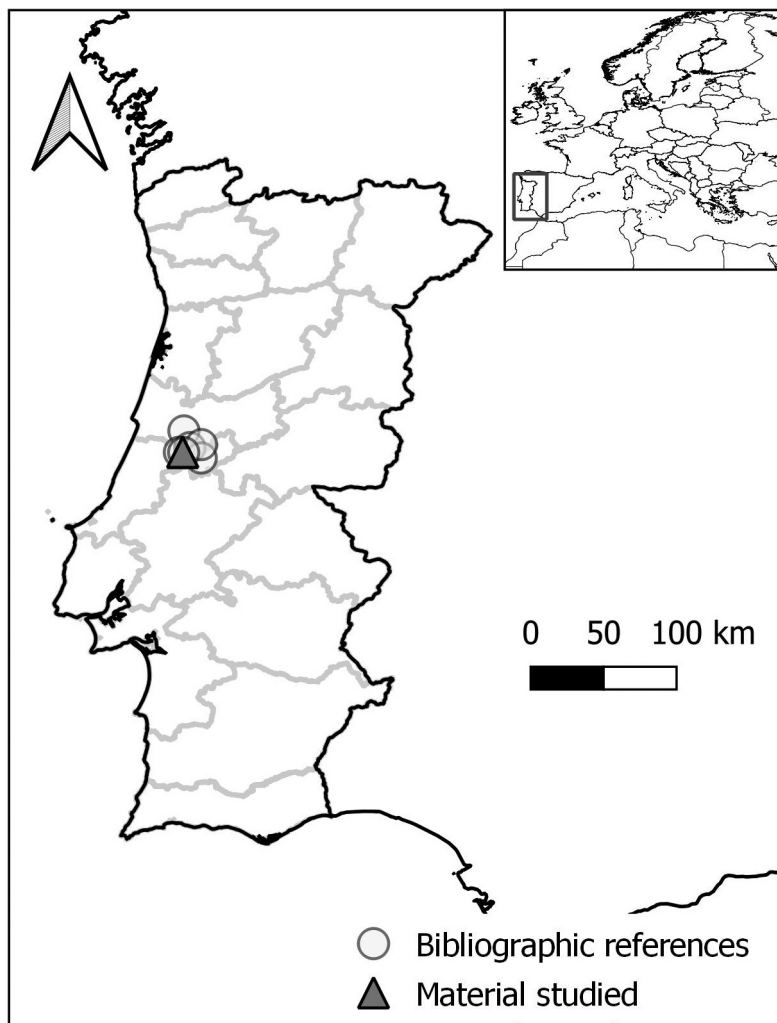
This Portugal endemic is known from the caves Gruta da Arrifana, Gruta da Senhora da Estrela, Gruta de São Simão, Gruta do Algarinho, Gruta do Soprador do Carvalho and Gruta da Cerâmica in Sicó Massif, and the district of Leiria (Reboleira *et al.* 2015; Fig. 19).



**Fig. 17.** *Trichoniscoides sicoensis* Reboleira & Taiti, 2015, ♂ (LPS868). A. Habitus. B. Pereopod 7 merus. C. Endopod I. D. Exopod I. E. Endopod II. F. Tip of endopod II.



**Fig. 18.** *Trichoniscoides sicoensis* Reboleira & Taiti, 2015, ♂ (LPS868). **A.** Pereopod 7 merus. **B.** Endopod I. **C.** Exopod I. **D.** Endopod II. **E.** Exopod II.



**Fig. 19.** Distribution of *Trichoniscoides sicoensis* Reboleira & Taiti, 2015 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

*Trichoniscoides subterraneus* Vandel, 1946

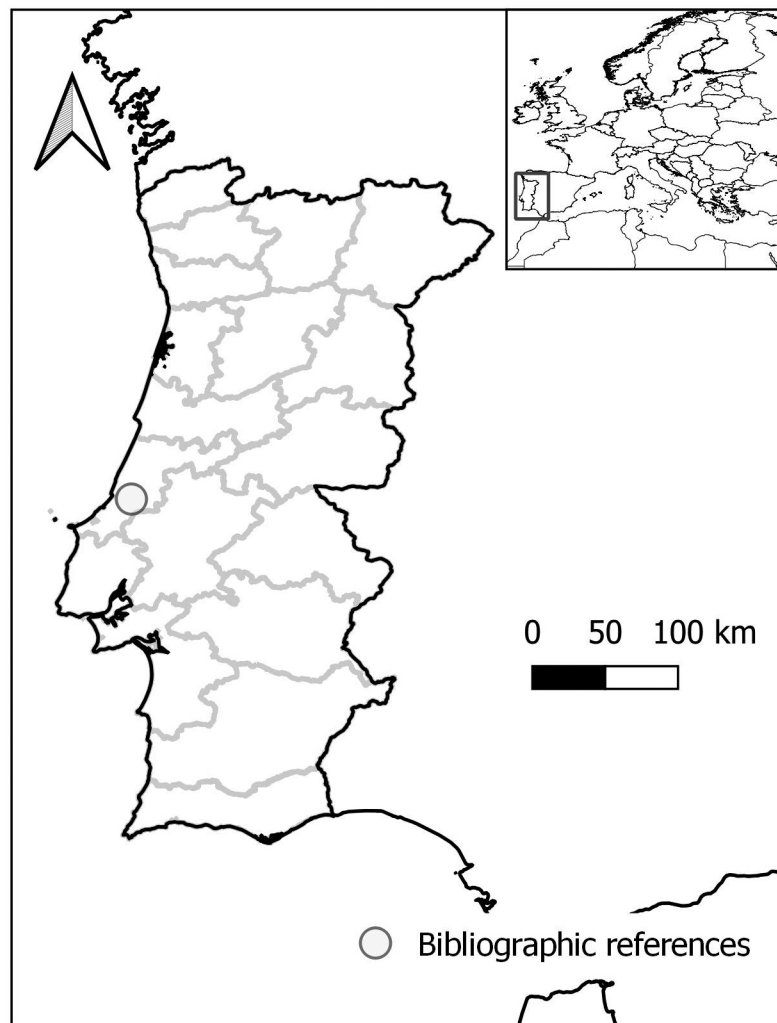
Fig. 20; Table 1

*Trichoniscoides machadoi subterraneus* Vandel, 1946: 173, figs 13–15.

*Trichoniscoides subterraneus* – Vandel 1952: 264, figs 2, 11.

**Remarks**

This species is characterized by a smooth integument, antennae with tubercles bearing scale-setae, and the male pereopod 7 sexually dimorphic, with a short and thick merus, carpus and propodus (Table 1). The male pleopod I endopod has a very long and triangular distal lobe with a rounded tip, and the exopod is triangular with rounded sides and a strong notch at the base of the two unequal rami stalks, with the internal one much smaller than the external. The male pleopod II endopod has a distal segment  $3.6 \times$  the length of the basal segment, with a very thin, long and sharp tip. This is a troglolithic species (Table 1).



**Fig. 20.** Distribution of *Trichoniscoides subterraneus* Vandel, 1946 in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

### Distribution

This Portuguese endemic is only known from its type locality, Gruta Alta do Cabeco dos Mosqueiros, in Aljubarrota, Leiria district (Vandel 1946; Fig. 20).

### *Trichoniscoides castanheirensis* sp. nov.

[urn:lsid:zoobank.org:act:E34DAC4B-4165-445B-B5E8-F494935FB8A0](https://zoobank.org/urn:lsid:zoobank.org:act:E34DAC4B-4165-445B-B5E8-F494935FB8A0)

Figs 21–24; Table 1

*Trichoniscoides* species C, Gregory *et al.* 2012: 14, fig. 4.

### Diagnosis

Coloration orange. Ocular apparatus with large black ocellus. Granular integument. Antenna with tubercles bearing scale-setae and three-segmented flagellum. In males, pereopods 1 and 2 with hyaline scales on merus and carpus, pereopod 3 with scales only on merus, pereopod 7 with hook-like process on merus. Male pleopod I endopod with triangular distal lobe; exopod trapezoidal with two unequal ciliated rami (internal smaller). Male pleopod II endopod broad, with hyaline membrane, ending in short, wide, triangular tip; exopod rectangular.

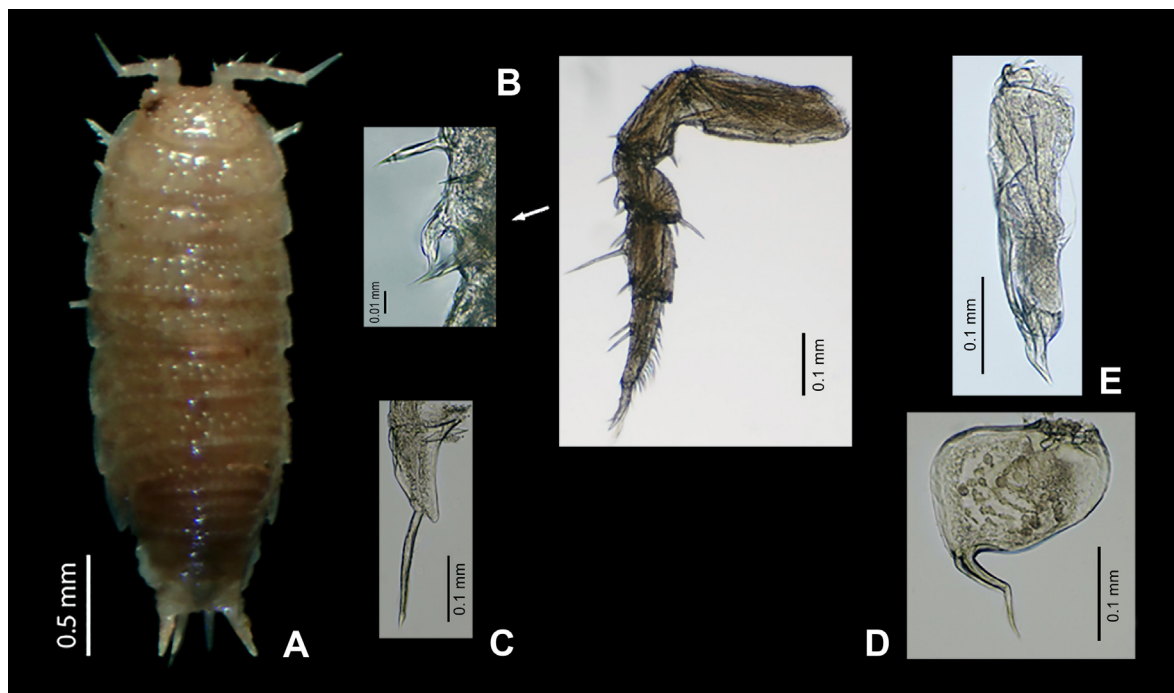
### Etymology

The specific name refers to Castanheira, the locality where the specimens that prompted the description of the new species were found.

### Type material

#### Holotype

PORTUGAL – Viana do Castelo • ♂; Castanheira; 41.9136° N, 8.5620° W; 12 Nov. 2023; L.P. Da Silva leg.; MNCN 20.04/21006 (ex. LPS792a).



**Fig. 21.** *Trichoniscoides castanheirensis* sp. nov. A. ♀ (LPS792b), habitus. B–E. ♂ (LPS 792a). B. Pereopod 7. C. Endopod I. D. Exopod I. E. Endopod II.

### Paratypes

PORTUGAL – Viana do Castelo • 1 ♀; same data as for holotype; MNCN 20.04/21007 (ex. LPS792b) • 1 ♀; same data as for holotype; LPS792c • 1 ♂, same data as for holotype; JC1048 (ex. LPS794).

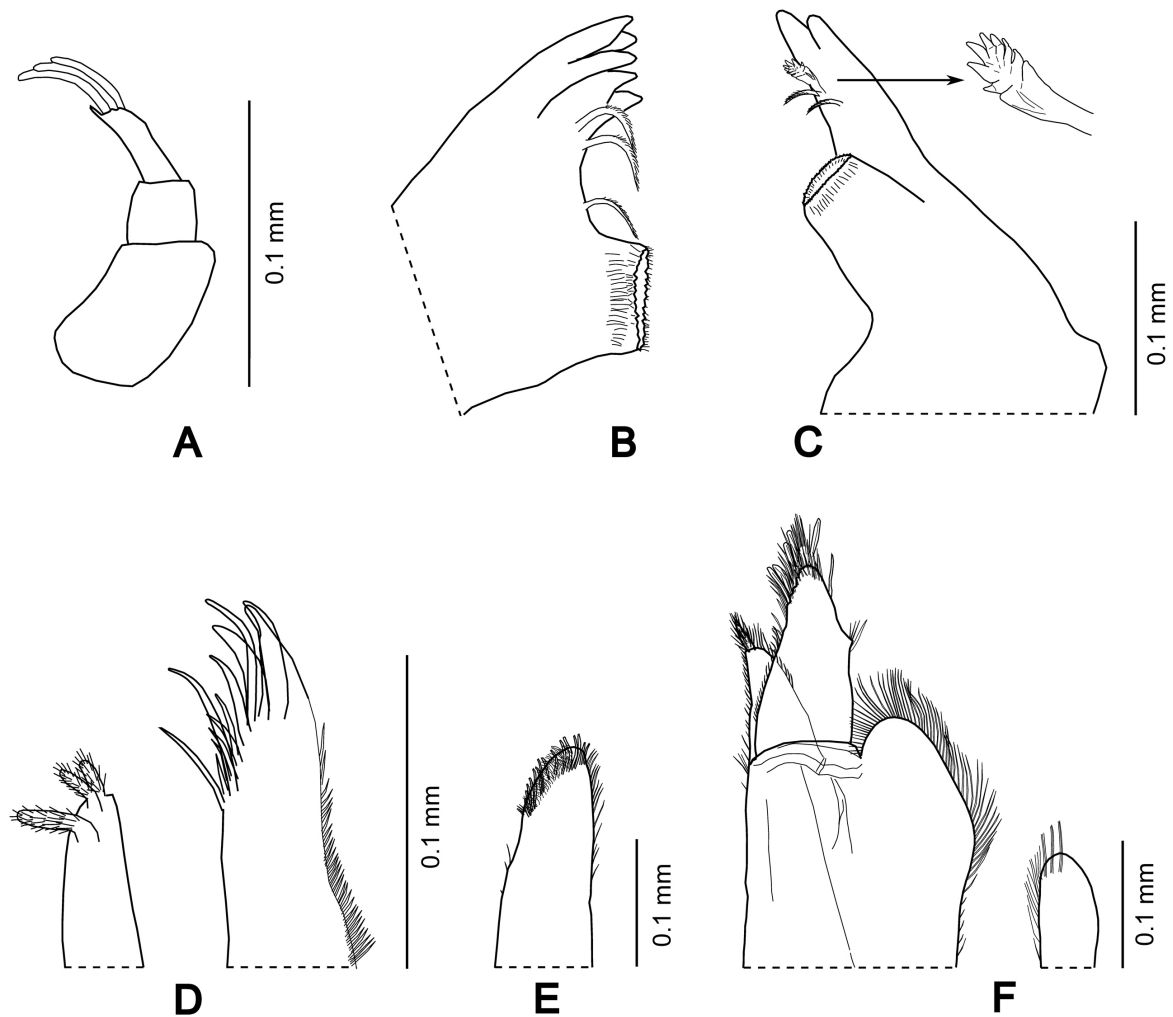
### Description

MEASUREMENTS. Maximum observed length: female 3 mm, male 2 mm.

COLORATION. Orange, with marked muscle insertions and one large black ocellus (Fig. 21A).

INTEGUMENTARY CHARACTERS. Integument with granulation (Fig. 21A), five rows on cephalon, four on pereonite I, three on pereonite II, two on pereonite III to VII. Additional row along posterior margin of each pereonite. In pleon, one row along posterior margin of first three pleonites.

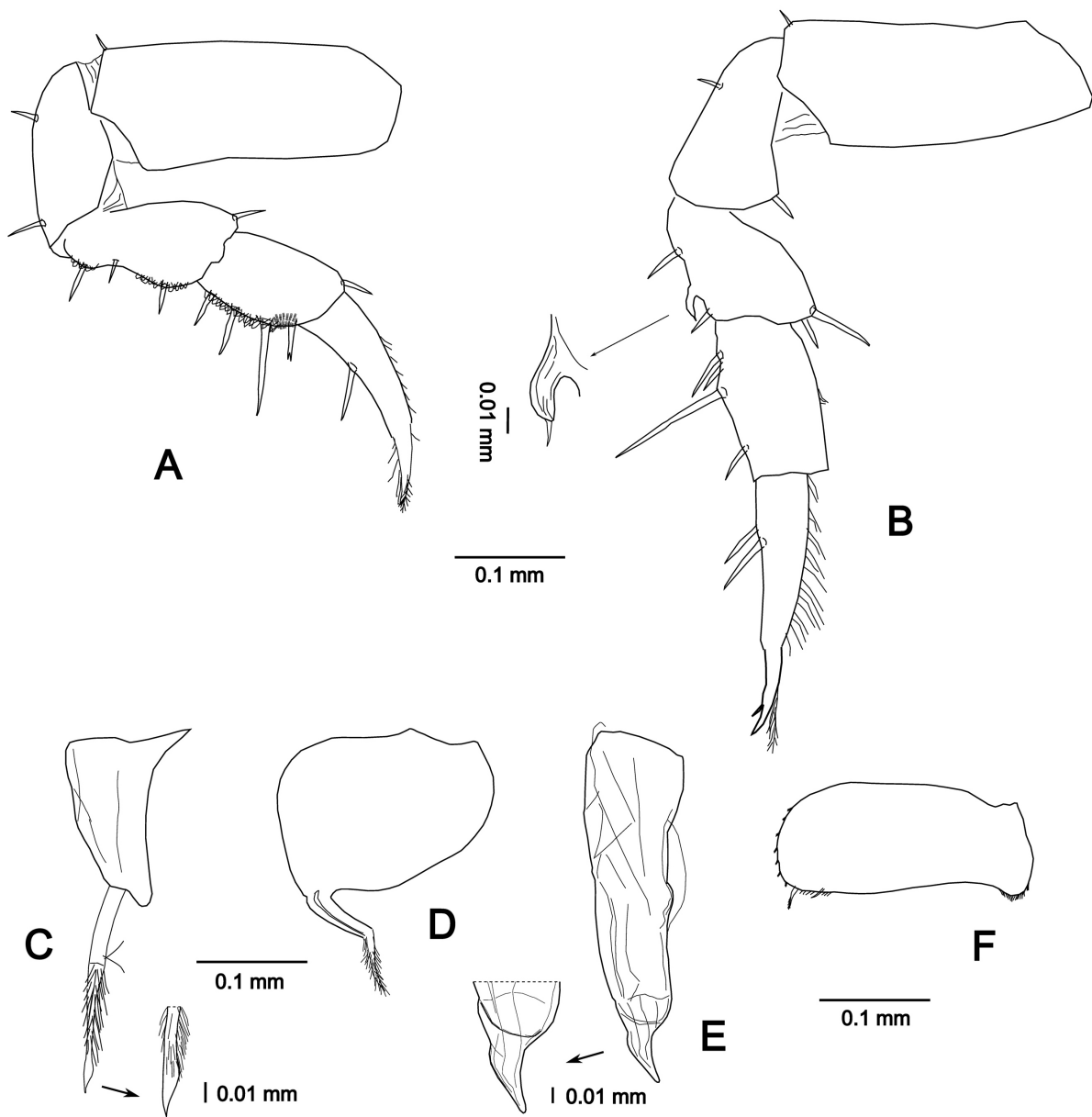
APPENDAGES. Antennules with three segments, second slightly shorter, third rectangular, very narrow, with three long terminal aesthetascs and lateral spine (Fig. 22A). Antennae very short (Fig. 21A), barely



**Fig. 22.** *Trichoniscoïdes castanheirensis* sp. nov., ♀ (A, LPS792b) and ♂ (B–F, LPS792a). A. Antennula. B. Left mandible. C. Right mandible. D. Maxillula. E. Maxilla. F. Maxilliped.

extending beyond posterior margin of pereonite I, with tubercles bearing scale-setae on fourth and fifth segments. Flagellum with three subequal segments, second with group of long aesthetascs. Buccal parts (Fig. 22B–F) as in congeners: left mandible with three free penicils (Fig. 22B), right mandible with two free penicils (Fig. 22C; rotated to show *lacinia mobilis* in its position); inner endite of maxillula with three free penicils (Fig. 22D).

MALE SEXUAL CHARACTERS. Pereopod 1 (Fig. 23B) and 2 with triangular hyaline scales on merus and carpus; carpus I tip with group of fan-shaped setae. Pereopod 3 merus has two groups of setae. Pereopod 7 merus with strong, curved hook-like process (Figs 21B, 23B), inserted at sternal edge and ending in small seta. Pleopod I endopod triangular (Figs 21C, 23C) with thick ciliated ramus inserted laterally, forming triangular distal lobe with rounded tip; ramus same length article it is inserted into, ending in



**Fig. 23.** *Trichoniscoides castanheirensis* sp. nov. ♂ (LPS792a). **A.** Pereopod 1. **B.** Pereopod 7. **C.** Endopod I. **D.** Exopod I. **E.** Endopod II. **F.** Exopod II.

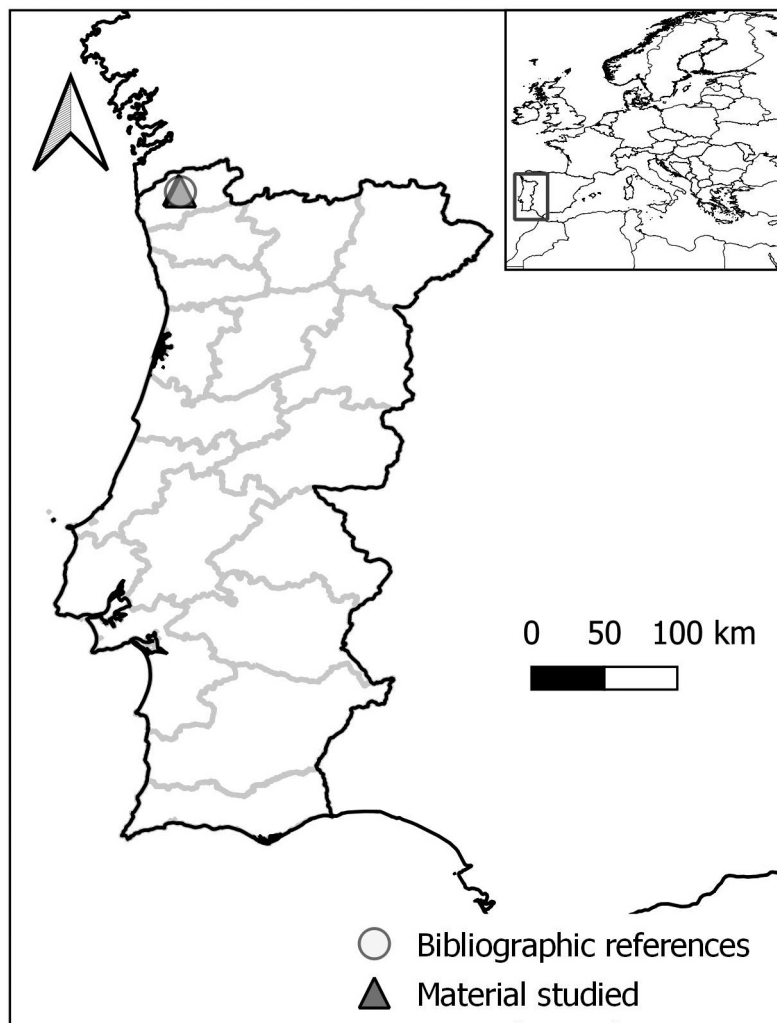
lanceolate tip. Exopod I trapezoidal (Figs 21D, 23D) with rounded outer margin and two unequal long ciliated rami, outer thicker than inner one, no notch at base of ciliated rami. Pleopod II endopod straight (Figs 21E, 23E), very broad, surrounded by large hyaline membrane, with distal segment as long as basal one, ending in short, wide, claw-like apically rounded tip. Exopod II rectangular (Fig. 23F), much wider than long, lacking internal tip, having small ciliated stem and spine, with fan-shaped setae on internal and external margins.

### Ecology

*Trichoniscoides castanheirensis* sp. nov. is an epigeic species (Table 1) found among large accumulation of wet leaf litter of deciduous trees, predominantly *Quercus orocantabrica* Rivas Mart., Penas, T.E. Díaz & Llamas.

### Remarks

Specimens matching this species, based on pereopod 7 and pleopods I and II, were previously found at Castanheira by Gregory *et al.* (2012). However, they were not formally described or named and were simply referred to as *Trichoniscoides* species C.



**Fig. 24.** Distribution of *Trichoniscoides castanheirensis* sp. nov. in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

*Trichoniscoides cordovensis* sp. nov.

[urn:lsid:zoobank.org:act:B5E7F5EA-6889-4711-8FC3-F85D295C8AFD](https://zoobank.org/urn:lsid:zoobank.org:act:B5E7F5EA-6889-4711-8FC3-F85D295C8AFD)

Figs 25–27; Table 1

**Diagnosis**

Coloration orange to dark red. Ocular apparatus with large ocellus, from orange to black. Granular integument. Antenna with tubercles bearing scale-setae and three-segmented flagellum. In males, pereopods 1 and 2 with hyaline scales on merus and carpus, pereopod 7 with conical process on merus. Male pleopod I endopod with long, triangular distal lobe, exopod trapezoidal with two unequal ciliated rami (internal shorter and much thinner). Male pleopod II endopod broad, with hyaline membrane, exopod trapezoidal.

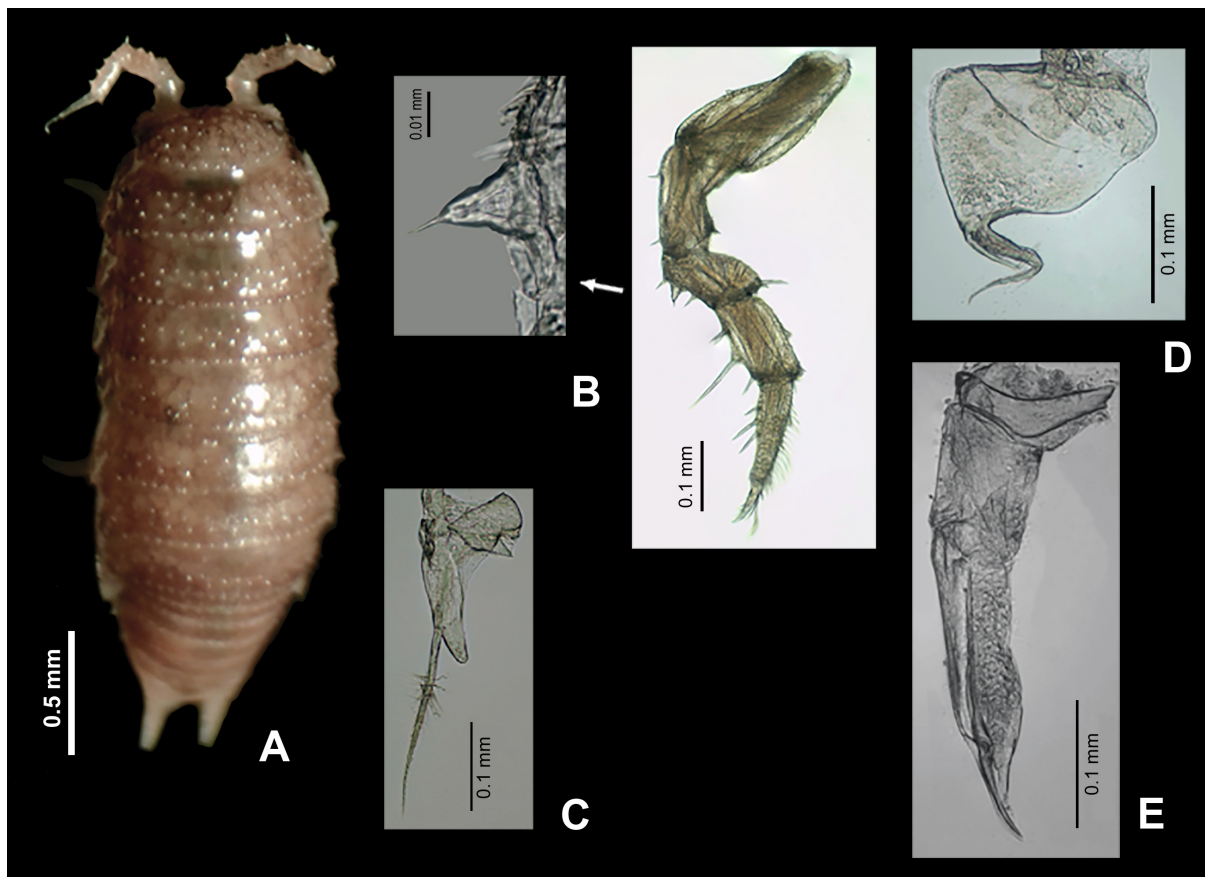
**Etymology**

The specific name refers to Monte Cordova, whose waters feed the Leça River and Quedas da Fervença, where the riparian gallery inhabited by this species is located.

**Type material**

**Holotype**

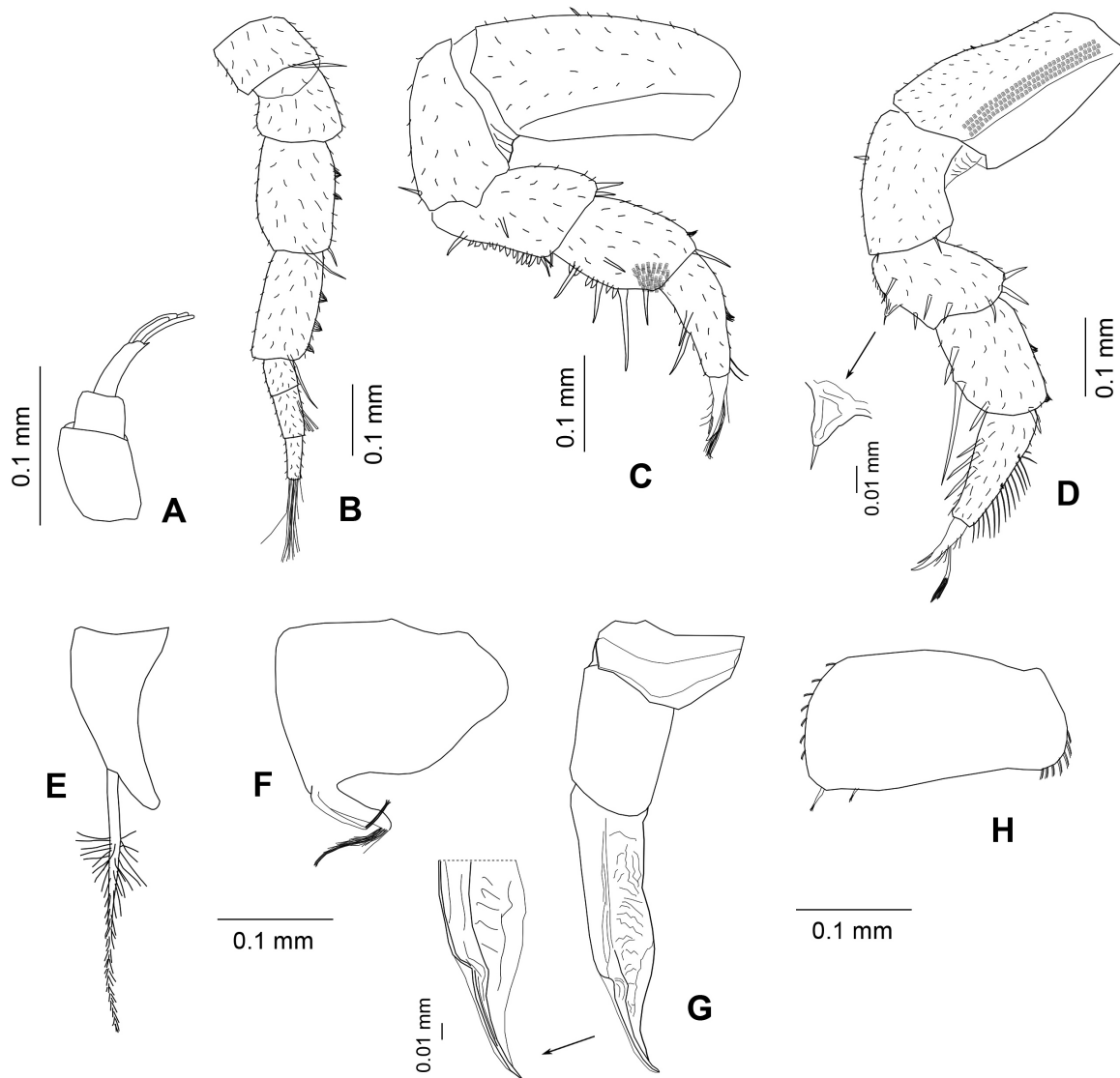
PORTUGAL – Porto • ♂; Quedas da Fervença, Valinhas; 41.3010° N, 8.4495° W; 1 Nov. 2022; L.P. Da Silva leg.; MNCN 20.04/21008 (ex. LPS490).



**Fig. 25.** *Trichoniscoides cordovensis* sp. nov. A. ♀ (LPS491), habitus. B. ♂ (LPS490), pereopod 7. C. ♂ (LPS776a), endopod I. D–E. ♂ (LPS490). D. Exopod I. E. Endopod II.

**Paratypes**

PORTUGAL – **Porto** • 1 ♀; Quedas da Ferveça, Valinhas; 41.3008° N, 8.4494° W; 1 Nov. 2022; L.P. Da Silva leg.; LPS491 • 1 ♀; Quedas da Ferveça, Valinhas; 41.3011° N, 8.4490° W; 1 Nov. 2022; L.P. Da Silva leg.; LPS492 • 1 ♂; Quedas da Ferveça, Valinhas; 41.3010° N, 8.4487° W; 1 Nov. 2022; L.P. Da Silva leg.; LPS493 • 1 ♀; Quedas da Ferveça, Valinhas; 41.3012° N, 8.4489° W; 4 Mar. 2023; L.P. Da Silva leg.; LPS744 • 2 ♀♀; Quedas da Ferveça-Valinhas; 41.3011° N, 8.4489° W; 4 Mar. 2023; L.P. Da Silva leg.; LPS745 • 1 ♂; Quedas da Ferveça, Valinhas; 41.3010° N, 8.4495° W; 22 Oct. 2023; L.P. Da Silva leg.; JC1049 (ex. LPS776a) • 4 ♀♀; same data as for preceding; LPS776b • 1 ♀; same data as for preceding; MNCN 20.04/21009 (ex. LPS776c) • 1 ♀; same data as for preceding; JC1050 (ex. LPS776d) • 4 ♀♀; Quedas da Ferveça, Valinhas; 41.3011° N, 8.4486° W; 22 Oct. 2023; L.P. Da Silva leg.; LPS777 • 1 ♂; Quedas da Ferveça, Valinhas; 41.3015° N, 8.4488° W; 22 Oct. 2023; L.P. Da Silva leg.; LPS778.



**Fig. 26.** *Trichonisoides cordovenssis* sp. nov. **A.** ♂ (LPS493), antennula. **B–D.** ♂ (LPS490). **B.** Antenna. **C.** Pereopod 1. **D.** Pereopod 7. **E.** ♂ (LPS776a). Endopod I. **F–H.** ♂ (LPS490). **F.** Exopod I. **G.** Endopod II. **H.** Exopod II.

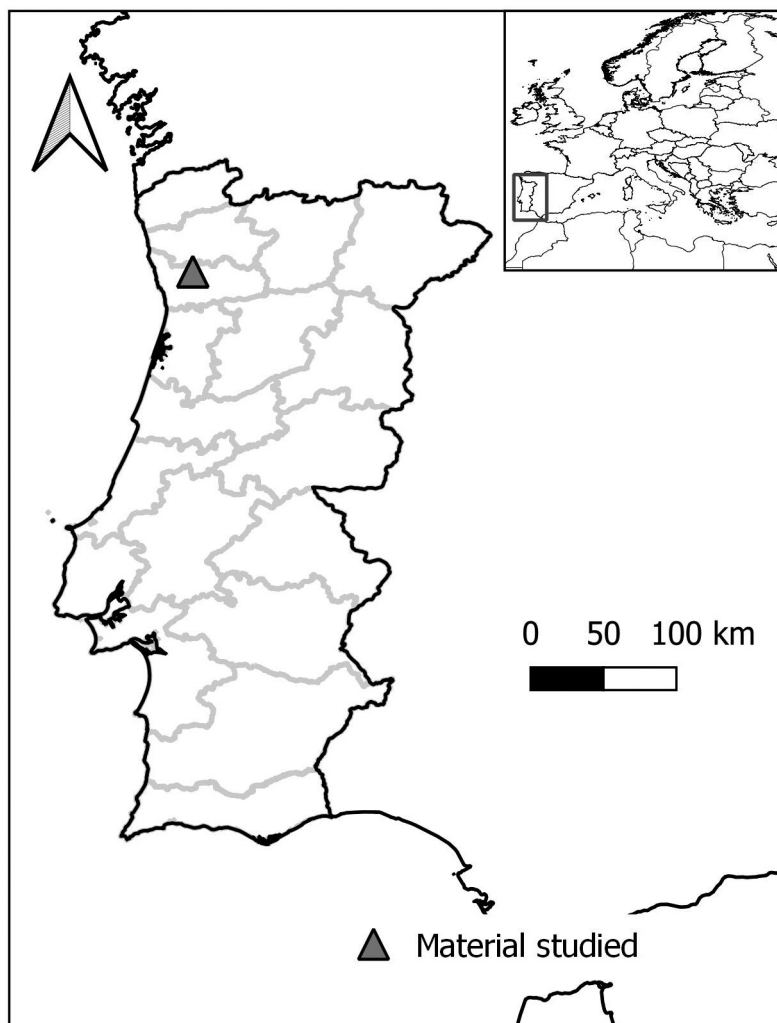
## Description

MEASUREMENTS. Maximum observed length: female 2.8 mm, male 2.1 mm.

COLORATION. Males light orange with large orange ocellus. Females dark red with large black ocellus (Fig. 25A).

INTEGUMENTARY CHARACTERS. Integument with granulation (Fig. 25A), four rows on cephalon, four on pereonite I, three on remaining pereonites, with one row on posterior margin. In pleon, one row of marked granulations on posterior margin of first three pleonites, rest very fine. Granulations fade toward posterior region.

APPENDAGES. Antennules with three segments, second shortest, third with three long aesthetascs (Fig. 26A). Antennae short (Figs 25A, 26B), barely extending beyond posterior margin of pereonite I, with tubercles bearing scale-setae on fourth and fifth segments. Flagellum with three subequal segments, second with group of long aesthetascs. Buccal parts as in other species.



**Fig. 27.** Distribution of *Trichoniscoides cordovensis* sp. nov. in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

MALE SEXUAL CHARACTERS. Pereopod 1 (Fig. 26C) and 2 with triangular hyaline scales on merus and carpus; carpus I tip with group of fan-shaped setae. Pereopod 7 merus with strong and straight process (Figs 25B, 26D), inserted in anterior half, bearing small seta. Pleopod I endopod with ciliated ramus inserted laterally, forming large triangular distal lobe (Figs 25C, 26E). Exopod I trapezoidal (Figs 25D, 26F) with rounded outer margin and two unequal long ciliated rami, outer much thicker than inner. Pleopod II endopod straight (Figs 25E, 26G), very broad, with distal segment twice the length of basal segment, surrounded by large hyaline membrane, ending in sharp tip reinforced with chitinous shaft. Exopod II trapezoidal (Fig. 26H), lacking internal tip, with two small ciliated stems and fan-shaped setae on internal and external edges.

### Ecology

*Trichoniscoides cordovensis* sp. nov. is an epigeal species (Table 1) found among wet leaf litter in a relatively well-preserved riparian gallery. All specimens were found in the litter accumulated at the base of relatively large *Quercus suber* L. trees.

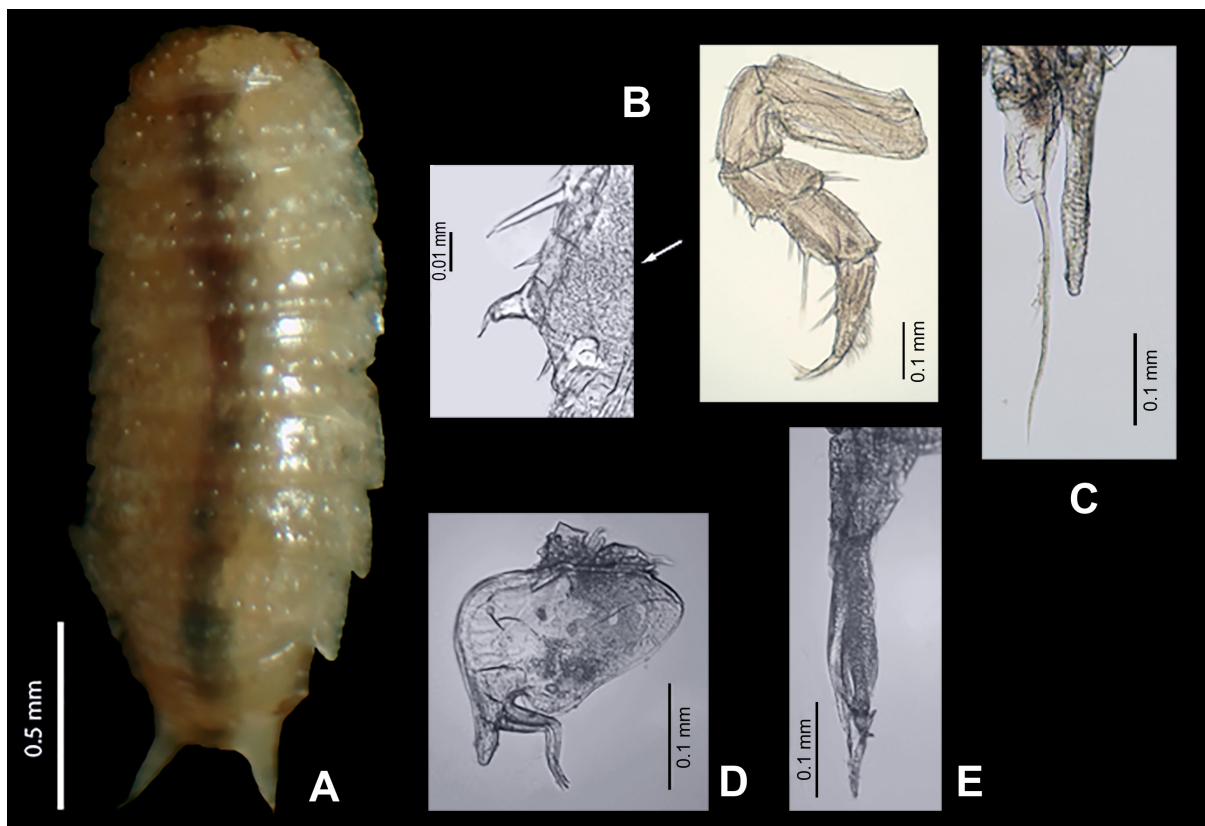
### *Trichoniscoides oloensis* sp. nov.

[urn:lsid:zoobank.org:act:3131C46F-1E1C-4E1F-9A2B-D28D47EAB7C3](https://zoobank.org/act:3131C46F-1E1C-4E1F-9A2B-D28D47EAB7C3)

Figs 28–30; Table 1

### Diagnosis

Coloration orange. Ocular apparatus with large black ocellus. Granular integument. Antenna with tubercles bearing scale-setae and three-segmented flagellum. In males, pereopods 1 and 2 with hyaline scales on



**Fig. 28.** *Trichoniscoides oloensis* sp. nov., ♂ (LPS488). A. Habitus. B. Pereopod 7 merus. C. Endopod I. D. Exopod I. E. Endopod II.

merus and carpus, pereopod 7 with short blunt process on merus. Male pleopod I endopod with small, rounded distal lobe; exopod triangular with long posterior-internal extension at posterior-internal edge and two subequal ciliated rami (internal slightly shorter and thinner). Male pleopod II endopod broad with hyaline membrane; exopod trapezoidal, with sinuous posterior edge and short, broad posterior-internal tip, rounded with large ciliated ramus.

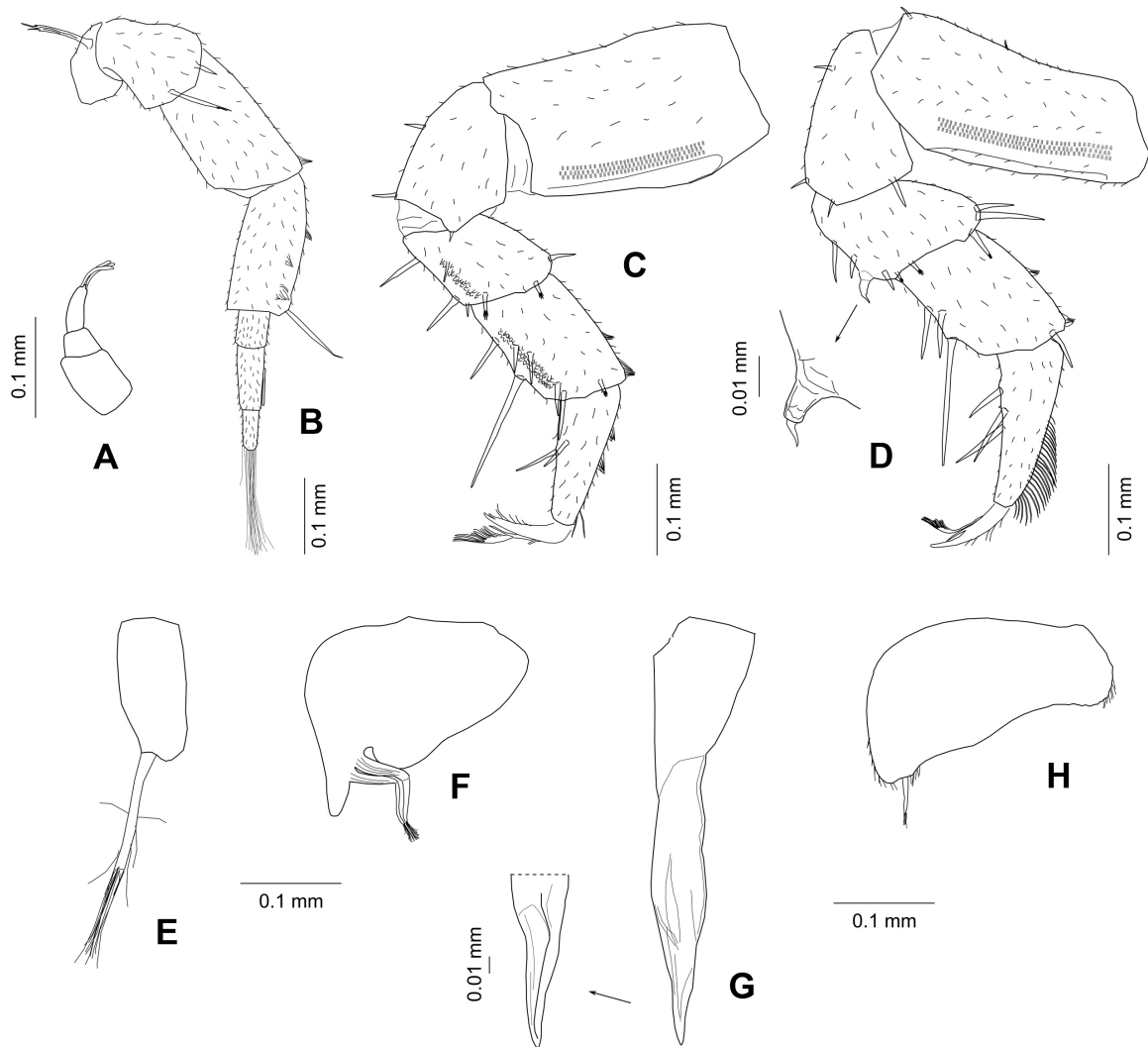
### Etymology

The species name refers to the type locality, the Olo River, which is used for an old irrigation system, preserving traditional land use.

### Type material

#### Holotype

PORTUGAL – Vila Real • ♂; Lamas de Olo; 41.3688° N, 7.8006° W; 30 Oct. 2022; L.P. Da Silva leg.; MNCN 20.04/21010 (ex. LPS488).



**Fig. 29.** *Trichoniscoides oloensis* sp. nov., ♂ (LPS488). **A.** Antennula. **B.** Antenna. **C.** Pereopod 1. **D.** Pereopod 7. **E.** Endopod I. **F.** Exopod I. **G.** Endopod II. **H.** Exopod II.

### Paratypes

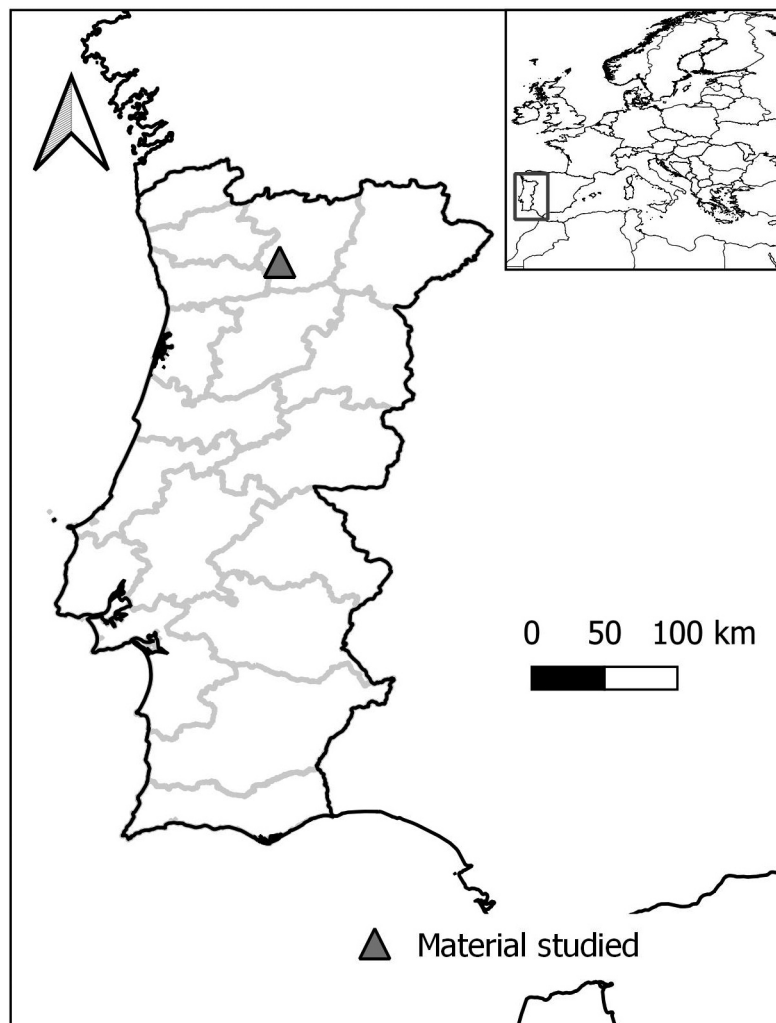
PORTUGAL – Vila Real • 1 ♀; Lamas de Olo; 41.3687° N, 7.8004° W; 30 Oct. 2022; L.P. Da Silva leg.; LPS487 • 1 ♀; Lamas de Olo; 41.3687° N, 7.8007° W; 13 May 2023; L.P. Da Silva leg., JC1051 (ex. LPS762) • 1 ♀; Lamas de Olo; 41.3688° N, 7.8008° W; 13 May 2023; L.P. Da Silva leg.; LPS763.

### Description

Measurements. Maximum observed length: female 2.3 mm, male 2 mm.

Coloration. Living specimens orange, progressively fading in ethanol (Fig. 28A). Eye apparatus consists of large black ocellus.

Integumentary characters. Integument with marked granulations (Fig. 28A), five rows on cephalon, one on posterior margin. Three rows on pereonite I and two on other pereonites, one on posterior margin of each pereonite. One row of small granulations on posterior margin of each pleonite, more pronounced on first three pleonites.



**Fig. 30.** Distribution of *Trichonisoides oloensis* sp. nov. in Portugal. Black lines represent country borders and grey lines mark Portuguese districts.

**Table 1.** Summary of comparative characters for species of the genus *Trichoniscoides* Sars, 1899 found in Portugal.

	<i>T. bellesi</i> Reboleira & Taiti, 2015	<i>T. broteroi</i> Vandel, 1946	<i>T. gallaecus</i> Cifuentes & Da Silva, 2023	<i>T. lusitanus</i> Vandel, 1946	<i>T. machadoi</i> Vandel, 1946	<i>T. meridionalis</i> Vandel, 1946	<i>T. ouremensis</i> Vandel, 1946	<i>T. serrai</i> Cruz, 1993	<i>T. sicoensis</i> Reboleira & Taiti, 2015	<i>T. subterraneus</i> Vandel, 1946	<i>T. castanheirensis</i> sp. nov.	<i>T. cordovens</i> sp. nov.	<i>T. oloensis</i> sp. nov.
Pigmentation	no	no	dark red	orange-pink or bright red	orange to white	no	no	no	no	no	orange	orange, red	orange
O c u l a r apparatus	no	no	1 ocellus	1 ocellus	no/1 ocellus	no	no	no	no	no	1 ocellus	1 ocellus	1 ocellus
Integument	granulated	granulated	granulated	smooth	smooth	weakly granulated	granulated	granulated	smooth	smooth	granulated	granulated	granulated
Antennae with tubercles	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes
♂ pereopod 1 differentiated	no	yes	no	no	yes	yes	yes	no	yes	yes	yes	yes	yes
♂ pereopod 7 differentiated	no	yes	yes	no	no	no	no	no	yes	yes	yes	yes	yes
♂ exopod I													
shape	triangular	sub- quadrangular	trapezoidal	triangular	triangular	rectangular	triangular	triangular	quadrangular	triangular	trapezoidal	trapezoidal	triangular, with posterior internal lamina
notch ciliated rami, i n t e r n a l relative to external	no	yes	no	yes	yes	no	no	yes	no	yes	no	no	yes
♂ endopod I													
shape	triangular	sub- rectangular	triangular	rectangular	trapezoidal	trapezoidal	triangular	triangular	rectangular	rectangular	triangular	triangular	rectangular
distal lobe	no	triangular, long	triangular, long	triangular, long	no	no	no	rounded, short, wide	triangular, short	triangular, very long	triangular, long	triangular, long	rounded, small
♂ exopod II													
shape	no data	trapezoidal	trapezoidal	trapezoidal	trapezoidal	trapezoidal	trapezoidal	trapezoidal	trapezoidal	trapezoidal	rectangular	trapezoidal	trapezoidal
♂ endopod II													
distal segment tip	thin	thin, in layer	thin, in layer	thin and straight	very thin	thin	thin, cylindrical, slightly curved	thin	thick with a complex tip	very thin, long and sharp	very wide, curved tip with rounded end	wide, with chitinous reinforcement	wide, with chitinous reinforcement
length ratio of distal to basal segments	2.2	3.6	3	3.5	4	3.6	3	1.8	1.5	3.6	1	2	2
Ecology	troglobiotic	troglobiotic	epigean	epigean	epigean	troglobiotic	troglobiotic	troglobitic	troglobiotic	troglobiotic	epigean	epigean	epigean

Appendages. Antennules with three segments, second shortest, third with three long aesthetascs (Fig. 29A). Antennae very short (Fig. 29B), barely extending beyond posterior margin of pereonite I, with tubercles bearing scale-setae. Flagellum with three segments, second one longer than others, with group of long aesthetascs. Buccal parts as in other species.

Male sexual characters. Pereopod 1 (Fig. 29C) and 2 with hyaline scales on merus and carpus on sternal edge. Pereopod 7 merus (Figs 28B, 29D) with strong blunt process in posterior third of sternal edge, bearing small seta. Pleopod I endopod rectangular (Figs 28C, 29E) with small distal lobe with rounded tip, having ciliated rami 1.4 × as long as basal segment. Exopod I triangular (Figs 28D, 29F) with rounded posterior internal lamina and strong notch at base of subequal ciliated rami (internal slightly shorter and thinner), each with very small setae. Pleopod II endopod broad (Figs 28E, 29G), straight, with hyaline membrane, distal segment twice as long as basal segment, ending in short tip reinforced with chitinous shaft. Exopod II trapezoidal (Fig. 29H) with sinuous posterior margin and short, broad posterior-internal tip with rounded end, having strong ciliated stem surrounded by fan-shaped setae on internal and external margins.

### Ecology

*Trichoniscoides oloensis* sp. nov. is an epigean species (Table 1) found on dead wood and among leaf litter of *Alnus lusitanica* Vít, Douda & Mandák, *Quercus pirenaica* Willd. and other deciduous trees, in very wet soil.

### Key to males of the species of the genus *Trichoniscoides* Sars, 1899, from the Portugal

1	Smooth dorsal integument .....	2
–	Granulated dorsal integument .....	5
2	Antennae without tubercles bearing scale-setae .....	<i>T. lusitanus</i> Vandel, 1946
–	Antennae with tubercles bearing scale-setae .....	3
3	Male pleopod II endopod ends in pointed tip .....	4
–	Male pleopod II endopod ends in complex tip .....	<i>T. sicoensis</i> Reboleira & Taiti, 2015
4	Male pleopod I endopod without distal lobe .....	<i>T. machadoi</i> Vandel, 1946
–	Male pleopod I endopod with long distal lobe .....	<i>T. subterraneus</i> Vandel, 1946
5	Distal segment of male pleopod II endopod narrows to sharp tip .....	6
–	Distal segment of male pleopod II endopod thick .....	11
6	Male pereopod 7 without sexual differentiation .....	7
–	Male pereopod 7 with sexual differentiation .....	10
7	Male pleopod I endopod without distal lobe .....	8
–	Male pleopod I endopod with distal lobe .....	<i>T. serrai</i> Cruz, 1993
8	Male pereopod 1 merus and carpus without hyaline scales .....	<i>T. bellesi</i> Reboleira & Taiti, 2015
–	Male pereopod 1 merus and carpus with hyaline scale .....	9
9	Male pleopod I exopod rectangular, inner ciliated ramus longer than outer .....	
	.....	<i>T. meridionalis</i> Vandel, 1946
–	Male pleopod I exopod triangular, ciliated rami equal in size .....	<i>T. ouremensis</i> Vandel, 1946

- 10 Male pleopod I exopod without notch at base of rami .....  
 ..... *T. gallaecus* Cifuentes & Da Silva, 2023  
 – Male pleopod I exopod with notch at base of rami ..... *T. broteroi* Vandel, 1946
- 11 Male pleopod I exopod triangular with posterior internal extension ..... *T. oloensis* sp. nov.  
 – Male pleopod I exopod trapezoidal, without posterior internal extension ..... 12
- 12 Male pereopod 7 process straight; male pleopod II endopod ends in pointed tip reinforced by chitinous shaft ..... *T. cordovens* sp. nov.  
 – Male pereopod 7 process curved; male pleopod II endopod ends in small curved tip without chitinous shaft ..... *T. castanheirens* sp. nov.

## Discussion

The genus *Trichoniscoides* Sars, 1899 comprises 55 species exclusively distributed in Europe (Bokyo *et al.* 2024; Cifuentes *et al.* 2024) and includes only five species (*T. broteroi*, *T. cadurcensis* Vandel, 1934, *T. consoranensis* Vandel, 1952, *T. gallaecus* and *T. sarsi*) that have granulations on the dorsal side of the integument and a process on the sternal edge of the male pereopod 7 merus. These same characters are also present in the three species described in this paper: *T. castanheirens* sp. nov., *T. cordovens* sp. nov. and *T. oloensis* sp. nov.

*Trichoniscoides broteroi*, *T. consoranensis*, *T. sarsi* and *Trichoniscoides oloensis* sp. nov. have a notch of varying size at the base of the ciliated rami of the male pleopod I exopod, which is absent from *T. cadurcensis*, *T. gallaecus*, *T. castanheirens* sp. nov. and *T. cordovens*. Additionally, *T. oloensis* also has a large triangular expansion on the posterior-internal side near the ciliated rami, a character not found in any other described species of the genus.

*Trichoniscoides cadurcensis* and *T. gallaecus* lack a notch at the base of the ciliated rami of the male pleopod I exopod, similar to *Trichoniscoides castanheirens* sp. nov. and *Trichoniscoides cordovens* sp. nov. However, in the first two species, the inner ciliated ramus of the male exopod of pleopod I is vestigial while the outer ramus is very long. In contrast, in *T. castanheirens* and *T. cordovens*, the rami are unequal, i.e. the inner ramus is well developed.

Finally, in the male of *T. castanheirens* sp. nov., the process on the merus of pereopod 7 is strongly curved, the ciliated ramus of the pleopod I endopod is short and expands into an oval shape at the tip, and the pleopod II endopod is very thick towards the end, ending in a short and curved tip. In contrast, in *T. cordovens* sp. nov., the process on the merus of pereopod 7 is straight, the ciliated ramus is long without expansion and ends in a sharp tip, and the endopod of pleopod II ends with a pointed tip reinforced by a chitinous shaft.

In the Iberian Peninsula, 39 of the 58 species of *Trichoniscoides* are known, with the majority (25 spp.) being troglolithic. In the rest of Europe, there are 22 species, but only eight are troglolithic (data compiled by the authors). To date, only three species are known both in the Iberian Peninsula and across the rest of Europe: *Trichoniscoides arcangelii* Vandel, 1952, found in the Pyrenees, namely the Spanish province of Lleida and the French department of Ariège; *T. jeanneli* Vandel, 1952, also from the Pyrenees in the Spanish provinces of Huesca and Navarre and the French department of Basses-Pyrénées; and *T. saeroeensis* Lohmander, 1924, found in the Spanish province of Cantabria as well as in Denmark, France and Sweden (Arcangeli 1935; Vandel 1940, 1952, 1960, 1963, 1972; Schmölzer 1971; Cruz 1991; Erhard 1997; Schmalzfuss 2003; Cifuentes 2019a; Cifuentes *et al.* 2021).

## Acknowledgments

We sincerely thank Dr Antoni Serra Sorribes from the Centre de Recursos de Biodiversitat Animal at the University of Barcelona (CRBA) for his kindness in granting access to the specimens from the collection of Dr Antonio Cruz for this work. We gratefully acknowledge the funding provided by FCT/MCTES, which supported LPsS through the individual research contract CEECIND/02064/2017 (<https://doi.org/10.54499/CEECIND/02064/2017/CP1423/CP1645/CT0009>).

## References

- Arcangeli A. 1935. Isopodi terrestri di caverne della Spagna (Collezione del Museo di Storia naturale di Madrid). *Eos* 10: 171–195. Available from <https://archive.org/details/eos-0013-9440-147127> [accessed 6 Jun. 2024].
- Boyko C.B., Bruce N.L., Hadfield K.A., Merrin K.L., Ota Y., Poore G.C.B. & Taiti S. (eds) 2024. *World Marine, Freshwater and Terrestrial Isopod Crustaceans Database. Trichoniscoides G. O. Sars, 1899*. Available from <https://www.marinespecies.org/aphia.php?p=taxdetails&id=249418> [accessed 6 Jun. 2024].
- Cifuentes J. 2019a. Contribution à la connaissance des *Trichoniscoides* Sars, 1899 ibériques, avec la description de deux nouvelles espèces: *Trichoniscoides marinae* n. sp. et *Tr. enoli* n. sp (Crustacea, Isopoda, Trichoniscidae). *Boletín Asociación española de Entomología* 43 (1–2): 27–54.
- Cifuentes J. 2019b. Los isópodos terrestres de Galicia, España (Crustacea: Isopoda, Oniscidea). *Graellsia* 75 (2): e098. <https://doi.org/10.3989/graellsia.2019.v75.243>
- Cifuentes J., Beruete E. & Prieto C.E. 2021. Isópodos oniscídeos en cuevas de la región Vasco-Cantábrica, España (Crustacea: Isopoda). *Boletín de la Sociedad Entomológica Aragonesa* (S.E.A.) 68: 270–288.
- Cifuentes J. & da Silva L.P. 2023a. A new epigeal species of *Trichoniscoides* (Isopoda: Oniscidea: Trichoniscidae) from the northwest of the Iberian Peninsula. *Nauplius* 31: e2023016. <https://doi.org/10.1590/2358-2936e2023016>
- Cifuentes J. & da Silva L.P. 2023b. The genus *Eluma* in the Iberian Peninsula, with the description of a new terrestrial isopod: *Eluma matae* sp. nov. (Oniscidea, Armadillidiidae, Eluminae). *European Journal of Taxonomy* 860: 27–41. <https://doi.org/10.5852/ejt.2023.860.2047>
- Cifuentes J. & da Silva L.P. 2024. Revision of the genus *Porcellionides* Miers, 1877 (Isopoda: Porcellionidae) in the Ibero-Balearic region. *European Journal of Taxonomy* 939: 1–51. <https://doi.org/10.5852/ejt.2024.939.2573>
- Cifuentes J., Prieto C.E. & Beruete E. 2024. Nueva contribución al conocimiento de los isópodos terrestres del norte de España, con la descripción de la nueva especie *Trichoniscoides hirulagun* n. sp. (Crustacea: Isopoda: Oniscidea). *Boletín de la Sociedad Entomológica Aragonesa* (S.E.A.) 74: 173–184.
- Cruz A. 1991. Isópodos terrestres de la colección del Museo de Zoología de Barcelona (Crustacea, Oniscidea). *Miscelánea zoológica*, Barcelona 15: 81–102.
- Cruz A. 1993. Especies nuevas o poco conocidas de isópodos terrestres de la Península Ibérica. III. *Trichoniscoides pitarquensis* sp. n. y *T. serrai* sp. n. (Crustacea, Oniscidea, Tichoniscidae). *Bulletin de la Société d'Histoire naturelle de Toulouse* 127: 15–21.
- Erhard F. 1997. Das pleonale Skelet-Muskel-System von *Titanethes albus* (Synocheta) und weiterer Taxa der Oniscidea (Isopoda), mit Schlußfolgerungen zur Phylogenie der Landasseln. *Stuttgarter Beiträge zur Naturkunde*, Serie A 550: 1–70.

- Gregory S., Lee P., Read H.J. & Richards P. 2012. Woodlice (Isopoda: Oniscidea) collected from north-west Spain and northern Portugal in 2004 by the British myriapod and isopod group. *Bulletin of the British Myriapod & Isopod Group* 26: 6–23.
- Patience A. 1908. On *Trichoniscoides albidus* and *T. sarsi* (nom. nov.). *Annals and Magazine of Natural History*, Series 8, 2: 84–88.
- Reboleira A.S., Gonçalves F., Oromí P. & Taiti S. 2015. The cavernicolous Oniscidea (Crustacea: Isopoda) of Portugal. *European Journal of Taxonomy* 161: 1–61. <https://doi.org/10.5852/ejt.2015.161>
- Schmalfuss H. 2003. World catalog of terrestrial isopods (Isopoda: Oniscidea). *Stuttgarter Beiträge zur Naturkunde*, Serie A 654: 1–341.
- Schmölzer K. 1955. Isopoda terrarum mediterraneorum. 1. Mitteilung: Über neue und bekannte Landasseln der Pyrenaenhalbinsel. *Eos (Madrid)* 31: 155–215. Available from <http://hdl.handle.net/10261/154616> [accessed 6 Jun. 2024].
- Schmölzer K. 1971. *Die Landisopoden der Iberischen Halbinsel*. Monografias de Ciencia moderna (Madrid) 80. Consejo Superior de Investigaciones Científicas, Madrid.
- Vandel A. 1940. Les isopodes terrestres des départements de la Haute-Garonne et de l’Ariège. *Bulletin de la Société d’Histoire naturelle de Toulouse* 75: 209–226.
- Vandel A. 1946. Crustacés isopodes terrestres (Oniscoidea) épigés et cavernicoles du Portugal. *Anais da Faculdade de Ciências do Porto* 30: 135–427.
- Vandel A. 1952. Biospeologica LXXIII. Isopodes terrestres (troisième série). *Archives de Zoologie expérimentale et générale* 88: 231–362.
- Vandel A. 1960. *Faune de France, vol. 64. Isopodes terrestres (Première Partie)*. Fédération française des Sociétés de Sciences naturelles, Paris.
- Vandel A. 1963. Évolution morphologique et répartition géographique de *Trichoniscoides arcangelii* Vandel 1952 (Crustacé; Isopode; Oniscoidea). *Bulletin du Muséum national d’Histoire naturelle* 35: 311–314.
- Vandel A. 1972. Les isopodes terrestres et cavernicoles de la Catalogne. *Miscelánea Zoológica* 3 (2): 23–41.

Printed versions of all papers are deposited in the libraries of two of the institutes that are members of the *EJT* consortium: Muséum national d’Histoire naturelle, Paris, France and Royal Museum for Central Africa, Tervuren, Belgium. The other members of the consortium are: Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Meise Botanic Garden, Meise, Belgium; Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Leibniz Institute for the Analysis of Biodiversity Change, Bonn – Hamburg, Germany; National Museum of the Czech Republic, Prague, Czech Republic; The Steinhardt Museum of Natural History, Tel Aviv, Israël.