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A NEW SPECIES OF *LUCASIUS* (ISOPODA: ONISCIDEA: PORCELLIONIDAE) FROM SOUTHERN SPAIN, WITH REMARKS ON *LUCASIUS MYRMECOPHILUS* KINAHAN, 1859

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Abstract: A new species of Isopoda Oniscidea of the family Porcellionidae, *Lucasius andalusicus* n. sp., is described. This new species has been found in nests of the ant *Messor barbarus*, in the Cádiz and Almería regions of southern Spain. *Lucasius myrmecophilus* Kinahan, 1859 is also reviewed and partly redescribed on the basis of some specimens collected by Dollfus in the 19th century in Algeria, from where this poorly known species was originally described. The study of the material preserved in the National Museum of Ireland (Dublin) allows an easy separation of this species from the new one. Both are distinguished from the third described species of the genus, *Lucasius pallidus* (Budde-Lund, 1885) by the characteristic structure of the cephalon and by the great reduction of the first article of the antennal flagellum, among other morphological characters. The possibility that *Lucasius myrmecophilus* also inhabits southern Spain, or has been confused in the past with *Lucasius andalusicus* n. sp., is also discussed. **Key words:** Isopoda, Oniscidea, Porcellionidae, *Lucasius*, taxonomy, Algeria, Spain

Una especie nueva de *Lucasius* (Isopoda: Oniscidea: Porcellionidae) del sur de España, con notas sobre *Lucasius myrmecophilus* Kinahan, 1859

Resumen: Se describe una especie nueva de isópodo terrestre (Isopoda: Oniscidea) perteneciente a la familia Porcellionidae, *Lucasius andalusicus* n. sp. La nueva especie se ha recolectado en nidos de la hormiga *Messor barbarus*, en las regiones de Cádiz y Almería (sur de la Península Ibérica). También se revisa *Lucasius myrmecophilus* Kinahan, 1859, que se redescribe parcialmente en base a algunos especímenes recolectados por Dollfus en el siglo XIX en Argelia, de donde se describió originalmente esta especie poco conocida. El estudio del material conservado en el Museo Nacional de Irlanda (Dublín) permite su fácil separación de la nueva especie. Ambas se distinguen de la tercera especie descrita del género, *Lucasius pallidus* (Budde-Lund, 1885) por la estructura característica del cefalón y por la gran reducción del primer artículo del flagelo antenal, entre otros caracteres morfológicos. Finalmente se discute la posibilidad de que *Lucasius myrmecophilus* también habite en el sur de España o se haya podido confundir en el pasado con *Lucasius andalusicus* n. sp.

Palabras clave: Isopoda, Oniscidea, Porcellionidae, *Lucasius*, taxonomía, Argelia, España.

Taxonomy / Taxonomía: *Lucasius andalusicus* n. sp.

Introduction

As a result of faunistic surveys conducted in the last years in hypogean and surface environments of the south of the Iberian Peninsula, a new species of myrmecophilous terrestrial isopod, belonging to the genus *Lucasius* Kinahan, 1859 (family Porcellionidae), was discovered.

The first specimens of this species were photographed by one of the coauthors (F.R.L.) in the field (without the presence of ants), in the province of Almería, and the images were disseminated without identification through the Internet spanish portal Biodiversidad Virtual (Virtual Biodiversity).

Initially, this morphotype was attributed by the first author to *Lucasius myrmecophilus* Kinahan, 1859, a poorly known species described in the 19th century from material from Algeria and later cited in southern Spain by different authors. In order to redescribe this species, more specimens were actively searched for the Cádiz region and several populations were found in coexistence with the ant *Messor barbarus* (Linnaeus, 1767). However, when these specimens are compared with others of *Lucasius myrmecophilus* from the Adrien Dollfus collection, collected in Algeria and conserved in the National Museum of Ireland, it has been proven that they belong to a different species, which is described here as a new species.

Taiti & Rossano (2015) have recorded *Lucasius pallidus* (Budde-Lund, 1885) in North Africa (Morocco) and suggest that this species, also present in the south of the Iberian Peninsula, could be a synonym of *Lucasius myrmecophilus* since there are contradictions about their main recognition characters; they consider it necessary to review the type material of the last species. At the moment, we have not been able to perform a formal redescription of *Lucasius myrmecophilus* based on the study of type material. However, the examination of the topotypic specimens of Dollfus preserved in the Museum of Dublin, has allowed us to describe its main external morphological characters in order that this species can be distinguished from others of the same genus.

Methods

The specimens of the new species were collected from ant nests. They were preserved and stored in 70% ethanol. For the morphological study, they were treated with Aman's Lactophenol liquid and dissected under the stereomicroscope (Olympus VMT and Euromex Nexius). Appendices and mouthparts were then mounted on a slide using Faure's liquor. The Dollfus specimens of the National Museum of Dublin

were not dissected. They were placed whole on a cavity slide, with glycerin, and drawn *in toto*. All the drawings were made in pencil under an Olympus CH30 optical microscope equipped with an Olympus DA camera lucida. The final illustrations have been inked digitally as is described in Montesanto (2015) and with the aid of a Wacom Intuos drawing tablet. The photographs of the preserved material were obtained with a 5MP Dino-Lite digital microscope and prepared for illustration with the GIMP software.

Abbreviations

MNCN: National Museum of Natural Sciences-Museo Nacional de Ciencias Naturales, Madrid, Spain

NMINH: National Museum of Ireland, Natural History Division, Dublin, Ireland

MBCN: Balearic Museum of Natural Sciences- Museu Balear de Ciències Naturals, Sóller, Mallorca Spain

CLLG: Lluc Garcia personal collection, Sóller, Mallorca, Spain

Taxonomy

Genus *Lucasius* Kinahan, 1859

Lucasius myrmecophilus Kinahan, 1859

Porcellio myrmecophilus Budde-Lund 1885

Lucasius myrmecophilus Dollfus, 1896

No *Porcellio myrmecophilus* Stein, 1859 (= *Porcellionides myrmecophilus*)

EXAMINED MATERIAL. NMINH: 1893.184.1. Algeria, Africa (no precise locality); from an ant nest. Collector Simon; Dollfus collection. 1 partially dissected ♂ specimen. 1 damaged ♂ specimen.

DESCRIPTION

Maximum length observed: 5 mm ♂. Habitus and general body form, as in figures 1A and 7A-B. Original pigmentation erased by the long stay in alcohol, no different shades in the integument or spots of muscle attachments are appreciated. Dorsal surface covered with minute, distinct, granulations and tricorn type scale-setae; the granulations are more abundant in the first three tergites. Glandular fields not visible in the whole animals. *Noduli laterales* small, not very distant from the lateral margin in the pereonites 1-7; *nodulus* of the pereonite 4 not eccentric (Figure 1 E). Cephalon without supra-antennal line; lateral lobes extended horizontally to the sides, with slightly curved front edge and slightly concave exterior margin; front slightly arched, no frontal lobe; eyes reduced, with about 8-10 ommatidia. Antenna (Figure 1 B) with antennal flagellum longer than the sum of the peduncular articles 3-5; first flagellar article very short, completely visible from the dorsal part; the second flagellar article is 9 times longer than the first. Pereonite 1-2 with a straight posterior margin and concave sides; epimera tips rounded. Pereonite 3-6 epimera with a clear angle with the hind margin and pointed tips directed backwards. Pereonite 7 hind margin regularly concave, the epimera forming only a weak angle next to the suture. Pleon slightly stepped in relation to the contour of the pereon. Pleonites 3-5 with the straight hind margin and large epimera, directed backwards. Telson triangular with straight sides, the tip exceeds the posterior margin of the uropod sympodites. Posterior margin of the uropodal sympodites straight. Uropodal exopods missing; the endopods extend beyond the tip of the telson.

REMARKS

Lucasius myrmecophilus was initially recorded in northern Algeria, where it was collected by Lucas. Later, Kinahan (1859) established the genus *Lucasius* and described this species based on the specimens collected by Lucas. This species has never been illustrated again, which makes its identification difficult. However, in the original description, Kinahan clearly defines its tergal morphology as: "granulated head, granulations that follow towards the first three segments of the cephalothorax". The illustration of the original description clearly shows the body densely covered with small granulations. Budde-Lund (1885) redescribes the Kinahan species based on specimens collected by Eugene Simon, also in Algeria. It defines the tegumentary aspect as densely and finely granulose ("dense et tenuiter granulatus") and its coloration as immaculate whitish ("color albidus, immaculatus"). However Vandel (1946; 1958; 1962), without providing concrete new data or illustrations, ensures that *L. myrmecophilus* differs from *L. pallidus* by having a smooth, instead a granulose, tegument. He also states that the species is also found in the south of Spain, near Málaga and in northern Morocco, near Melilla.

The examined specimens from the Dublin Museum, assigned to *Lucasius myrmecophilus*, were collected in Algeria by Eugene Simon and are part of a lot from the Dollfus collection, acquired by the museum in 1893. According to Dollfus (1896) the specimens of his collection collected by Simon come from the localities of Algiers, Teniet el Had and "Western Algeria" and also cites material from Cap Matifou and Touggourt. The specimens of Lucas described by Kinahan come from Medea and those of Simon, redescribed by Budde-Lund, are from Beidah. All localities (except Touggourt) are located within a radius of about 50 km.

The occurrence of *Lucasius myrmecophilus* in southern Spain, as indicated by Bude-Lund (1885) and Dollfus (1892) and then Vandel (1946; 1958; 1962) and Schmölzer (1965), needs confirmation; however, the recognition characters provided by Schmölzer (1965) correspond, for the most part, to this species (granulated and completely unpigmented).

Lucasius myrmecophilus can be distinguished from *Lucasius pallidus* by numerous morphological characters, especially by the shape of the cephalon that in *L. pallidus* has a large and triangular central lobe, non-existent in *L. myrmecophilus*; the lateral lobes extended horizontally in *L. myrmecophilus* and large and oblique in *L. pallidus*; the first article of the antennal flagellum, extremely short in *L. myrmecophilus* and less shortened in *L. pallidus*; by the form of telson, with straight sides in *L. myrmecophilus* and longer and with slightly concave sides in *L. pallidus*; among other external morphological characters. Both species have dorsal granulations.

Lucasius andalusicus Garcia 2019 n. sp.

EXAMINED MATERIAL:

Holotype: ♂, Algeciras, Cádiz, Spain, 15/10/2016, collected by Álvaro Pérez-Gómez (MNCN 20.04/11955). **Paratypes:** ♀, Algeciras, Cádiz, Spain, 15/10/2016, collected by Álvaro Pérez-Gómez (MNCN 20.04/11956); ♂, Campiña de Jerez, Cádiz, Spain, 24/12/2017, collected by Álvaro Pérez-Gómez, with *Messor barbarus* (MNCN 20.04/11957); 2 ♂♂, 4 ♀♀, Campiña de Jerez, Cádiz, Spain, 24/12/2017, collected by Álvaro Pérez-Gómez, with *Messor barbarus* (CLLG); 2 ovi-

gerous ♀♀, 1 ♂, Montes de Propio (La Jarda/Rojitán), Jerez de la Frontera, Cádiz, Spain, 23/05/2018, collected by Álvaro Pérez-Gómez, with *Messor barbarus* (CLLG). 3 ♂♂, 3 ♀♀, Algeciras, Cádiz, Spain, 15/10/2016, collected by Álvaro Pérez-Gómez (MBCN 23397, MBCN 23398). One specimen photographed *in vivo*, not collected, El Ejido, Almería, Spain, 24/12/2015, photograph by Francisco Rodríguez-Luque.

DIAGNOSIS

Cephalon without frontal lobe and lateral lobes extended horizontally; antenna with a very small, inconspicuous, first peduncular article; tergites smooth; *noduli laterales* of the IV pereonite located in the paramedian zone, very eccentric in relation to those of the tergites 1-3 and 5-7; posterior margin of the tergites 1-2 sinuated; telson triangular with concave basal part; uropodal sympodites with a concave hind margin.

ETYMOLOGY

From Andalusia (Andalucía), the southernmost region of Spain.

DESCRIPTION

Maximum length observed: 7.8 mm ♂; 6.8 mm ovigerous ♀. Habitus and general body form, as in figures 1 C, 7 C and 8). Colour light brown with the side edges of epimera and hind margin of tergites a little lighter; visible spots of muscle attachments in the paramedian areas of the pereon; white central stripe (hind gut contents visible due to the thin tegument); second antennae (*antennae*) without pigment in the peduncular articles 3-5 nor the flagellum; basal articles 1-2 of the same color as the tergites; ventral parts, pereopods and pleopods, unpigmented. Cephalon (Figure 2 A) with small and non prominent granulations. Tergites completely smooth, covered with many tricorn type scale-setae, with slight variations in shape and size according to the zones; semi-ovoid cuticular scales (Figure 2 B). Glandular fields only present in the anterior corners of pereonite 1, elongated in shape and near the lateral margin, with approximately 10-12 pores. *Noduli laterales* small, not very distant from the lateral margin in the pereonites 1-3 and 5-7; in pereonite 4 they are very far from the lateral margin, in the paramedian zone (Figure 1-F). Cephalon (Figure 2 A) without supra-antennal line; the frontal line is slightly erased in the center; lateral lobes very extended horizontally towards the sides and barely protruding forwards; front only slightly arched, no frontal lobe; eyes with about 10 ommatidia. Pereonites 1-3 with sinuated hind margins, concave at the sides; pereonites 4-5 with straight posterior margins and posterior corners of epimera bending backwards; hind margin of 6-7, regularly concave and also with posterior corners bending backwards; epimeral suture visible in pereonites 1-7, more evident in the last four. Pleon slightly stepped off the contour of the pereon; pleonites 3-5 with the posterior corners directed backwards. Telson triangular with slightly concave sides, the tip exceeding the length of uropod sympodites. Posterior margin of the uropodal sympodites concave. Uropodal exopods short, triangular, with a rounded tip; endopods reaching half the length of the exopods. First antennae (*antennulae*) (Figure, 2 C) with the basal article twice as long as the second and a little longer than the third; distal article with 15-18 aesthetascs, 10 of which subapical. Second antennae (Figure 1 D) not exceeding the posterior margin of pereonite 2 and densely covered by scale-setae; flagellum longer than the sum of the peduncular articles 2-5; first fla-

gellar article extremely short, almost invisible from the dorsal part, since the joint is inconspicuous and is partially embedded in the last peduncular article; the second flagellar article is 10 times longer than the first. Right mandible (Figure 4 F) with dichotomized molar penicil and 9-10 penicils in the middle part; left mandible (Figure 4 G) with dichotomized molar penicil and 4 penicils in the middle part. Maxillule (Figure 2 D-E) with 4 + 6 teeth and a supplementary seta on the external branch, three of the smaller ones toothed in their apical third; internal branch with two thick penicils and a sharp posterior corner. Maxilla (Figure 2 F) with three thick setae between the lobes; internal lobe with many cylindrical setae in the anterior margin; outer lobe finely pilose, a little more than twice as wide as the inner one. Maxilliped (Figure 2 G) with two setae in the first article of the palp and two, more longer and thinner, in the second; endite with two triangular teeth on the anterior edge and a strong pointed seta on the caudal face, without penicil; basis with divided setae in their caudal face.

Male: Pereopod 1 (Figure 3 A-B; Figure 6) carpus with a dense ventral brush of lacinate setae; merus with a ventral brush of pectinate setae. Pereopod 2 (Figure 6) with ventral brushes on merus and carpus. Pereopod 7 (Figure 3 C-D, Figure 6) ischium with distinct concave ventral margin in adult males (7 mm) -straight in specimens of 5 mm length- and a setose area in the frontal face (for additional sexual differences of these appendices see Figure 6). Pleopod 1 exopod (Figure 4 A-B) with acuminate medial lobe and indented respiratory field; the posterior apex is variable and ends in a rounded tip; endopod (Figure 4 A-C) longer than the exopod, with sinuate inner margin and small teeth on the central line of his apical half. Pleopod 2 (Figure 4 D-E) exopod with straight inner margin; outer margin with strong sensory spines and indented respiratory field; endopod one and a half times longer than exopod with sinuated, progressively sharp, apical part. Pereopods 3-5 as in Figure 5 A-C. Genital papilla with ventral shield and rounded distal part (Figure 5 D).

REMARKS

Lucasius andalusicus n. sp. seems closely related to *Lucasius myrmecophilus*. The new species presents, with the exception of the cephalon, a smooth tegument, whereas this is distinctly granulated in *L. myrmecophilus*; the first article of the antennal flagellum is distinctly shorter in *L. andalusicus* than in *L. myrmecophilus*, inconspicuous from the dorsal side; pereonites 1-3 with a markedly sinuate posterior margin in *L. andalusicus*, while in *L. myrmecophilus* it is straighter with concave sides; *L. andalusicus* presents visible epimeral sutures in pereonites 1-7 while in *L. myrmecophilus* they are only visible in pereon-tergites 3-7; the position of the *noduli laterales* is different in the two species: very far from the lateral margin in the IV pereonite in *L. andalusicus* n.sp. instead of no eccentric in *L. myrmecophilus*. Another difference is the hind edge of the uropod basipodite, clearly concave in *L. andalusicus* and almost straight in *L. myrmecophilus*. The telson is also different in the two species, with a widened, concave, basal part in *L. andalusicus* and with straight sides in *L. myrmecophilus*.

It differs from *Lucasius pallidus* by the absence of a central lobe in the cephalon; by the lateral lobes extended to the sides; by the extremely reduced basal article of the antennal

flagellum; and by the smooth instead of granulose dorsum, among other morphological characters.

Acknowledgment

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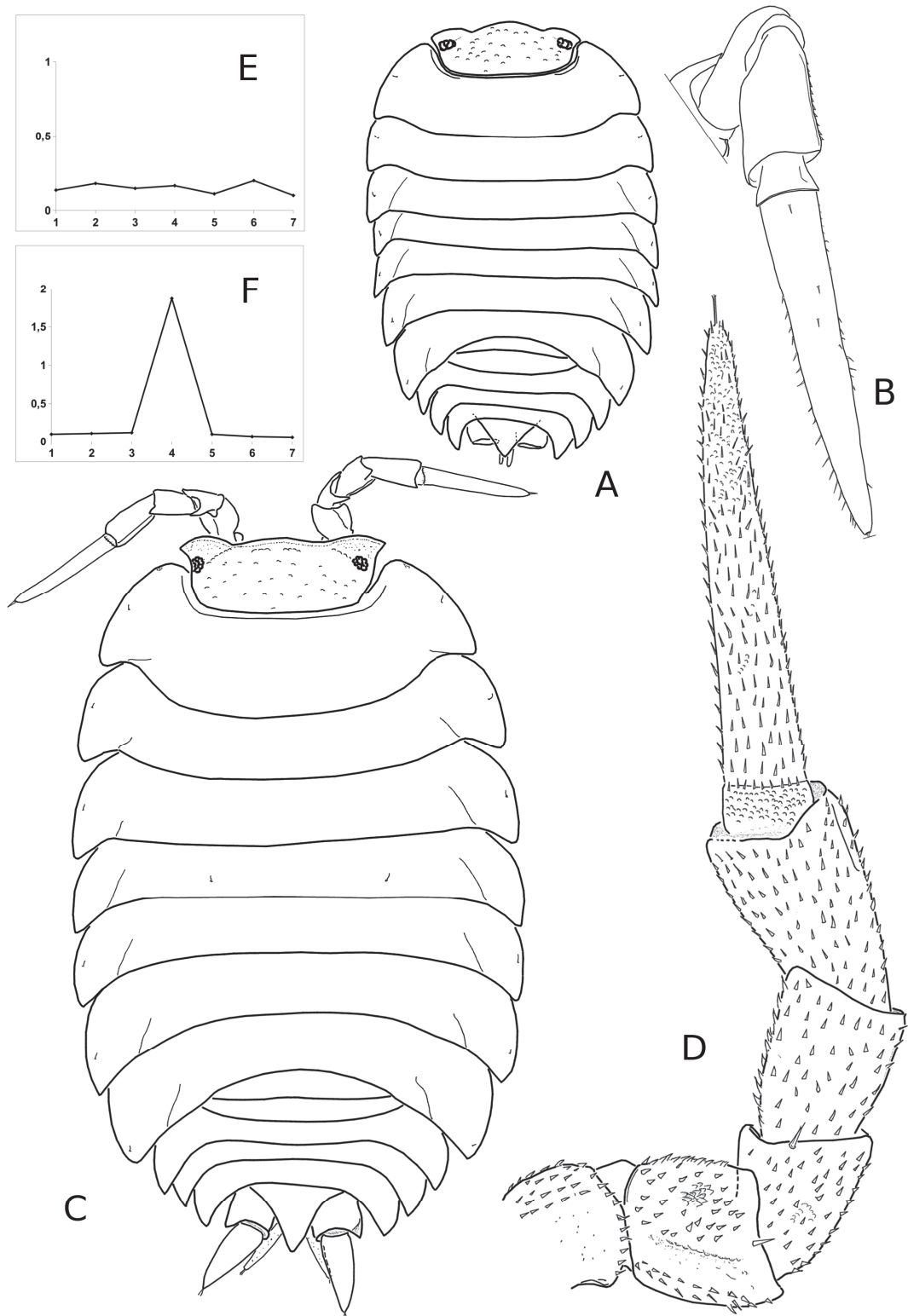


Fig. 1. **A.** *Lucasius myrmecophilus*, ♂, NMINH: 1893.184.1. Algeria. Dollfus collection. **B.** Second antenna (dorsal). **C.** *Lucasius andalusicus* n.sp. ♂, Cádiz, Spain. **D.** Second antenna (ventral). **E-F.** *Noduli laterales* (d/c co-ordinate values) of *L. myrmecophilus* (E) and *L. andalusicus* n.sp. (F).

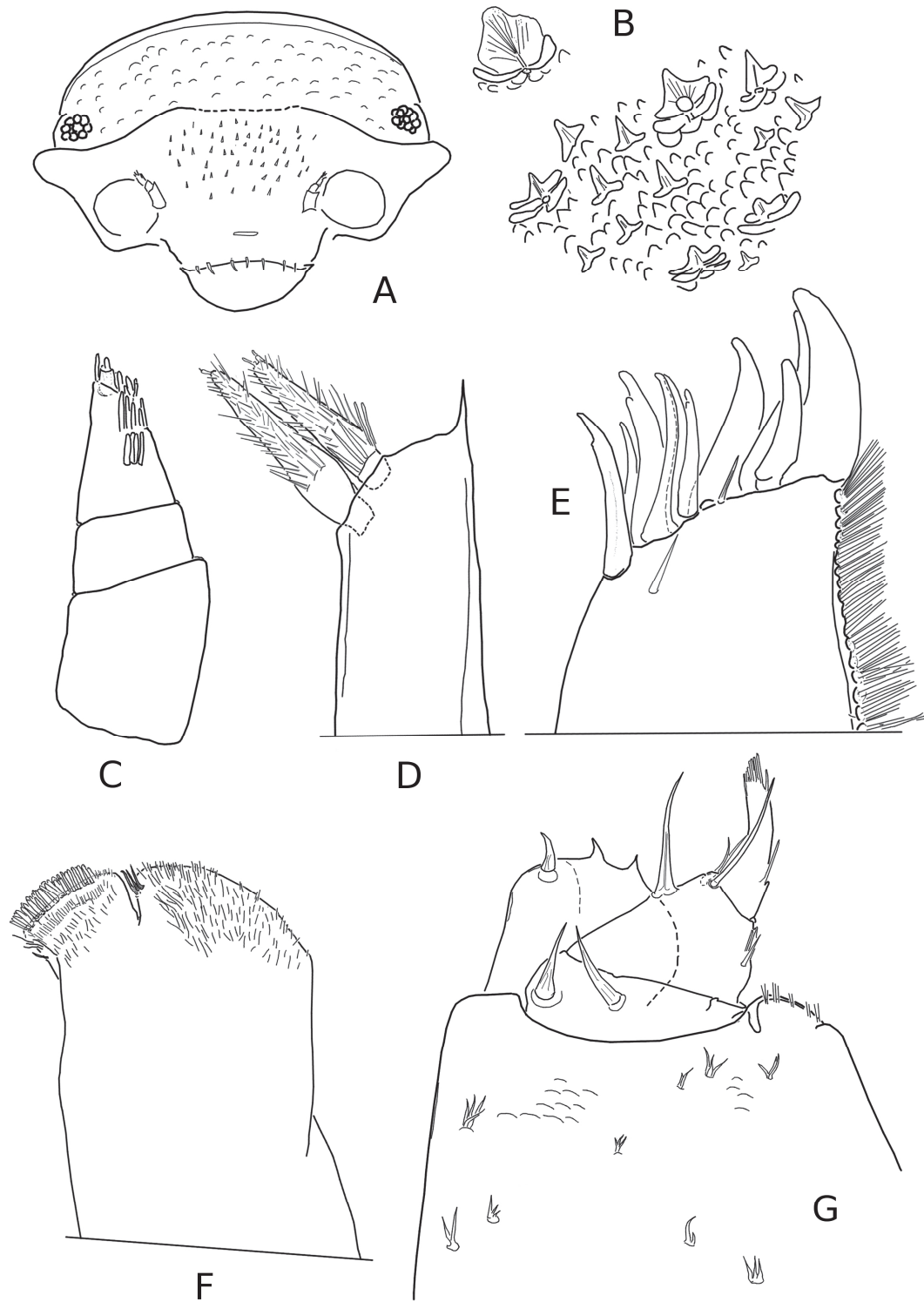


Fig. 2. *Lucasius andalusicus* n. sp. **A.** Cephalon (frontal). **B.** Scale-setae and cuticular scales. **C.** First antenna. **D-E.** First maxilla internal (D) and external (E) branches. **F.** Second maxilla. **G.** Maxilliped.

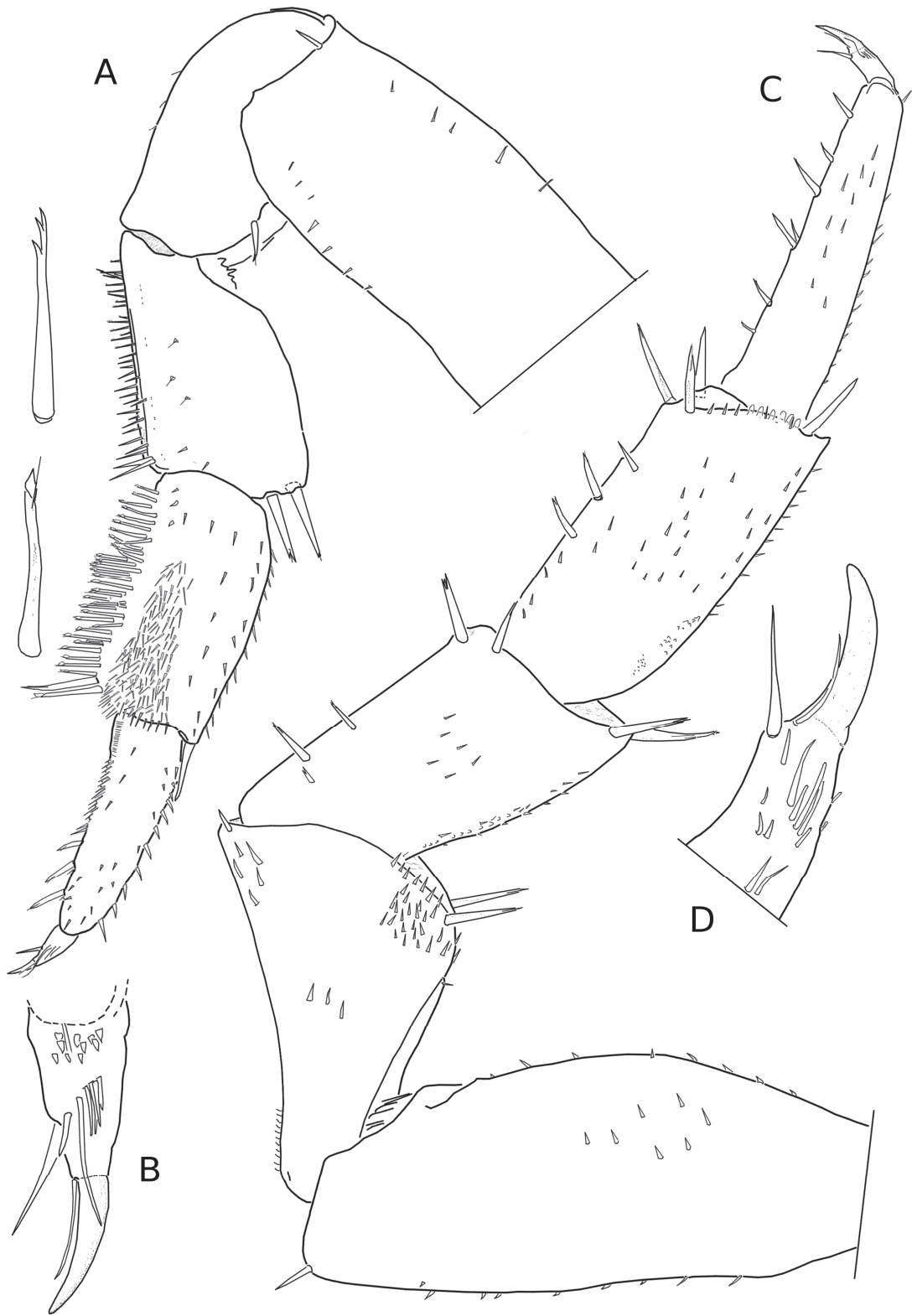


Fig. 3. *Lucasius andalusicus* n. sp. **A-B.** ♂ First pereopod, frontal (A) and detail of dactylus (B). **C-D.** ♂ Seventh pereopod, frontal (C) and detail of dactylus (D).

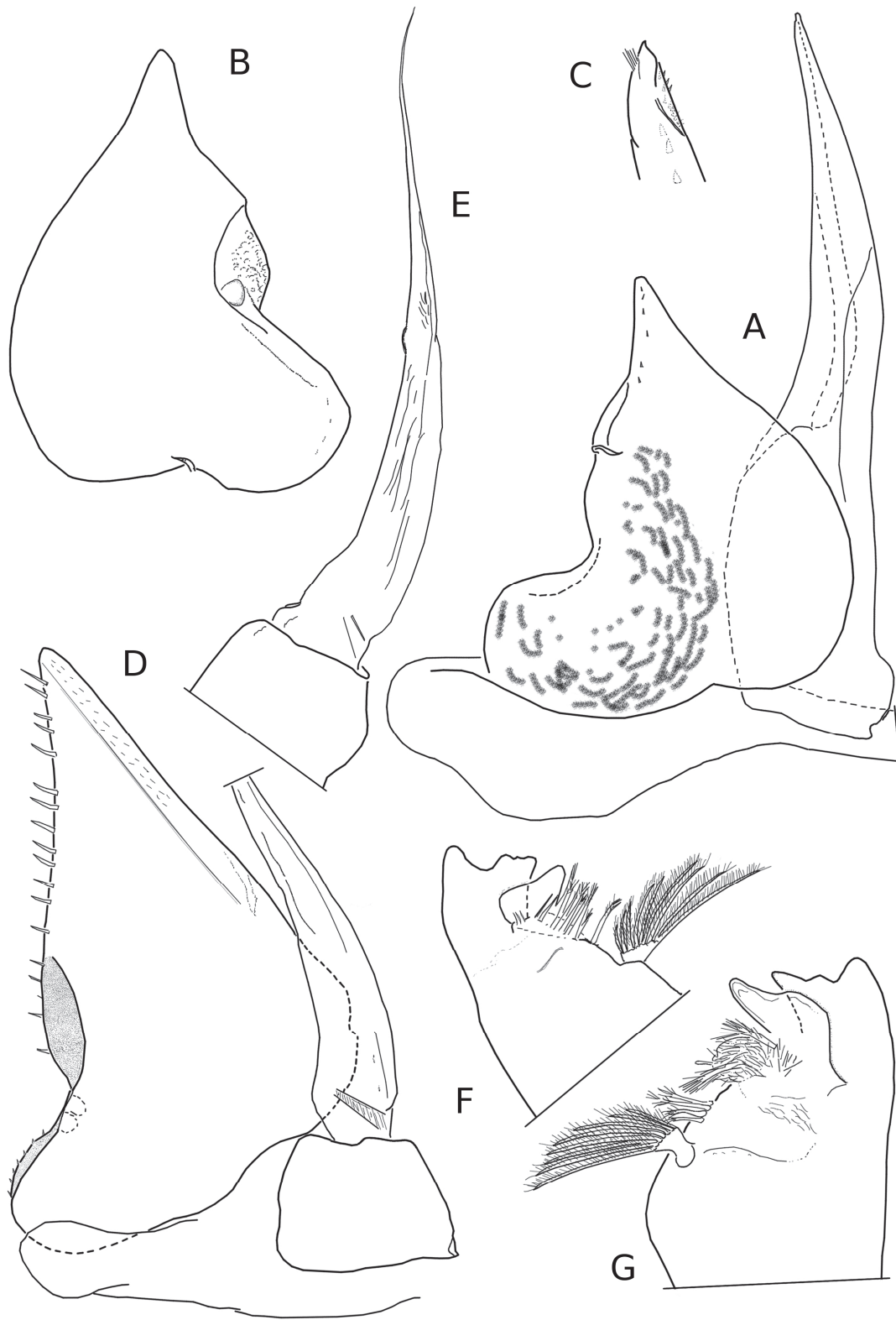
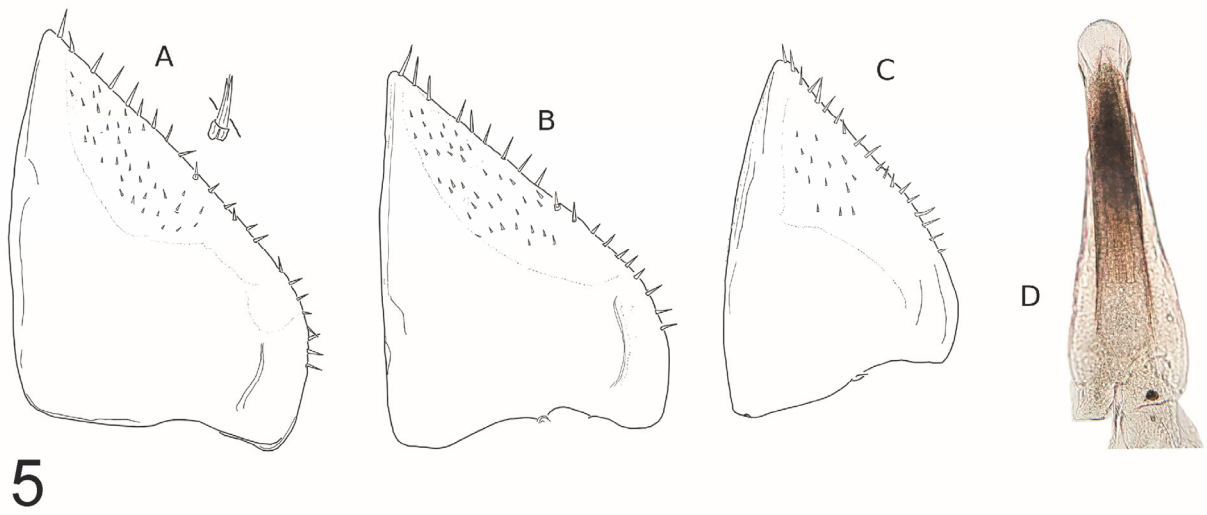
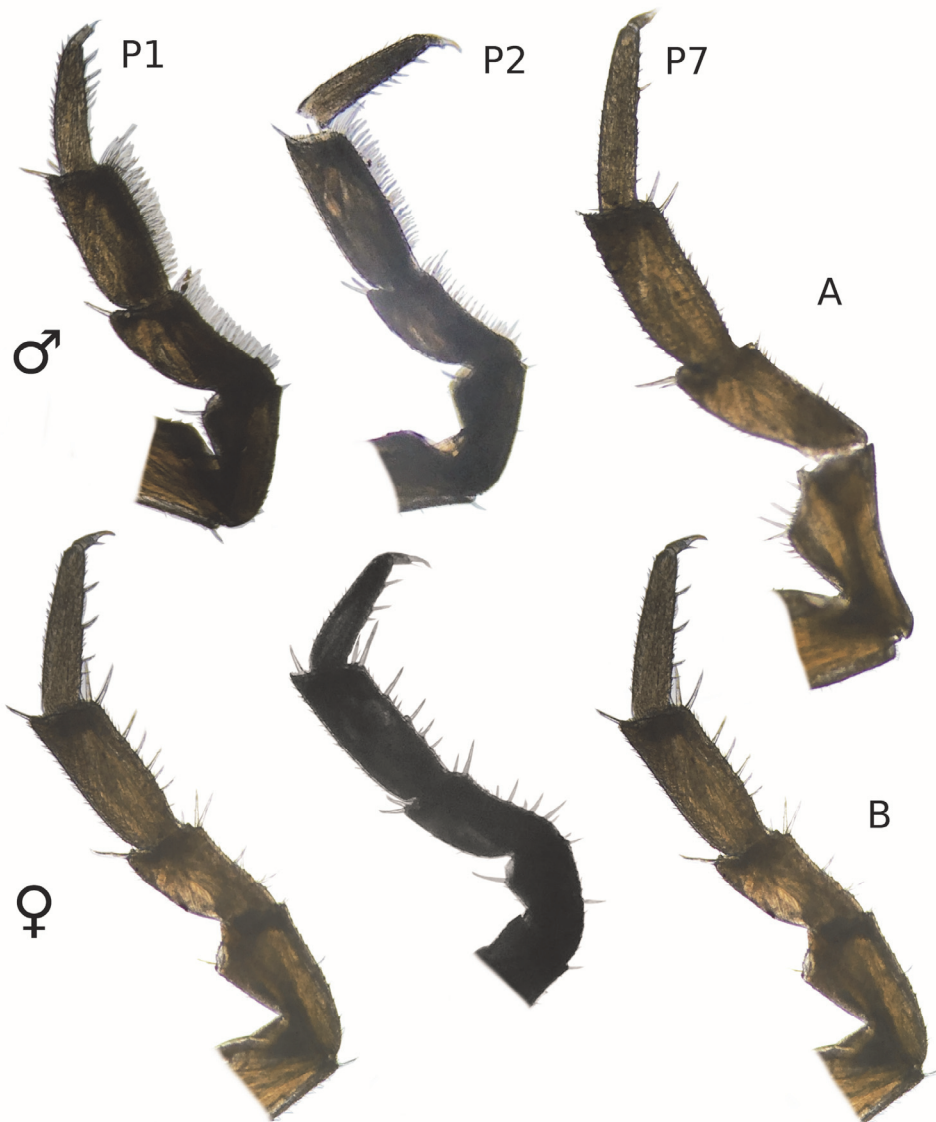


Fig. 4. *Lucasius andalusicus* n.sp. **A-C.** ♂ First pleopod, frontal (A), exopod, ventral (B), detail of endopod distal part (C). **D-E.** ♂ Second pleopod exopod, ventral (D), endopod (E). **F.** Right mandible. **G.** Left mandible.

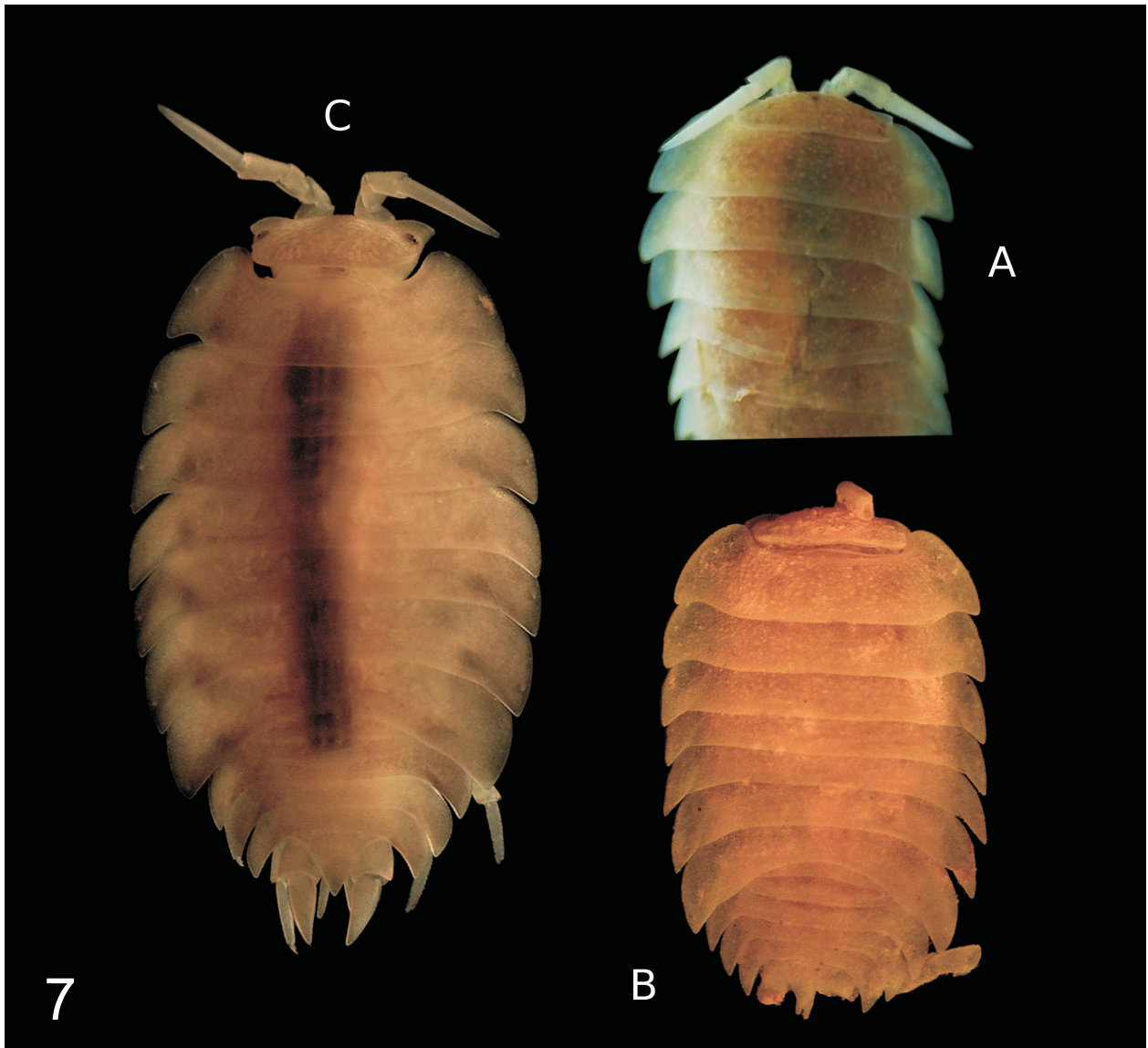


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Fig. 5. *Lucasius andalusicus* n.sp. **A-C.** ♂ Third (A), fourth (B) and fifth pleopod (C). **D.** Genital papilla. **Fig. 6.** *Lucasius andalusicus* n.sp. Comparison between the first (P1), second (P2) and seventh (P7) pereopods of the male (above) and the female (below).



7 **A-B.** *Lucasius myrmecophilus* ♂♂, NMINH:1893.184.1. Algeria. Dollfus collection. **C.** *Lucasius andalusicus* n. sp. Cádiz (Spain) ♂. **8.** *Lucasius andalusicus* n.sp. Specimen photographed alive in the field. (Photo by F. R. Luque).