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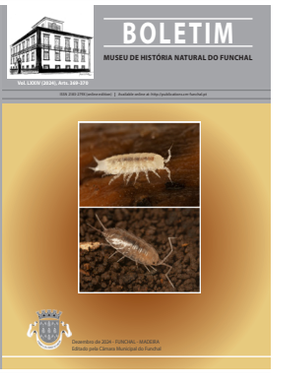

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A new terrestrial isopod species from Madeira (Isopoda, Oniscidea, Porcellionidae)

With 5 figures

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ABSTRACT: A new endemic species of terrestrial isopod, *Porcellio garciai* sp. n., (Oniscidea: Porcellionidae) is described from Machico, Madeira. The new species belongs to the "Atlantic-group" morphological complex, and has close affinities with *P. zarcoi* Vandel 1960 from the Madeiran archipelago and *P. eserensis* Rodríguez & Vincente, 1992 from the Canary islands. Its diagnostic characteristics, affinities, habitat and ecology are discussed and a key to the *Porcellio* species of the Madeiran archipelago is provided.

Keywords: Isopoda, Oniscidea, Porcellionidae, *Porcellio*, taxonomy, morphology, new species, Madeira, Portugal.

RESUMO: Uma espécie nova, endémica, de isópode terrestre, *Porcellio garciai* sp. n., (Oniscidea: Porcellionidae) é descrita para Machico, Madeira. A nova espécie pertence ao complexo morfológico do "grupo Atlântico" e tem estreitas afinidades com *P. zarcoi* Vandel 1960 do arquipélago madeirense e *P. eserensis* Rodríguez & Vincente, 1992 das ilhas Canárias. São discutidas as suas características de diagnóstico, afinidades, habitat e ecologia e é fornecida uma chave para as espécies do género *Porcellio* presentes no arquipélago da Madeira.

Palavras-chave: Isopoda, Oniscidea, Porcellionidae, *Porcellio*, taxonomia, morfologia, nova espécie, Madeira, Portugal.

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INTRODUCTION

The terrestrial isopod genus *Porcellio* Latreille, 1804 currently contains 185 species and is distributed across Macaronesia, Europe the Levant and north Africa (Schmalfuss, 2003). Several dubious species from other parts of the world are also included within the *Porcellio* but are likely alien introductions or are erroneously attributed to this genus (Ibid.). Within Europe, the greatest diversity is observed in the western Mediterranean and the Macaronesian archipelagos.

With the omission of a few widespread and cosmopolitan species, the majority of the approximately 35 species recorded from across Macaronesia are endemic and have close morphological and systematic relationships to one another, considered to be a result of them originating from a small number of pioneering species (Vandel, 1960; Rodriguez, 1990; Schmalfuss, 2003). Of these islands, the Madeiran archipelago has one of the richest and most ecologically varied range of species, which have diversified into an array of highly specific microhabitats and altitudinal preferences (Vandel, 1960). With such an unusual species diversity, it is surprising that very little attention has been focussed on the genus within the archipelago since the comprehensive works of Vandel over 60 years ago (Ibid.). Only one *Porcellio* species has been added to the list since then, but this was based on a single male specimen collected around 1899 and has not been recorded since (Hoese, 1978).

There are currently 12 species of *Porcellio* known from the Madeiran archipelago, of which 10 are endemic, including: *P. atlantidium* Paulian de Félice, 1939 from Madeira, *P. cataractae* Vandel, 1960 from Madeira, *P. ferroi* Paulian de Félice, 1939 from Porto Santo, *P. gruneri* Hoese, 1978 from Madeira, *P. lamellatus madeirae* Arcangeli, 1958 from Madeira and Porto Santo, *P. maculipes* Budde-Lund, 1885 from Madeira, *P. normani* (Dollfus, 1899) from Madeira and the Desertas Islands (Ilhéu Chão and Deserta Grande), *P. scitus* Budde-Lund, 1885 from Madeira, *P. xavieri* Arcangeli, 1958 from Madeira and the Desertas Islands (Deserta Grande), and *P. zarcoi* Vandel, 1960 from Madeira (Ilhéu do Desembarcadouro) (Vandel, 1960: Hoese, 1978). The remaining two species, *P. dilatatus* Brandt *in* Brandt & Ratzeburg, 1831 and *P. laevis* Latreille, 1804 are cosmopolitan with a western palaearctic origin (Schmalfuss, 2003). With the exclusion of *P. lamellatus madeirae* all of the remaining endemic *Porcellio* species fall under the informal morphological complex known as the "Atlantic-group" (previously the "*scaber*-group") which includes representatives from across Macaronesia, Iberia and the Baetic-Rifian region (Vandel, 1946, 1951, 1956, 1960). The "Madeiran-subgroup" was later proposed to accommodate 7 species within the "Atlantic-group" that are endemic to the Madeiran archipelago. This is due to them sharing a combination of two rare morphological characteristics, sexual dimorphism of the antennae and multiplicity of the glandular fields (Vandel, 1960).

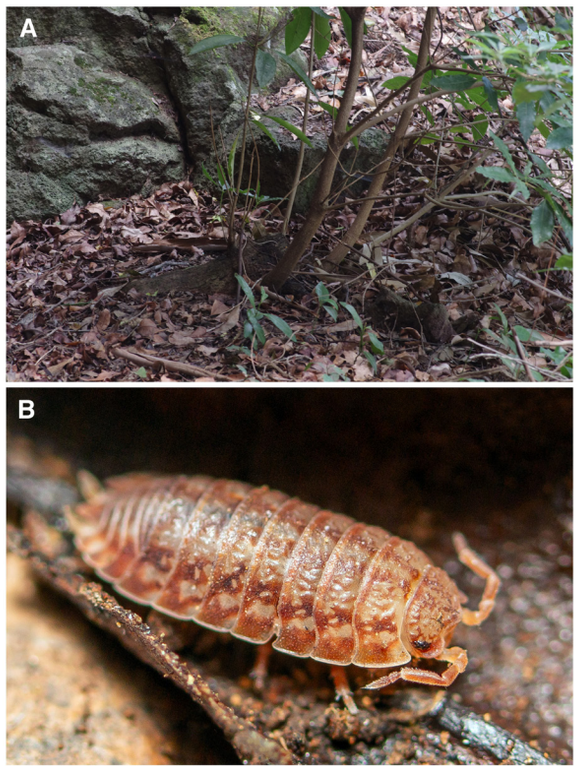

Fig. 1 – **A**. Habitat; **B**. *Porcellio garciai* sp. n. female habitus, *in-situ*.

In the present paper a new *Porcellio* species, *P. garciai* sp. n. is described and illustrated from the environs surrounding the Furnas do Cavalum cave system in Machico, Madeira. The new species is one of only three endemic *Porcellio* to the Madeiran archipelago that belongs to the "Atlantic-group" but cannot be included in the "Madeiran-subgroup".

MATERIALS AND METHODS

Specimens were collected by hand, immersed in 70% isopropanol and dissected under a stereo microscope (Wild M3). Body parts were prepared as permanent slide mounts using Euparal. Drawings were made using a

camera Lucida attached to a compound microscope (Wild M20), and the final illustrations were digitally drawn with the aid of a graphic tablet (XP-PEN Deco 01 V2) using Photoshop. The type material has been deposited in the Museu de Historia Natural do Funchal (MMF) and the Natural History Museum, London (NHM UK).

RESULTS

Porcellio garciai sp. n.

Figures 1B, 2, 3 & 4

Type material. **Holotype**: 1♂, Madeira – Portugal, Furnas do Cavalum, Cavalum IV entrance, Machico, 32° 43' 56.4132" N 16° 47' 4.7112" W, 9 Dec. 2023, leg. T. Hughes (MMF 50533). **Paratypes**: 1♂, 1♂ as 9 microscope slides, without corresponding specimen (MMF 50534, 50542), 7♀ (2 microscope slides), same data as holotype (MMF 50535-50541). 1♂, 4♀, same data as holotype (NHM UK 2024.144-145).

DESCRIPTION

Maximum body length: ♂ 4.5 mm, ♀ 5 mm. Body slightly convex, with outline as in Fig. 2A. Colour (example, Fig. 1B) variable, either grey, brown or red; pereon with dark central stripe, occasionally divided by a narrow paler internal stripe; cephalon completely pigmented with a continuation of the dark central stripe present on the vertex and with slight darkening below the eyes; pereonites 1-7 with a distal dark stripe delineating the upper edge of the epimera; epimera darker posteriorly, with a small white spot bearing the noduli laterales; pleon pigmentation as in the pereon, although the stripe pattern is poorly defined or absent; pleon epimera pigmented, except for anterior portion of pleonites 4-5 which bear a paler spot; antennae and pleotelson well pigmented, uropods notably paler. Dorsal surface of cephalon and pereon entirely granulated; pleon smooth. Glandular fields (Fig. 2B) semicircular, with 1-4 pores each, inserted anteriorly on the lateral margin. First glandular field located on the top margin of pereonite 1 then positioned either a quarter or a third down in subsequent pereonites. Integument covered in numerous short triangular scale-setae (length 0.0095mm) with a blunt apex (Fig. 2C). Noduli laterales (Fig. 2D & 2E) (length 0.044 mm) situated in an unpigmented disk; noduli 1-3 and 5-6 equidistant from the lateral margin, noduli 4 and 7 slightly more inset. Cephalon (Fig. 2F & 2G) lateral lobes sub-rounded with a regularly sinuous anterior margin; median lobe protruding slightly further than the lateral ones, narrowly rounded with a median indentation; eyes comprised of 7 ommatidia. Pereonites 1-3 with the posterior margin strongly concave at sides; pereonites 4-6 with a weakly sinuous posterior margin; pereonite 7 regularly sinuous. Posterior tips of epimera acutely angled becoming less so posteriorly. Pleon with continuous outline with pereon; posterior tips of pereon epimera directed backwards with acute angles. Pleopods 1 and 2 with indented tracheal fields. Telson (Fig. 2H) triangular, slightly wider than long with weakly concave sides and a broadly rounded apex. Uropods (Fig. 2I) without sexual dimorphism; protopodites reaching to two thirds the length of the telson; endopod slightly shorter than exopod. Antennula (Fig. 2K) 3 segmented with the basal article equal to 2 + 3; distal article with 6-8 aesthetascs and rounded lobe. Antenna (Fig. 2J) when extended backwards, reaching just behind the posterior border of pereonite 1; first flagellar article a third the length of the second. Mandibles (Fig. 3A & 3B) with molar penicils dichotomised; right mandible with 2 free penicils; left mandible with 4 free penicils; no penicils present on the pilose lobes. Maxillula (Fig. 3C) external branch with 4 + 6 teeth (2 moderately toothed), internal branch with 2 stout penicils with slightly indented apex and toothed posterior corner. Maxilla (Fig. 3D) inner lobe with setose apex; inner lobe slightly wider than inner. Maxilliped (Fig. 3E) first palp article with 1 small and 1 large seta; second article with 2 well developed setae; distal article elongate, with the apex bearing a tuft of short setae; endite with 2 + 1 anterior triangular teeth and 1 large sub-apical seta.

Male

Pereopod 1 (Fig. 4A & 4B) merus and carpus bearing abundant setae on the sternal margin, with 3 prominent palmatiform setae on carpus; antennal grooming brush also absent from carpus. Pereopod 7 (Fig. 4C) lacking distinct sexual modification, ischium sternal margin weakly concave. Pleopod 1 (Fig. 4D) exopod with projecting lobe on posterior tip, lacking spines along the medial margin and with an indented tracheal field; endopod broadly tapering, with 6 small setae at its apex. Pleopod 2 (Fig. 4E) exopod triangular, with weakly concave outer margin and indented tracheal field; distal process with chamfered apex bearing one small and one large spine; endopod flagelliform, a third longer than the exopod. Pleopods 3-5 as in Figures 4F, 4G & 4H.

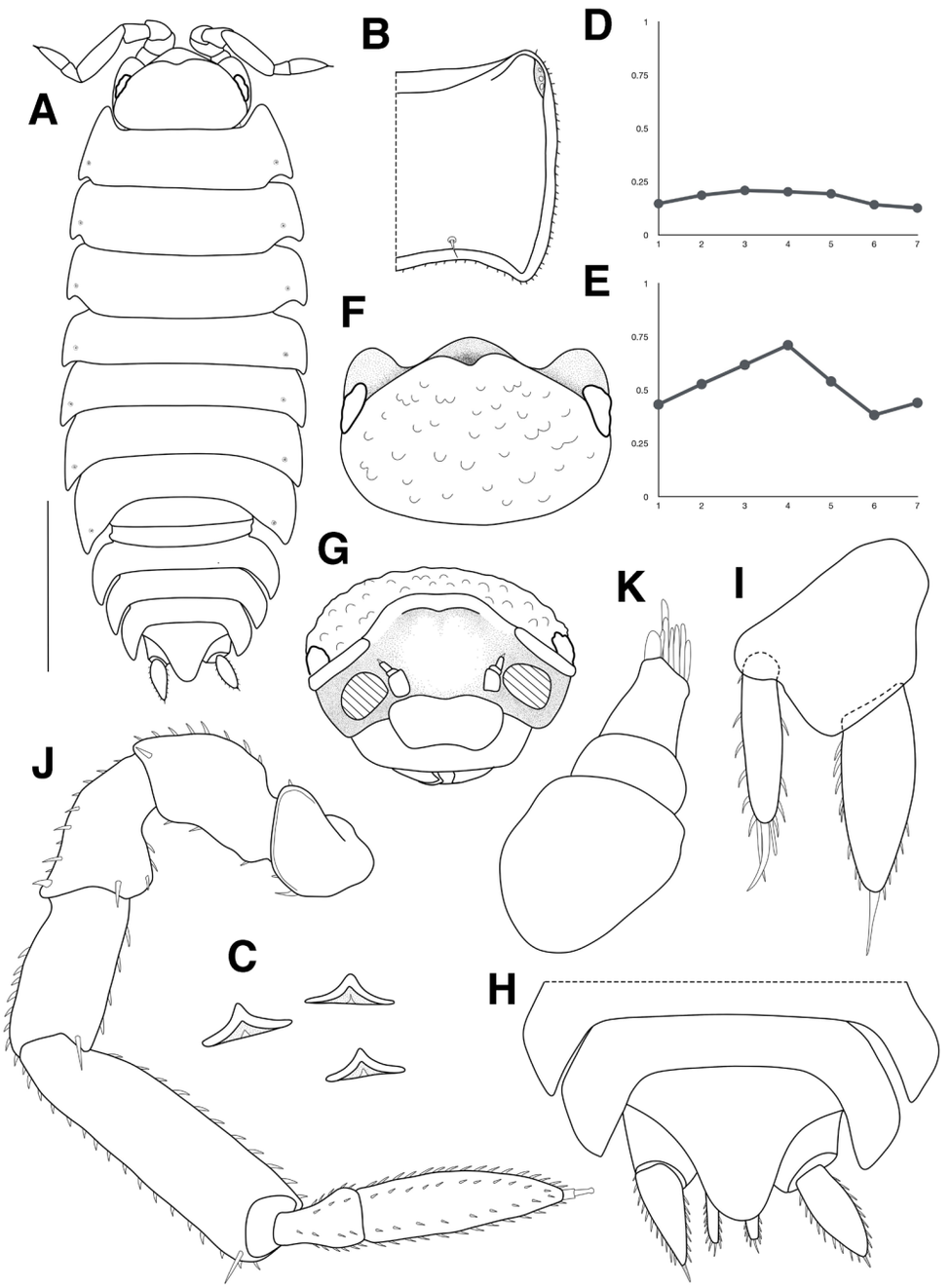

Fig. 2 – *Porcellio garciai* sp. n. female (A-I), male (J-K): **A**. Habitus, dorsal; **B**. Pereonite 1 showing disposition of glandular field and nodulus lateralis, dorsal; **C**. Scale-setae, dorsal; **D**. Noduli laterales b/c coordinates; **E**. Noduli laterales d/c coordinates; **F**. Cephalon, dorsal; **G**. Cephalon, frontal; **H**. Pleotelson, dorsal; **I**. Uropod, dorsal; **J**. Antenna; **K**. Antennula (scale bar 1 mm).

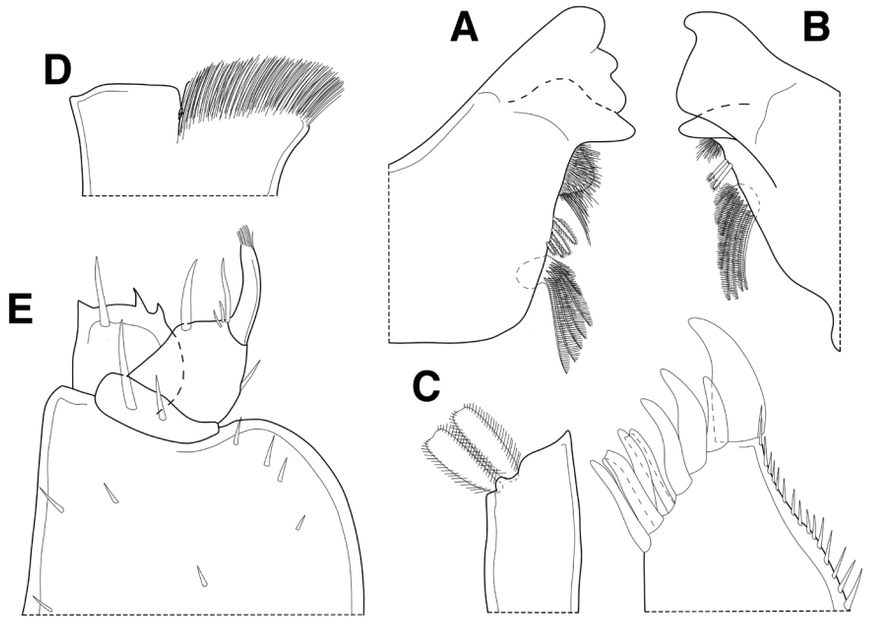

Fig. 3 – *Porcellio garciai* sp. n. male: **A**. Left mandible; **B**. Right mandible; **C**. Maxillula; **D**. Maxilla; **E**. Maxilliped.

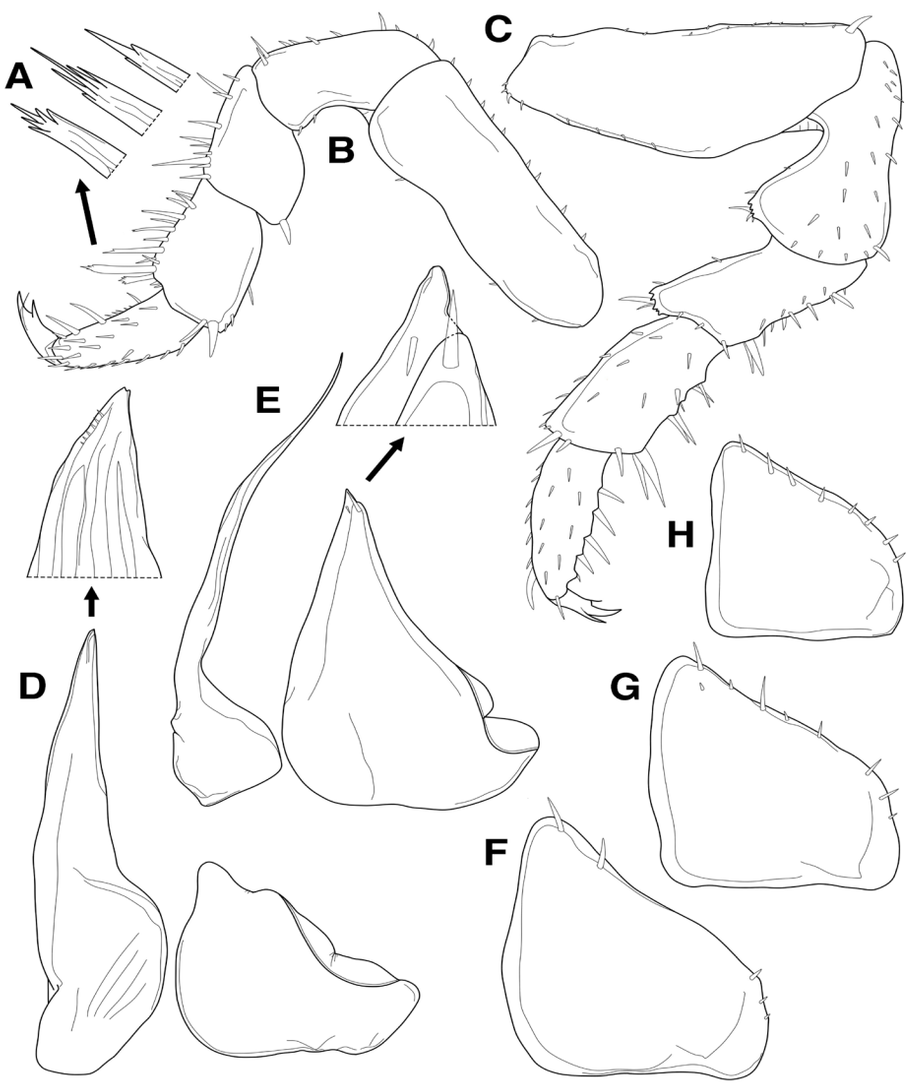

Fig. 4 – *Porcellio garciai* sp. n. male: **A**. Detail of carpal spines; **B**. Pereopod 1; **C**. Pereopod 7; **D**. Pleopod 1; **E**. Pleopod 2; **F**. Pleopod 3; **G**. Pleopod 4; **H**. Pleopod 5.

Etymology: Named after the Mallorcan carcinologist Lluc Garcia in recognition of his taxonomic contributions to the western Mediterranean terrestrial Isopod fauna. His detailed and carefully illustrated publications have been a great source of inspiration for the author.

REMARKS

P. garciai sp. n., belongs to the "Atlantic-group" morphological complex due to the glandular fields being semi-circular and attached to the lateral margin, the disposition of the tracheal field on the lateral margin of the 1st male exopod and the carpus being straight sided on the 7th male pereopod (Vandel, 1960). However, as the new species lacks sexual dimorphism of the antennae and multiplicity of the glandular fields it cannot be included within the "Madeiran-subgroup" (Ibid.). Only 2 other species endemic to the Madeiran archipelago fall into this category, these being *P. xavieri* and *P. zarcoi*. *P. garciai* sp. n. is morphologically closer to *P. zarcoi* but can be differentiated from it by the presence of dorsal granulations and by the first pleopod exopod having a more elongate posterior lobe and lacking spines. *P. garciai* sp. n. also has morphological affinity with *P. eserensis* Rodríguez & Vicente, 1992 from El Hierro, Canary Islands, but it can be differentiated from this species by the smaller number of ommatidia (7 compared to 20) and the shape and lack of spines on the first pleopod exopod.

DISCUSSION

At present, *P. garciai* sp. n. is only known from outside the entrance to Cavalum IV of the Furnas do Cavalum lava tube complex in Machico, Madeira. Specimens were collected, with difficulty, by sifting through the first few centimetres of frass-rich soil covered by a leaf layer of the invasive plant species *Pittosporum undulatum* Ventenat, 1802 (Fig. 1A). Sympatric terrestrial isopods found at the type location included the western palearctic species *Eluma caelata* (Miers, 1878) and *Porcellionides sexfasciatus* (Budde-Lund, 1885). Vandel (1960), also documents the cosmopolitan species *P. dilatatus* and *Oniscus asellus* Linnaeus, 1758, in addition to *Miktoniscus patiencei* Vandel, 1946 from the environs surrounding the cave system. Within the lava tubes, the Macaronesian endemic troglobitic species *Trichoniscus bassoti* Vandel, 1960 has been recorded from Cavalum I, II and III (Serrano & Borges, 2010) (Fig. 5A), in addition to a single observation of the Madeiran endemic *Soteriscus bremondi* Vandel, 1960 from within the entrance to Cavalum II (*pers. obs.*) (Fig. 5B).

During the micro-preparation of the type material of *P. garciai* sp. n., multiple secondary capilliconidia of *Basidiobolus* Eidam, 1886 (*Amphoromorpha*) fungi were found attached to the pereopods and antennae. This fungus has previously been cited as occurring on cave adapted terrestrial isopods by Racovitza (1907, 1908), but to our knowledge this has not been recorded from a *Porcellio* species before.

Due to *P. garciai* sp. n., currently being recorded from only a single locality, it remains unknown whether the species is restricted solely to, or has a strong specificity with, the microhabitat found around the cave entrance itself. Therefore, further soil faunal studies are strongly encouraged within the surrounding forests to understand the distribution and ecology of this new species. The Furnas do Cavalum lava tubes are listed in the Madeira Geological Heritage Inventory (M04), but lack any form of protection (Brum da Silveira *et al*., 2012; Baquero *et al*., 2023). As such, it is hoped that the addition of another new species, currently known only from the environs surrounding the lava tube complex, will further highlight the need to protect this important natural feature.

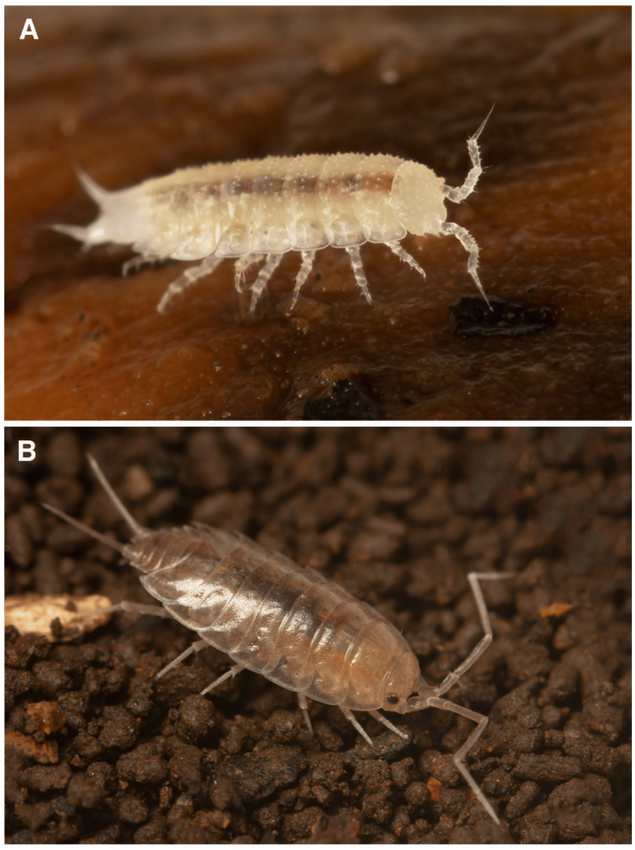

Fig. 5 – Madeiran endemic terrestrial Isopods found within the Furnas do Cavalum: **A**. *Trichoniscus bassoti*, **B**. *Soteriscus bremondi*.

Key to the *Porcellio* of the Madeiran Archipelago

The following key is a modification of the one provided by Vandel (1960), for the species belonging to the "Atlantic-group". It is expanded to incorporate all *Porcellio* recorded from the archipelago, including the cosmopolitan species and those described after Vandel's publication.

1. Glandular fields completely absent, dorsum strongly granulated and telson with a truncated apex (maximum size 21 mm) ..... ***Porcellio xavieri*** **Arcangeli, 1958**
1a. Glandular fields present, dorsum granulated or smooth **2**

2. Pereonites with a single glandular field **3**
2a. Pereonites with multiple glandular fields (at least on the first pereonite) attached to the lateral margin. Most species show clear sexual dimorphism of the antennae ... **9**

3. Pereonites with a single round or elliptical glandular field not attached to the lateral margin (with the exception of the first pereonite). Dorsum smooth to weakly granulated and the telson with a pointed apex (maximum size 20 m) ... . ***Porcellio laevis*** **Latreille, 1804**
3a. Pereonites with a single semicircular glandular field attached to the lateral margin **4**

4. Dorsum smooth without granulation (maximum size 5 mm) ..... ***Porcellio zarcoi*** **Vandel, 1960**
4a. Dorsum granulated **5**

5. Cephalon with a quadrangular, strongly projecting median lobe and telson with a pointed apex (maximum size 10 mm) .... ***Porcellio lamellatus madeirae*** **Arcangeli, 1958**
5a. Cephalon with a small rounded or pointed lobe. Telson trapezoidal or triangular with a rounded apex **6**

6. Body broad with expanded epimera. Telson parallel sided just before the apex. Male pleopod 1 exopod with a broadly rounded posterior lobe (maximum size 15 mm) .... ***Porcellio dilatatus*** **Brandt *in* Brandt & Ratzeburg, 1831**
6a. Body more elliptical. Telson triangular with regular curved edges before the apex. Male pleopod 1 exopod with either a triangular or clearly extended round posterior lobe **7**

7. Antennae not sexually dimorphic. Posterior margin of the male pleopod 1 exopod with an extended round lobe (maximum size 5 mm) ..... ***Porcellio garciai*** **Hughes sp. n.**
7a. Antennae sexually dimorphic. Posterior margin of the male pleopod 1 exopod with an evenly triangular lobe ... **8**

8. Granulation uniform across the entire dorsum (maximum size 13 mm) ... ***Porcellio normani*** **(Dollfus in Norman, 1899)**
8a. Granulation becoming more developed on the last 3 pereonites and pleonites, appearing spinescent on the posterior margin (maximum size 10 mm) .... ***Porcellio ferroi*** **Paulan de Félice, 1939**

9. Median cephalic lobe projecting further than the lateral lobes. The dorsum is entirely covered with coarse granules and the posterior margin of male pleopod 1 exopod with a concave lobe ..... ***Porcellio gruneri*** **Hoese, 1978**
9a. Median cephalic lobe projecting to the same extent as the lateral lobes, but if extending further then the dorsum granulation is much more pronounced in the posterior half. Posterior margin of male pleopod 1 exopod with an evenly triangular lobe or with a single projecting point **10**

10. Small. Body convex and narrow, with parallel sides. The dorsum Is entirely granulated and the antennae have pronounced sexual dimorphism (maximum size 6 mm) .... ***Porcellio scitus*** **(Budde-Lund, 1885)**
10a. Much larger (12-19 mm) **11**

11. Dorsum strongly granulated becoming well developed and spinescent in the posterior half (maximum size 19 mm) ..... ***Porcellio atlantidium*** **Paulian de Félice, 1939**
11a. Dorsum with weak granulation in the posterior half **12**

12. Sexual dimorphism of the antennae pronounced, teeth of peduncle articles 2, 3 and 4 very strongly developed in the males. Posterior margin of the male pleopod 1 exopod with an evenly triangular lobe (maximum size 18 mm) .... ***Porcellio cataractae*** **Vandel, 1960**
12a. Sexual dimorphism of the antennae weak, teeth of peduncle article 2, 3 and 4 weak or absent in the males. Posterior margin of the male pleopod 1 exopod with a single projecting point (maximum size 12 mm) .... ***Porcellio maculipes*** **Budde-Lund, 1885**

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REFERENCES

BAQUERO, E., J. I. ARBEAM, É. NUNES, D. AGUIN-POMBO, E. MATEOS & R. JORDANA:

2023. Collembola if the Cavalum and Landeiro Caves (Madeira, Portugal). *Insects*, **14** (6): 525. 10.3390/insects14060525.

BRUM da SILVEIRA A., S. PRADA, R. RAMALHO, J. MADEIRA, P. FONSECA, E. CANHA & J. BRILHA:

2012. Inventariação do Património Geológico da Ilha da Madeira. Secretaria Regional do Ambiente e Recursos Naturais – Relatório Final. World Wide Web electronic publication. https://geodiversidade.madeira.gov.pt: 414p. (Last accessed on 01 May 2022).

HOESE, von B.:

1978. Über eine Isopodensammlung von Madeira und eine neue *Porcellio*-art: *Porcellio gruneri* n. sp. (Isopoda, Oniscoidea). *Bocagiana*, **44**: 1-7.

RACOVITZA, E. G.:

1907. Biospeologica IV: isopodes terrestres. *Archives de Zoologie Expérimentale et Générale*, **4** (7): 145-225.

1908. Biospeologica IX: isopodes terrestres. *Archives de Zoologie Expérimentale et Générale*, **4** (9): 259-415.

RODRIGUEZ, R.:

1990. Algunas consideraciones del género *Soteriscus* Vandel, 1956 en las Islas Canarias con la descipción de una nueva especie: *Soteriscus disimilis* n. sp. (Crustacea: Isopoda: Oniscidea). *Boletín de la Asociación Española de Entomología*, **14**: 115-126.

SCHMALFUSS, H.:

2003. World catalog of terrestrial Isopods (Oniscidea). *Stuttgarter Beiträge zur Naturkunde, Serie A*, **654**: 1-341.

SERRANO, A. R. M., & P. A. V. BORGES:

2010. The cave-adapted arthropod fauna from Madeira archipelago. *Arquipelago. Life and Marine Sciences*, **27**: 1-7.

VANDEL, A.:

1946. Crustacés isopodes terrestres (Oniscoïdea) épigés et cavernicoles du Portugal. *Anaïs da Faculdadede Ciências do Porto*, **30**: 135-427.

1951. Le genre *Porcellio* (crustacés; isopodes: Oniscoidea). Évolution et systématique. *Mémoires du Muséum national d'Histoire naturelle, Série A*, **3**: 81-192.

1956. Une nouvelle classification du genre *Porcellio* (crustacés; isopodes terrestres). *Bulletin du Muséum national d'Histoire naturelle, 2e Série*, **28**: 124-128.

1960. Les Isopodes Terrestres de l'Archipel Madérien. *Mémoires du Muséum national d'histoire naturelle, Nouvelle série. Série A*, **22**: 1-156.