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## Description of *Lucasius tazeekkaensis* sp. nov. from Morocco (Isopoda: Oniscidea: Porcellionidae) with an identification key of the known species of the genus

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### Abstract

A new myrmecophilous species of terrestrial isopod belonging to the genus *Lucasius* is described from the Middle Atlas of Morocco. *Lucasius tazeekkaensis* sp. nov. is morphologically very similar to *L. andalusicus* from Spain and *L. myrmecophilus* from Algeria, differing from them only in subtle morphological characters despite a highly similar habitus. An identification key for distinguishing the four species currently known within the genus is also provided.

**Key words** Terrestrial isopods, myrmecophily, Maghreb, Middle Atlas, Tazekka.

### Introduction

The genus *Lucasius* was erected by Kinahan (1859) to accommodate *Lucasius myrmecophilus* Kinahan, 1859 from Algeria. Subsequently, *Lucasius* was treated as a subgenus of *Porcellio* (see Boyko *et al.* 2026). Several species of Porcellionidae initially included within *Lucasius* were later reassigned to other genera (see Schmalfuss 2003). The genera *Agabiformius* Verhoeff, 1908, *Mica* Budde-Lund, 1908, and *Leptotrichus* Budde-Lund, 1879 exhibit notable morphological affinities with *Lucasius*, primarily a relatively small body size (maximum 7.5 mm), eyes composed of a low number of ommatidia, antennae with the first flagellar article much shorter than the second, a triangular pleotelson with concave sides, and small uropods in both sexes (Caruso & Lombardo 1996). This resemblance has led to several misidentifications (Taiti & Rossano 2015).

The type species of the genus is *L. myrmecophilus*, reported from North Africa (Algeria and Morocco) and the Iberian Peninsula (Budde-Lund 1885; Dollfus 1896; Schmalfuss 2003; Achouri *et al.*

2008; Garcia *et al.* 2019; Cifuentes, 2021). However, a revision of old topotypical material of *L. myrmecophilus* demonstrated that the specimens from the Iberian Peninsula belong to a distinct species, *Lucasius andalusicus* Garcia, 2019. *Lucasius myrmecophilus* and *L. andalusicus* exhibit a highly similar habitus, differing only in subtle but significant characters, mainly the position of the noduli laterales and the morphology of the antennae (Garcia *et al.* 2019). *Lucasius pallidus* (Budde-Lund, 1885) is also known from the same geographic region, although this species is morphologically distinct and exhibits a wider distribution (see Schmalzfuss 2003; Taiti & Rossano 2015; Cifuentes 2021).

During a faunistic survey conducted in Tazekka National Park (Taza Province, Fès-Meknès region, Morocco), several specimens of *Lucasius* were collected from ant nests. These specimens exhibit a somatic morphology very similar to that of *L. myrmecophilus* and *L. andalusicus*. However, a detailed morphological study allowed them to be distinguished from the aforementioned species, and they are herein described as a new species.

## Material and methods

### Study area

Tazekka National Park (Morocco) is a protected area located in the northern Middle Atlas, near the city of Taza (Fig. 1A). Established in 1950, it was initially designated to conserve relict stands of Atlas cedar (*Cedrus atlantica* Carrière, 1855) and associated high-altitude Mediterranean ecosystems. The park has since been expanded to approximately 13,700 ha and encompasses a heterogeneous mosaic of mountain forests, karstic formations, valleys, and riparian habitats, which together constitute important ecological refugia within a region characterized by pronounced altitudinal climatic gradients. Vegetation is dominated by *Cedrus atlantica*, cork oak (*Quercus suber* L.), and holm oak (*Quercus ilex* L.), and is characterized by high floristic diversity, including numerous medicinal and endemic plant taxa (Saadi *et al.* 2020). The park harbours relict and endemic invertebrate species, highlighting its ecological importance as a refuge for ancient lineages and species found nowhere else (Belahcen *et al.* 2023; Piscart *et al.* 2025).

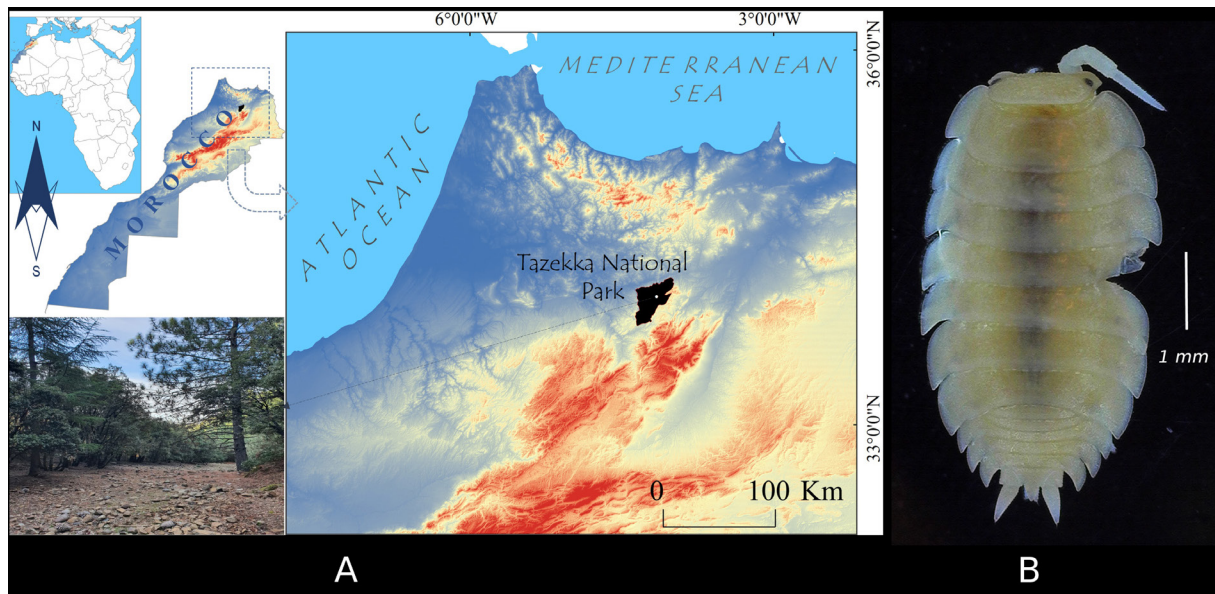


**Figure 1.** Location of Tazekka National Park (Morocco) and habitat of *Lucasius tazeekkaensis* sp. nov. B. *Lucasius tazeekkaensis* sp. nov. Female paratype.

The Tazekka National Park massif exhibits strong altitudinal climatic gradients. Mean annual rainfall ranges from approximately 500 mm at Taza (500 m a.s.l.) to 1,267 mm at Bab Bou Idir (1,570 m a.s.l.). Maximum temperatures in the warmest month vary from 34.5 °C at Taza to 28 °C at Tazekka (1,380 m a.s.l.), while minimum temperatures in the coldest month range from −2.8 °C at Bab Bou Idir to 5.5 °C at Taza. The duration of the dry season varies with elevation, lasting approximately 2–3 months

at higher altitudes and 4–5 months at lower elevations. These gradients reflect a transition from subhumid conditions at lower elevations to humid bioclimatic stages at higher altitudes (Fougrach *et al.* 2007).

### Specimen Preparation and Morphological Analysis

Specimens were collected from an ant nest and preserved in 70% ethanol. The study was based exclusively on morphological characters. One male specimen was dissected under stereomicroscope (Euromex Nexius). Body parts were temporarily mounted in glycerin for microscopic observation and hand-drawn using a camera lucida mounted on a compound microscope (Olympus CH 30). Cephalon, mouthparts, pleon, pleotelson, pleopods and uropods were mounted on slides using glycerin-jelly as the mounting medium. Pereon-tergites and appendages were preserved separately in microvials with 70% ethanol. The relative position of the noduli laterales (d/c and b/c indexes) was obtained and graphically represented following Vandel (1962) method. Final illustrations were prepared using the free software GIMP, following Montesanto (2015), with the additional assistance of a graphics tablet (Wacom-Intuos). Type specimens have been deposited in the crustacean collection at Museu Balear de Ciències Naturals (MUCBO Foundation) in Mallorca, Balearic Islands, Spain (MBCN).

## Systematics

### Order Isopoda Latreille, 1817

### Suborder Oniscidea Latreille, 1802

### Family Porcellionidae Brandt, 1831

### Genus *Lucasius* Kinahan, 1859

#### *Lucasius tazeekkaensis* sp. nov.

Figs. 1B and 2–3

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**Material examined** — HOLOTYPE: ♂, Morocco, Fès-Meknès province, Tazekka National Park, 1/02/2024; leg. Y. Mabrouki and A. Fouzi Taybi; specimen divided into 2 microscope slides and 7 vials; MBCN 33612-1 to MBCN 33612-9. PARATYPES: 2 ♀, same data as for the Holotype; MBCN 33613 and MBCN 33614. All specimens collected in a nest of *Messor* sp.

**Description** — Dimensions. Male, 7.1 mm; female, 6.2 mm. Color light brown without visible muscle attachment spots; antennae and epimera, unpigmented (Fig. 1B). Cephalon and tergites smooth, with triangular scale-setae (Fig. 2A). Glandular field only present on pereonite 1, not well defined, with approximately 5-8 pores near anterolateral corner. Noduli laterales small, not very distant from lateral margin on pereonites 1-3 and 5-7, and paramedian on pereonite 4 (Fig. 2B). Cephalon without supra-antennal line; lateral lobes protruding laterally; without frontal lobe; eyes with about 20 ommatidia (Fig. 2C). Outline of pereon and pleon, not stepped; pereon and pleon tergites with posterior tips of epimera directed backward; pereonites 1-3 with sinuated posterior margin; 4, regularly curved; 5-6, straight; 7, concave. Pleonites 3-5 with posterior corners directed backward; posterior tip of pleon tergite 5 not exceeding uropod protopods' posterior margin (Fig. 2C-D). Pleotelson triangular with slightly concave sides; tip surpasses uropod protopods' posterior margin (Fig. 2D). Uropod protopods with concave posterior margin; with prominent and acute lateral corner (Fig. 2E). Uropod exopods conical; endopods cylindrical, inserted proximally, reaching up to 1/4 of exopods' length (Fig. 2E). Antennula with distal article 4 times as long as medial and slightly longer than basal; distal article bearing 8-10 aesthetascs and small apical lobe (Fig. 2F). Antenna does not surpass posterior margin of pereonite 1 when extended backward; densely covered by scale-setae; fourth peduncular article deeply emarginate ventrally; fifth peduncular article cylindrical, as long as articles 3rd+4th; first flagellar article very short, partially housed in 5th peduncular article distal cavity; second flagellar article 10 times longer than first (Fig. 2G). Right mandible with dichotomized molar process bearing 8 branches; 3+1 penicils (Fig. 2H); left

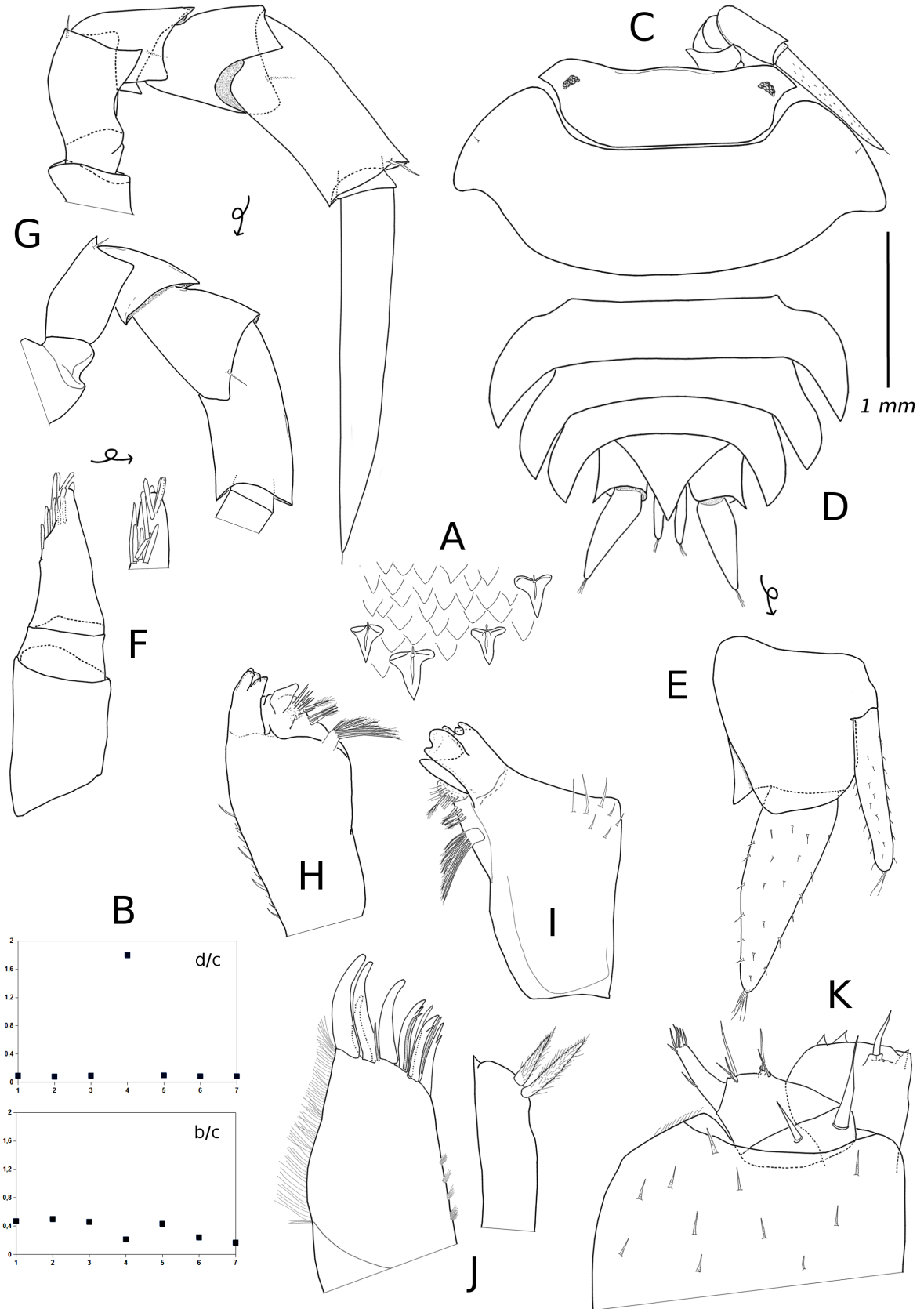


**Figure 2.** *Lucasius tazeekkaensis* sp. nov. Male holotype. A. Dorsal scale-setae. B. Noduli laterales d/c and b/c coordinates. C. Cephalon and first pereon-tergite, dorsal. D. Pleon-tergites 3–5, pleotelson and uropods, dorsal. E. Right uropod, ventral. F. Antennula. G. Antenna. H. Right mandible. I. Left mandible. J. Maxillule. K. Maxilliped.

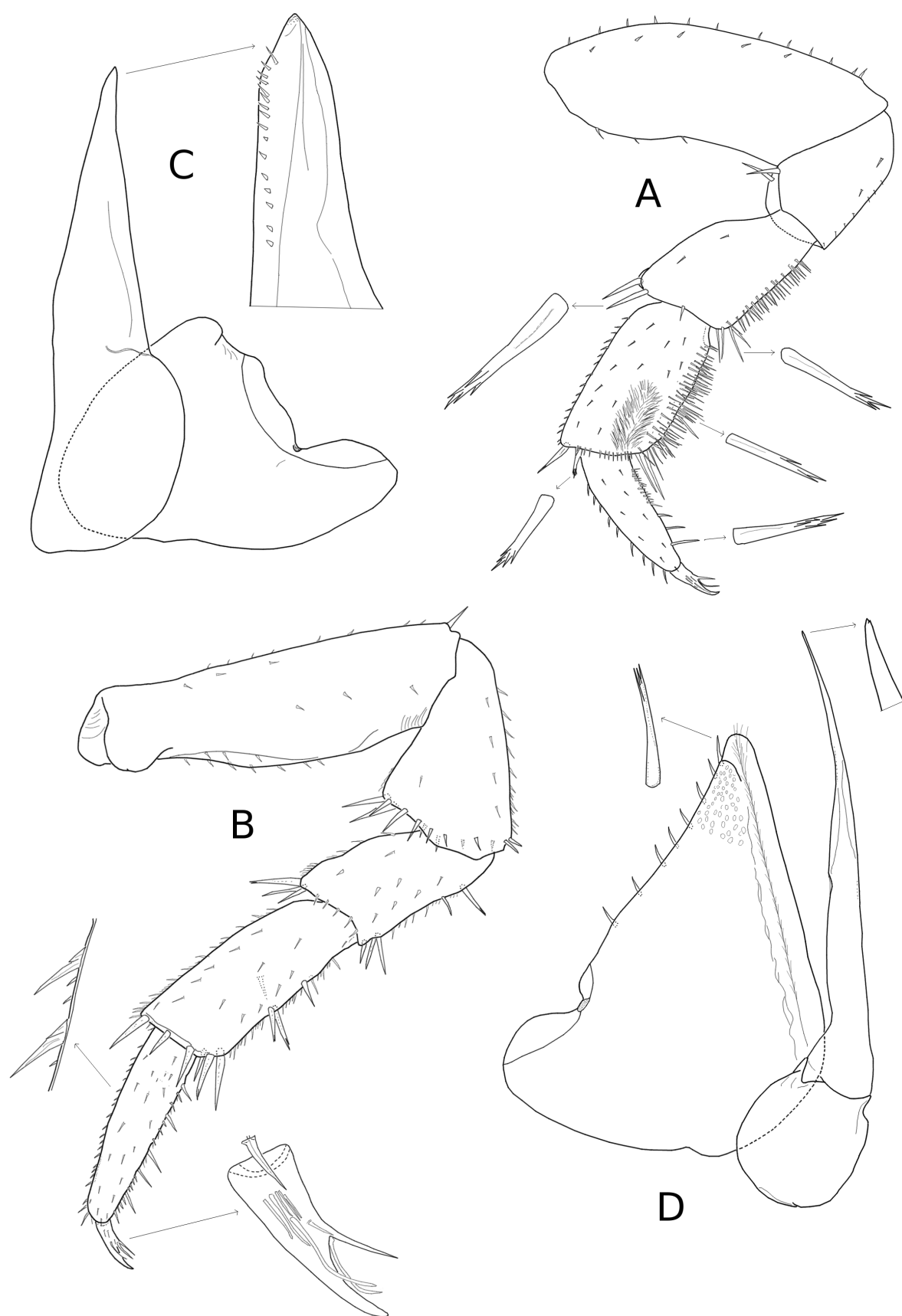


**Figure 3.** *Lucasius tazeckaensis* sp. nov. Male holotype. A. Pereopod 1. B. Pereopod 7. C. Pleopod 1. D. Pleopod 2.

mandible with dichotomized molar process with 8 branches; 4+1 penicils (Fig. 2I). Maxillule, external branch with 11 teeth, 4 of them thick and smooth, 3 apically cleft, and 4 entire and slender; internal branch with 2 penicils and short posterior tip (Fig. 2J). Maxilla bilobed, without special features. Maxilliped with 2 setae on palp basal article; medial article with 2 groups of setae; distal article with apical tuft of short setae; endite with 3 triangular lobes (2 on upper margin and 1 on frontal face) and one strong seta on caudal face; basis with slender triangular scale-setae on caudal face (Fig. 2K).

Male: Pereopods 1–2 with ventral brush of setae on merus and carpus (Fig. 3A). Pereopod 7 without sexual modifications; ischium with straight ventral margin (Fig. 3B). Pleopod 1 exopod with short posterior lobe, distally rounded; respiratory field with notched outer margin, extending to 2/3 length of exopod margin (Fig. 3C); endopod twice as long as exopod, with small teeth on ventral face of apex (Fig. 3C). Pleopod 2 exopod with straight inner margin; respiratory field with notched outer margin, extending to 1/3 length of exopod margin (Fig. 3D); endopod flagelliform 1.5 times longer than exopod, with progressively sharp apical part (Fig. 3D).

**Etymology** — The species name derives from the toponym Tazekka, a natural area and mountain massif located in the Middle Atlas mountain range, Morocco.

**Remarks** — *Lucasius tazeekkaensis* sp. nov. is closely related to *L. andalusicus*, from the Iberian Peninsula, and to *L. myrmecophilus*, from Algeria, species with which it shares a very similar habitus, a markedly flattened body, lateral cephalic lobes projecting outwards, and the extreme reduction of the first article of the antennal flagellum (cf. Fig. 1B and Garcia et al., 2019, figs. 7 and 8). It differs from *L. myrmecophilus* in the position of the noduli laterales of tergite 4; in the morphology of the antenna (cf. Fig. 2B–G, 3C and Garcia et al. 2019, figs. 1B and 1E); and in the shape of the first male pleopod exopods, which lack the posterior distal protrusion characteristic of all other species of the genus (Fig. 3C). It differs from *L. andalusicus* in the morphology of the antennae and the shape of the first male pleopod exopods (cf. Fig. 2G, 3C and Garcia et al., 2019, figs. 1D and 4A–C). The differences with *L. pallidus* are more significant, primarily concerning head morphology, antennae, and exopods of the first male pleopods (cf. Vandel, 1962, fig. 321). Identification of the four known species of the genus is facilitated by the following key.

#### Identification key to the species of the genus *Lucasius*

- 1 Body very flattened dorsoventrally, with uniform colouration; tergites smooth or slightly granulate. Central cephalic lobe absent or very poorly developed; lateral lobes expanded laterally. First article of the antennal flagellum reduced, more than 8 times shorter than the second article .....3
- 2 Body slightly convex, with contrasting colouration (sometimes partially unpigmented). Central and lateral cephalic lobes well-developed, prominent, the central one raised upwards. Cephalon and tergites with evident, more or less developed, granulations. First article of the antennal flagellum about 3 times shorter than the second article. Noduli laterales of the pereon-tergite 4, much farther from the lateral margin than in the other tergites; male pleopod 1 exopod, with a posterior distal protrusion .....*Lucasius pallidus*
- 3 Noduli laterales of pereon-tergite 4, very far from the lateral margin, in a paramedian position .....4
- Noduli laterales of pereon-tergite 4 no farther from the distal margin than those of the other tergites. First article of the antennal flagellum approximately 8 times shorter than the second, completely visible dorsally and ventrally. Fifth article of the antennal peduncle subcylindrical, approximately 1.5 times longer than the fourth. Exopod of the first male pleopod slightly wider than long, with a distal protrusion.....*Lucasius myrmecophilus*
- 4 First article of the antennal flagellum, approximately 10 times shorter than the second, partially housed in the distal cavity of the fifth peduncular article, only fully visible in ventral view; fifth peduncular article subconical, approximately as long as the fourth; exopod of the first male pleopod one and a half times longer than wide, with a distal protrusion..... *Lucasius andalusicus*
- First article of the antennal flagellum, approximately 10 times shorter than the second, partially housed in the distal cavity of the fifth peduncular article, but visible dorsally and ventrally; fifth peduncular article subcylindrical, twice as long as the fourth; exopod of the first male pleopod one and a half times wider than long, without distal protrusion .....*Lucasius tazeekkaensis* sp. nov.

## Discussion

Three of the four species currently included in the genus *Lucasius*—*L. myrmecophilus*, *L. andalusicus*, and *L. tazeekkaensis* sp. nov.—are morphologically very similar and show clear adaptations to myrmecophily. These adaptations are characterized primarily by a flattened body, modified antennae (including reduction of the first antennal flagellum), and reduced eyes, among other features. They occur in numerous lineages of terrestrial myrmecophilous isopods that are not phylogenetically closely related, which undoubtedly reflects a case of convergent evolution (see Parmentier *et al.* 2025). To date, these three species have only been found in ant nests of the genus *Messor* Forel, 1890 (Garcia, 2019; this study; and unpublished data), although *L. myrmecophilus* was originally described as a commensal of *Aphaenogaster testaceopilosa* (Lucas, 1846). Parmentier *et al.* (2025) consider *L. myrmecophilus* and *L. andalusicus* to be obligate myrmecophiles, a condition that most likely also applies to *L. tazeekkaensis* sp. nov. In the study area, we also collected *L. pallidus*, in this case co-occurring with ants of the genus *Camponotus* Mayr, 1861, although this species is considered an occasional myrmecophile and its morphology does not appear to be highly specialized (Vandel, 1962). According to Vandel (1962), in Morocco *L. pallidus* is frequently found in association with ants of the genus *Bothriomyrmex* Emery, 1869.

*Lucasius myrmecophilus*, *L. andalusicus*, and *L. tazeekkaensis* sp. nov. exhibit differences in antennal morphology, particularly a progressive reduction of the first flagellar article, which is relatively long and distinct in *L. myrmecophilus* and much shorter, almost vestigial, in the other two species. Differences are also observed in the shape and relative length of the antennal peduncular segments and in the position of the noduli laterales (see identification key). However, the marked difference in the position of the noduli laterales on the fourth pereon tergite in *L. andalusicus* and *L. tazeekkaensis* sp. nov. (and also, in *L. pallidus*) compared to *L. myrmecophilus* represents an important character suggesting a greater divergence between the Algerian species and the other members of the genus. This character—which contrasts with the overall morphological similarity of the remaining features—deserves further investigation in more specialized future studies. Such work will be necessary, as some characters traditionally used in Porcellionidae taxonomy have proven inconsistent and are not supported by molecular and genetic data (Dimitriou *et al.* 2018).

In Morocco, there are previous records of *L. pallidus* (Taiti & Rossano 2015) and *L. myrmecophilus* (Vandel 1958; Schmölzer, 1965, 1971; Achouri *et al.* 2008); however, the records of the latter species require confirmation. Due to their very similar overall morphology, *L. myrmecophilus*, *L. andalusicus*, and *L. tazeekkaensis* sp. nov. were probably confused in the past, both in Morocco and on the Iberian Peninsula (see Garcia *et al.* 2019). Their distributions are likely allopatric, and they are distinguished by subtle but significant morphological characters (see identification key).

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