European Journal of Taxonomy 821: 1–15
https://doi.org/10.5852/ejt.2022.821.1793
ISSN 2118-9773
www.europeanjournaloftaxonomy.eu
2022 · Garcia L. & Robla J.

Research article

urn:lsid:zoobank.org:pub:2D78A872-DD3B-4D15-81CA-50BEA8E57821

Buchnerillo atlanticus sp. nov., a new halophilic woodlouse (Isopoda: Oniscidea: incertae sedis) from the Atlantic coast of the Iberian Peninsula, with ecological remarks

Lluc GARCIA [1,*] & Jairo ROBLA [2,*]

[1] Balearic Museum of Natural Sciences - Interdisciplinary Ecology Group, University of Balearic Islands, Mallorca, Spain.
[2] Department of Conservation Biology, Doñana Biological Station – CSIC, Sevilla, Spain.

[*] Corresponding: both authors
[1] Email: llucgarciaisopoda@gmail.com
[2] Email: jairoroblasuarez@gmail.com

[1] urn:lsid:zoobank.org:author:914965A1-6DEB-4870-94A3-B4E41B018921
[2] urn:lsid:zoobank.org:author:9FBE706B-F463-4CA7-9AC9-BEF1B6FB8689

Abstract. A new woodlouse species of the genus *Buchnerillo* Verhoeff, 1942 is described and illustrated from the Cantabrian Coast of Asturias (Eastern Atlantic Ocean of the Iberian Peninsula). *Buchnerillo atlanticus* sp. nov. is a halophilic woodlouse that lives under embedded rocks in fine-grained sand areas of its type locality beach. Its morphological features, including secondary sexual characteristics, allow it to be distinguished from the other three known species of the genus *Buchnerillo*. Biological, ecological and ethological data of the new species are commented. To facilitate the separation of the four known species of *Buchnerillo*, the main diagnostic features are summarized and their known distribution is commented.

Keywords. Cantabric coast, coastal oniscidea, halophilic woodlouse, morphology, terrestrial isopoda.

Garcia L. & Robla J. 2022. *Buchnerillo atlanticus* sp. nov., a new halophilic woodlouse (Isopoda: Oniscidea: incertae sedis) from the Atlantic coast of the Iberian Peninsula, with ecological remarks. *European Journal of Taxonomy* 821: 1–15. https://doi.org/10.5852/ejt.2022.821.1793

Introduction

Buchnerillo Verhoeff, 1942 is a woodlouse genus with an uncertain systematic position at family level. It was included in the family Buddelundiellidae Verhoeff, 1930 in its original description (Verhoeff 1942). Three years later, Vandel (1945) erected the genus *Lereboulletia* also in the family Buddelundiellidae that he synonymized later with *Buchnerillo* (Vandel 1960a). Vandel (1960a) created the subfamily Buchnerilloninae (included in Buddelundiellidae) for the genus *Buchnerillo*. Since then, there has been no consensus about the taxonomic position of this genus. Some authors considered this genus belonging to an 'undetermined family' (Taiti & Ferrara 1991, 1996) or not related to any Synocheta Legrand, 1946 (Tabacaru 1993). Schmalfuss (2003), in his world catalogue of terrestrial isopods,

suggested that *Buchnerillo* could be included in the family Detonidae Budde-Lund, 1904 (section Crinocheta Legrand, 1946). Later works commented that the taxonomic position of the genus is still uncertain and requires molecular analysis to be clarified (Taiti 2014; Taiti *et al.* 2018). Although Taiti *et al.* (2018) suggested that *Buchnerillo* might be related to the family Olibrinidae Budde-Lund, 1913, there are no clear conclusions. So, the genus is still maintained as incertae sedis until new molecular data could clarify its position. Up to now, three known species are included in this genus: *Buchnerillo litoralis* Verhoeff, 1942, *Buchnerillo oceanicus* Ferrara, 1974 and *Buchnerillo neotropicalis* Taiti, Montesanto & Vargas, 2018. *Buchnerillo litoralis,* was described from a beach in Ischia Island (Italy) and it is the most widely distributed and recorded species. It is distributed along the Mediterranean shores of the Tyrrhenian Sea, Sardinia, Sicily, Tuscany and other Italian islands (Verhoeff 1942; Caruso 1973; Ferrara & Taiti 1978; Taiti & Ferrara 1989; Argano & Manicastri 1991, 1996; Argano *et al.* 1995; Taiti & Argano 2011; Pezzino 2015), Malta (Caruso & Lombardo 1982), French coasts and islands (Vandel 1945, 1960a; Berner 1966; Taiti & Ferrara 1996; Noël & Séchet 2017), Mallorca in Balearic Islands (Cruz 1991; Garcia & Cruz 1996) and the Algarve coast of Portugal (da Gama *et al.* 2000). It was also recorded from the Atlantic island of Madeira (Vandel 1960b) and there is a doubtful record from Florida Keys (Paoletti & Stinner 1989). Thirty-two years later, *Buchnerillo oceanicus* was described and studied from the Indian coasts of Somalia (Ferrara 1974; Chelazzi & Ferrara 1978; Ferrara & Taiti 1979) and later also found in the Maldives (Taiti 2014). More than 40 years later, a third species of *Buchnerillo* was described from the Pacific coasts of Costa Rica: *B. neotropicalis* (Taiti *et al*. 2018). All species have very few records, so their populations and actual range are unknown. The small size of these animals may be one of the reasons why they remain largely unnoticed, even though species of *Buchnerillo* probably have a much more extensive coastal distribution (Vandel 1960a; Noël & Séchet 2017). However, since the vast majority of later works that recorded species of *Buchnerillo* have been faunistic, morphological data have only been provided in the original descriptions or redescriptions. In addition, the genus *Buchnerillo* is poorly known, not only from a distributional point of view, but also from an ecological one. Vandel (1960a) included *B. litoralis* in the category of 'halophilic woodlice': those limited to coastal habitats. The three existing species are supposed to be strictly halophilic. All known records correspond to coastal habitats like beaches, at most at the tidal limit. *Buchnerillo* woodlice are usually found on sandy or rocky beaches with trunks, logs, embedded rocks and plant remains (*Posidonia* spp., *Zostera* spp. or *Thalassodendron* spp., depending on the locations) deposited by the sea (Verhoeff 1942; Vandel 1960a; Chelazzi & Ferrara 1978; Taiti & Argano 2011; Nöel & Séchet 2017; Taiti *et al*. 2018). Although these species are believed to use all the remains deposited by the waves as a refuge or for feeding, nothing more specific is known about *Buchnerillo* species diet, their behaviour, their phenology or their life cycle. Any ecological information, mostly on habitat, is restricted to that mentioned in ecological data provided by several authors (Vandel 1960a; Chelazzi & Ferrara 1978; Taiti 2014; Noël & Séchet 2017; Taiti *et al.* 2018). Until now, the genus *Buchnerillo* is poorly known from an ecological and distributional point of view. So, the main goal of this work is: A) describe a new species of *Buchnerillo* from the Cantabrian coasts of the Iberian Peninsula (Asturias); B) comment the differences between the four known species of *Buchnerillo*; and C) provide biological and distributional remarks of *Buchnerillo* spp.

Material and methods

Description of collecting site

The population of the new species of *Buchnerillo* was located in the Conejera beach (Villaviciosa) in the Principality of Asturias (northern Spain) (Fig. 1A). The collecting area has an Atlantic macrobioclimate with supratemperate climate (Rivas-Martínez *et al.* 2017). The influence of the sea moderates the climate in the area. The area of Villaviciosa has a 12.8 ºC mean annual temperature and 1345 mm mean annual precipitation (data available at https://es.climate-data.org). Conejera is a heterogeneous beach composed by two different substrates: fine-grained sand and rocks. Fine-grained sand areas are characterized by

the presence of boulders embedded in the substrate (Fig. 1B). No logs or plant remains were found in the study area. However, algae accumulations were common (*Codium* spp., *Gelidium* spp., among others) (Fig. 1B). The study area remains largely unchanged due to limited human impact.

Methodology

Surveys were carried out in the Principality of Asturias (northern Spain) in 2020 and 2021. After the discovery of a population of the new species of *Buchnerillo*, the locality was visited several times for ecological and ethological observations. Images of live specimens were taken in situ with a Nikon D5300 camera equipped with Tamron 90 mm macro lens and a Nikon D7000 camera equipped with the same lens. Several specimens were hand collected, stored and preserved in 75% ethanol. The collected specimens were dissected under a stereo microscope (Nexius-Z Euromex). For their morphological study, appendages, mouthparts and tergites were treated with Amann's lactophenol and mounted on microscope slides using Faure's liquid. Photographs of preserved specimens were taken with a digital microscope (Dino-Lite) and the main measurements were taken with the associated software (Dino-Capture ver. 2.0). Pencil drawings were prepared using a camera lucida attached to an Olympus CH-30 biological microscope and digitally inked according to the method described by Montesanto (2015) and with a drawing tablet (Wacom Intuos). A female specimen was examined and photographed by scanning electron microscope (Hitachi S-3400N). Photographs were edited with GIMP ver. 2.10.12. Maps were generated with ArcGis Desktop ver. 10.8.1. The type material has been deposited in the collections of the National Museum of Natural Sciences of Madrid and the Balearic Museum of Natural Sciences of Mallorca, both in Spain. The specimen used for SEM analysis is part of the first author's personal collection.

The acronyms used in the text are as follows:

CLLG = Lluc Garcia personal collection, Sóller, Mallorca, Spain
MBCN = Balearic Museum of Natural Sciences – Museu Balear de Ciències Naturals, Sóller, Mallorca, Spain
MNCN = National Museum of Natural Sciences – Museo Nacional de Ciencias Naturales, Madrid, Spain
SEM = Scanning electron microscope

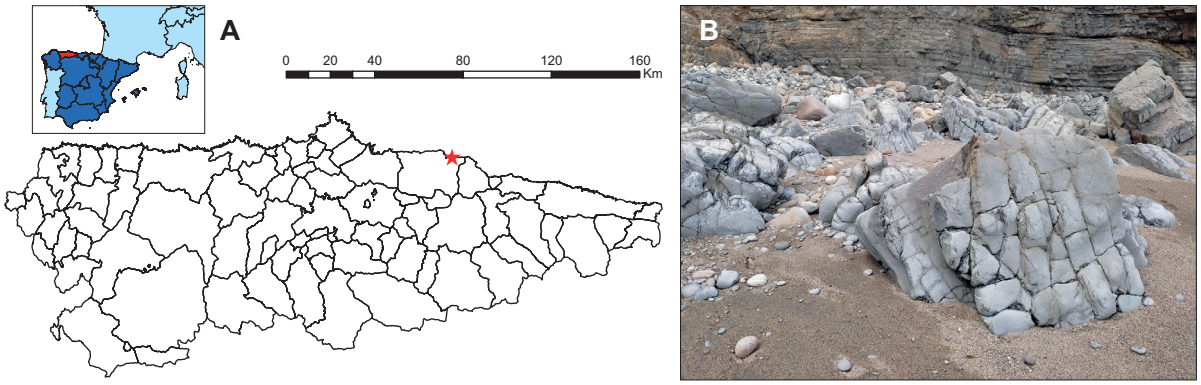

Fig. 1. A. Type locality of *Buchnerillo atlanticus* sp. nov. (★) in Asturias (red), Spain (dark blue). **B**. Habitat of *Buchnerillo atlanticus* sp. nov. in Conejera beach (Villaviciosa, Asturias).

Results

Order Isopoda Latreille, 1817
Suborder Oniscidea Latreille, 1802
Family incertae sedis

Genus ***Buchnerillo*** Verhoeff, 1942

Type species

Buchnerillo litoralis Verhoeff, 1942.

Buchnerillo atlanticus sp. nov.
urn:lsid:zoobank.org:act:39D99F57-E621-4F96-99EC-95AE7F48D45C
Figs 2–7

Diagnosis

Species of *Buchnerillo* characterized by ovoid and endoantennal conglobation type. Cephalon, pereon-tergites and pleon-tergites smooth and covered with long setae regularly arranged. Frontal area striated, not grooved. Mandibles with dichotomized molar penicil. First pereon-tergite posterolateral corner without schisma. Endopod of male pleopod 1 with straight distal part.

Etymology

The name of the species comes from the Atlantic Ocean (concretely the Cantabrian Sea) which is the area where the specimens were collected.

Material examined

Holotype

SPAIN • ♂; Principality of Asturias, Villaviciosa, Selorio (Conejera beach); 43º31′56.1″ N, 5º21′48.3″ W; 3 m a.s.l.; 3 Sep. 2021; J. Robla leg.; hand collected from the lower face of embedded stones; MNCN 20.04/14403.

Paratypes

SPAIN • 3 ♀♀; same collection data as for holotype; MNCN 20.04/14404 to 20.04/14406 • 1 ♀; same collection data as for holotype; 9 Jul. 2021; MNCN 20.04/14407 • 10 specs; same collection data as for holotype; 13 Jul. 2021; MNCN 20.04/14408 to 20.04/14417 (both included) • 1 ♂ (specimen mounted in 3 microscope slides); same collection data as for holotype; 1 Jul. 2021; MBCN 24683-1 to 24683-3 • 1 ♀; same collection data as for holotype; 9 Jul. 2021; MBCN 23149.

Additional material

SPAIN • 1 ♀ (specimen used for SEM); same collection data as for holotype; 1 Jul. 2021; CLLG.

Description

Measurements. Maximum length observed: male 1.7 mm, female 3.2 mm.

Colour. Cephalon and epimera pale. Rest of body reddish or yellow-orange with darker irregular reticulated spots, with slight variability (Figs 2A–B, 3D).

Body. Conglobation ovoid, endoantennal (Figs 2C, 3A). Surface of body without prominent tubercles; cephalon and tergites regularly covered with erected and long setae (Figs 2A–B, 3A–B) as follows: five

Fig. 2. A–B. Alive specimens of *Buchnerillo atlanticus* sp. nov. in their habitat (photo: N. Noval). **C**. *Buchnerillo atlanticus* sp. nov. conglobated after suffering a disturbance (photo: M. Álvarez Fidalgo).

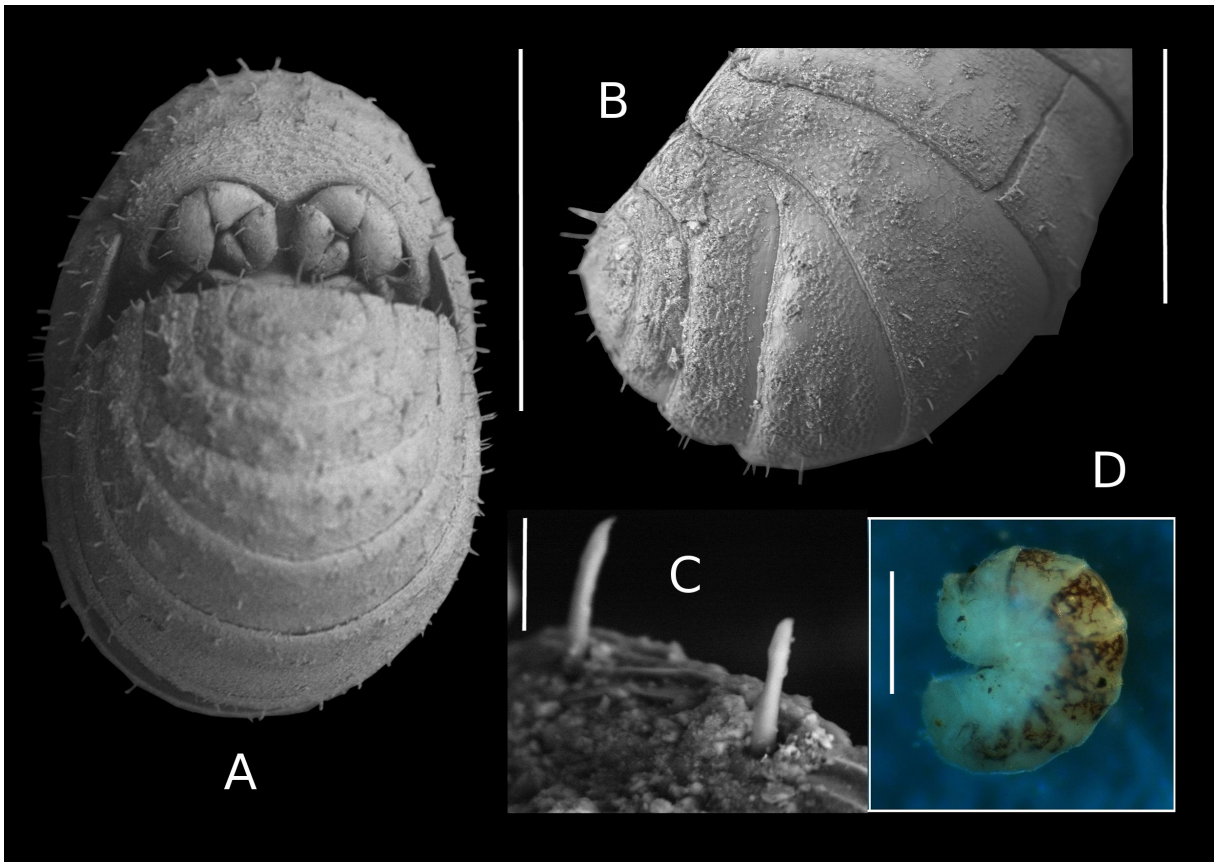

Fig. 3. *Buchnerillo atlanticus* sp. nov., ♀ (CLLG). **A**. Whole animal, partially conglobated. **B**. Last pereonites, pleon and pleotelson, lateral view. **C**. Tergal setae. **D**. Short time preserved specimen in lateral view. Scale bars: A, D = 0.5 mm; B = 0.3 mm; C = 0.015 mm.

rows of setae on cephalon and pereon-tergite 1; two rows on posterior half of pereon-tergites 2–7 and pleon; one row on pleotelson; setae emerge from cuticular pits (Fig. 3C).

Cephalon. With frontal and suprantennal ridges, delimiting frontal shield; upper margin regularly curved; lower margins concave, delimiting on each side hollows in which antennae are housed during conglobation (Fig. 3A). Frontal shield surface covered with fine transverse striae (Fig. 3A). Eyes formed by one ocular spot, not well-defined as ommatidium.

Pereon. Pereon-tergite 1 with anterolateral margin rounded and protruded; posterolateral margin without schisma; with short ventral lobe (Fig. 4A); hind margin straight. Pereon-tergites 2–4 with slightly sinuous hind margin; epimera subtriangular, with rounded lateral margins. Pereon-tergites 3–7 with quadrangular epimera.

Pleon. Pleon-tergites 1–2 not visible. Epimera of pleon-tergite 3 not visible. Pleon-tergites 4–5 with straight lateral margin (Fig. 3B).

Pleotelson. Twice wider than long, with curved anterior edge, converging sides, and straight hind margin (Fig. 3A).

First antenna. Two articles; first article slightly longer than second; second article with two long apical aesthetascs (Fig. 4B).

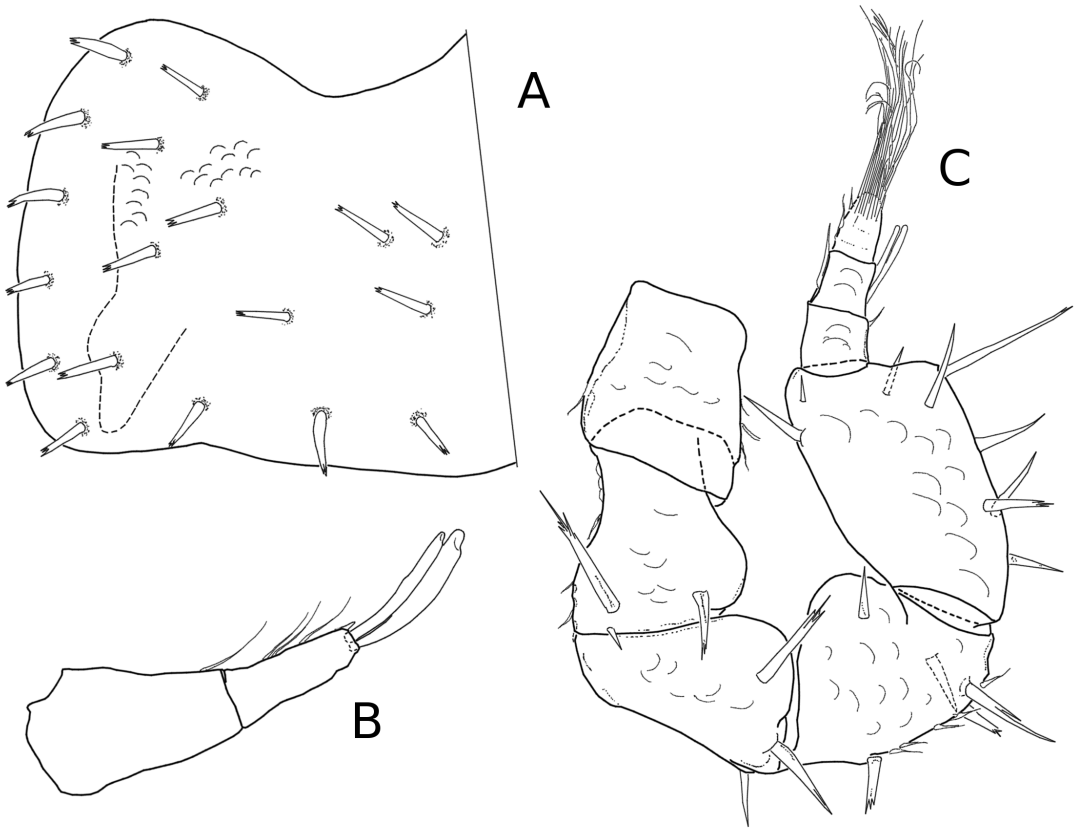

Fig. 4. *Buchnerillo atlanticus* sp. nov., paratype, ♂ (MBCN 24683). **A**. Left half of pereon-tergite 1, extended; the interrupted lines represent the ventral lobe. **B**. First antenna. **C**. Second antenna. Figure not to scale.

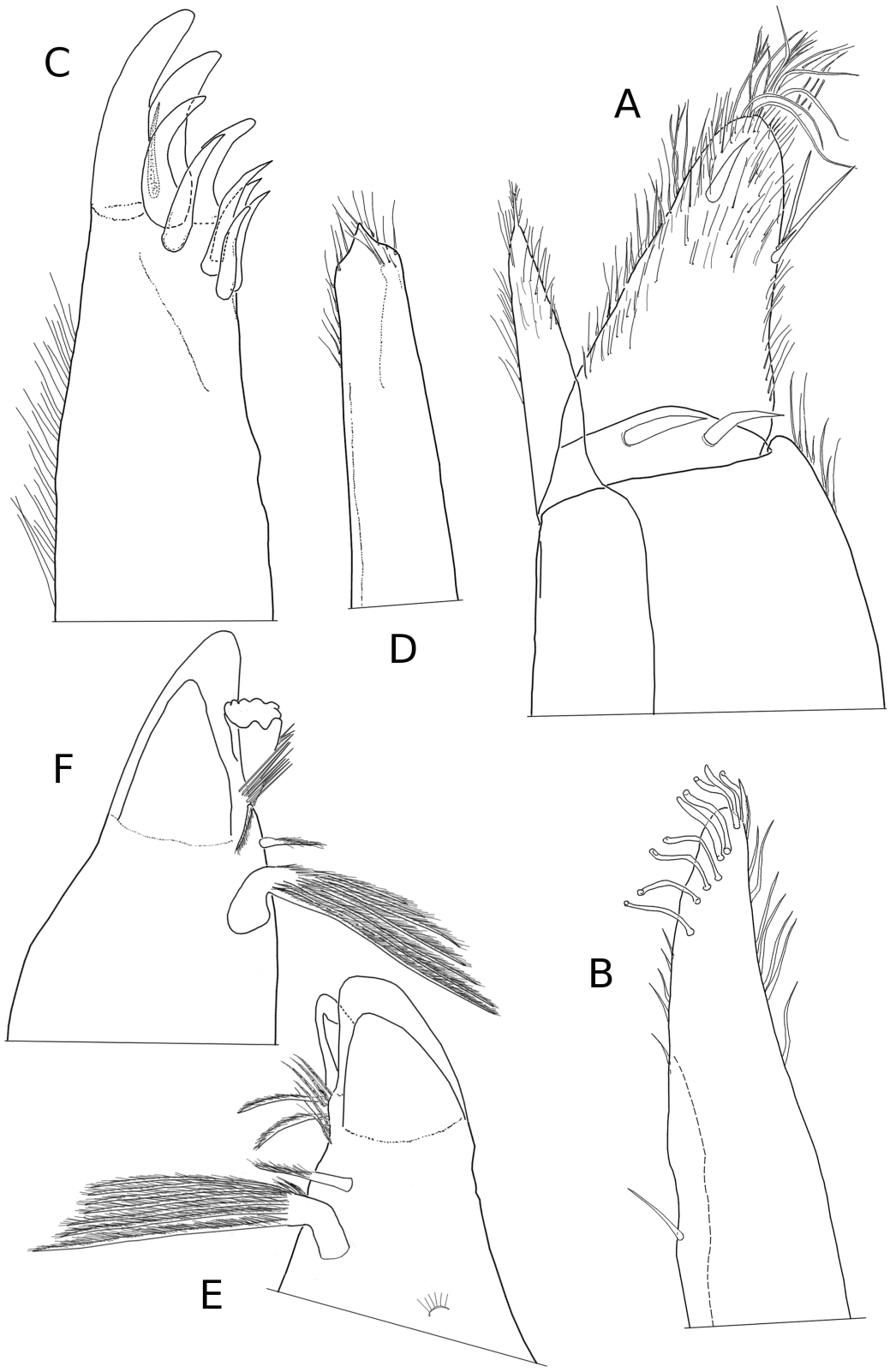

Fig. 5. *Buchnerillo atlanticus* sp. nov., paratype, ♂ (MBCN 24683). **A**. Distal part of maxilliped. **B**. Maxilla. **C**. Maxillula, outher branch. **D**. Maxillula, inner branch. **E**. Left mandible. **F**. Right mandible. Figure not to scale.

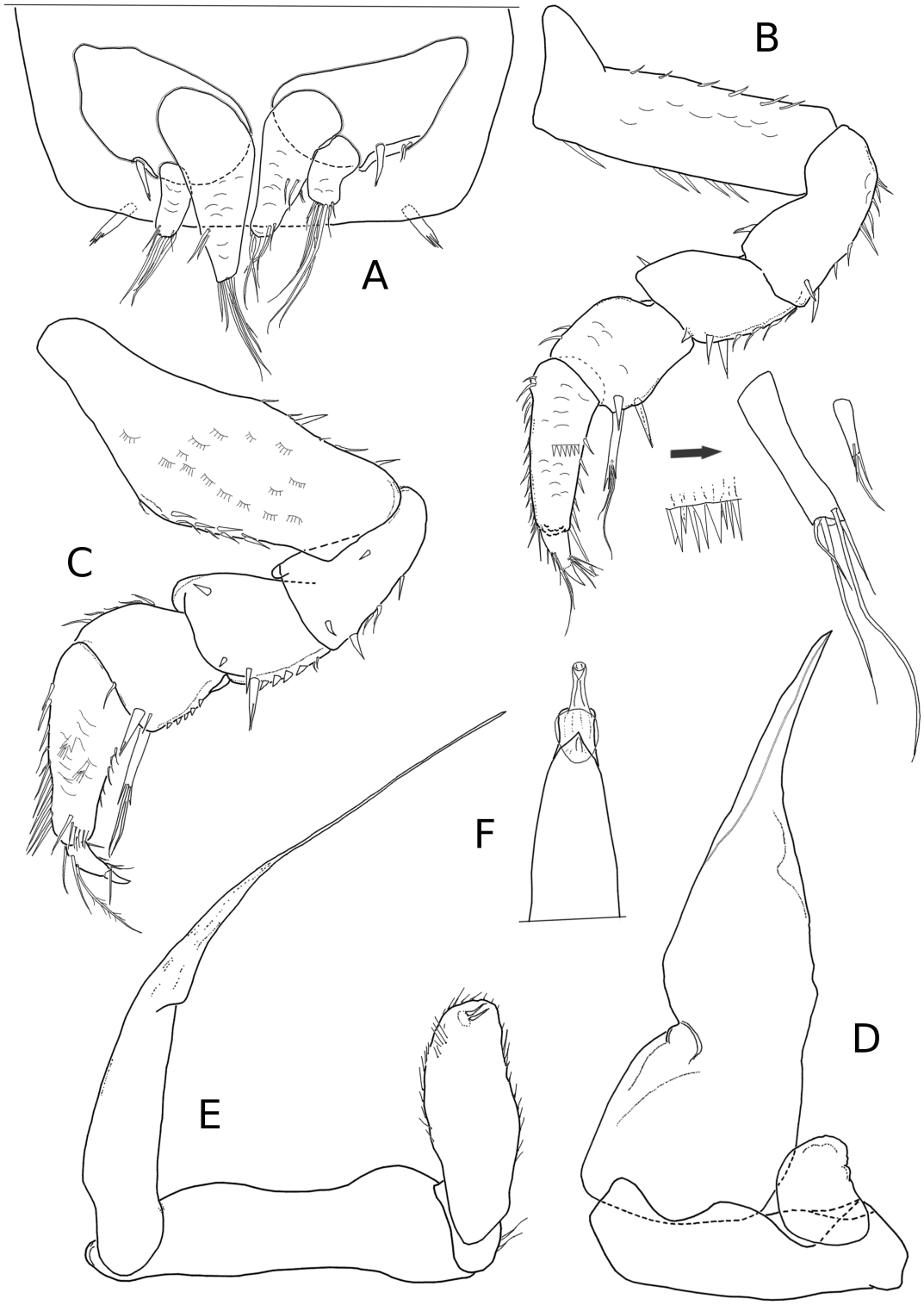

Fig. 6. *Buchnerillo atlanticus* sp. nov., paratype, ♂ (MBCN 24683). **A**. Pleotelson and uropods, ventral view. **B**. First pereopod; arrow indicates divided setae of carpus and pectinate scale of propodus. **C**. Seventh pereopod. **D**. First pleopod. **E**. Second pleopod. **F**. Genital papilla. Figure not to scale.

Second antenna. Thick and short, with long setae on peduncular articles; flagellum with three articles; two aesthetascs on second flagellar article (Fig. 4C).

Mouthparts. Maxilliped: endite narrow, as long as ³/₄ of palp length, with one thin apical penicillium; palp with two strong setae on basal article and one on distal article (Fig. 5A). Maxilla distally rounded, bearing about 10 tubular setae (Fig. 5B). Maxillula: inner branch distally pointed, without penicils (Fig. 5D); outer branch with 5 + 4 apically entire teeth and one supplementary seta among outer group (Fig. 5C). Left mandible with dichotomized molar penicil, with 2 + 1 free penicils (Fig. 5E); right mandible with dichotomized molar penicil, with 1 + 1 free penicils and toothed lacinia mobilis (Fig. 5F).

Pereopods. Short, with one long divided seta on carpus. Dactylus with long and plumose dactylar seta.

Pleopods. All exopodites without pleopodal lungs.

Uropods. Endopod twice as long as exopod, both with long apical setae (Fig. 6A).

Male

Pereopods 1 and 7 without distinct modifications (Fig. 6B–C). First pleopod with exopod small, reniform, without setae; endopod with very wide basal part and narrow, almost straight, distal third (Fig. 6D). Second pleopod: exopod elongated-ovoid, with marginal hairs and two subdistal setae; endopod with long and thin distal half (Fig. 6E). Genital papilla as in Figure 6F.

Remarks

Buchnerillo atlanticus sp. nov. is distinguished from the other three known species of the genus, in addition to other morphological characteristics, by the lack of dorsal tubercles and by having long sensory setae. According to the respective original descriptions, it also differs from the other species by having the mandibles with dichotomized molar penicil, instead of semi-dichotomized. In addition to these morphological features, it is distinguished from *B. litoralis* by its ovoid rather than spherical conglobation (Vandel 1960a), by the shape of the endopod of the first male pleopod, which in *B. atlanticus* is almost straight with a very wide basal part and in *B. litoralis* has a curved distal part, apically dilated (Vandel 1960a). Both species have the frontal area of the cephalon not excavated, but covered with fine transverse striae. In addition to the characteristics already mentioned, *B. atlanticus* is distinguished from *B. oceanicus* by the cephalic structure, with striated instead of grooved frontal area (Ferrara 1974). *Buchnerillo atlanticus*, *B. litoralis* and *B. oceanicus* share the lack of schisma in the first pereon-tergite and presence of a short lobe in its ventral part. Finally, *B. atlanticus* is also distinguished from *B. neotropicalis* by the absence of schisma in the first pereon-tergite and by the shape of the male first pleopods, among other characteristics (Taiti *et al.* 2018). The most distinctive morphological features of the four known species of *Buchnerillo* are presented in Table 1.

Distribution

Buchnerillo atlanticus sp. nov. is only known from its type locality of Conejera beach in Villaviciosa (Asturias, Spain) (Fig. 1A–B). Although several localities with similar ecological conditions were visited, no specimens were found. Up to date, each species of *Buchnerillo* belong to different coastal areas of the world: *Buchnerillo litoralis* occurs on the Mediterranean shores, *B. oceanicus* on the coasts of the Indian Ocean, *B. neotropicalis* on the coasts of the Pacific Ocean and *B. atlanticus* on the Cantabric coast of the Atlantic Ocean (Fig. 7).

Ecology

Buchnerillo atlanticus sp. nov. was always found in Conejera beach areas with fine-grained sand. All the specimens were adherent to the lower face of large highly humid stones embedded in the substrate.

Table 1. Main morphological differences between the four known species of *Buchnerillo* Verhoeff, 1942.

Morphological characteristic	*Buchnerillo litoralis* Verhoeff, 1942	*Buchnerillo oceanicus* Ferrara, 1974	*Buchnerillo neotropicalis* Taiti, Montesanto & Vargas, 2018	*Buchnerillo atlanticus* sp. nov.
Conglobation	Spheric	Spheric	Spheric	Ovoid
Back	Tuberculated	Tuberculated	Tuberculated	Smooth
Setae	3–4 hyaline scales and 1 short leaf-shape scale-seta on each dorsal tubercle	1 short sensory seta and 2–3 short petaliform scale-setae on each dorsal tubercle	1 short subtriangular scale-seta on each dorsal tubercle	1 long spiniform scale-seta reaching from each cuticular pit
Cephalon	Frontal area finely striated	Frontal area grooved	Frontal area grooved	Frontal area finely striated
Eyes (ommatidia)	1 or 2	4	4	1
Mouthparts	Semidichotomized mandibular molar penicil	Semidichotomized mandibular molar penicil	Semidichotomized mandibular molar penicil	Dichotomized mandibular molar penicil
Pereon tergite 1	Without schisma	Without schisma	With schisma	Without schisma
	With ventral lobe	With ventral lobe	Without ventral lobe	With ventral lobe
Male pleopod 1	Distal half of endopod curved	Unknown	Endopod straight	Distal half of endopod straight
Pleotelson	Semicircular	Semicircular	Semicircular	Semielliptic

Contrary to the habitat of other species of *Buchnerillo*, in the study area no logs or plants remains are present (Fig. 1B). Several specimens seemed to be seen feeding on small patches of algae and other organic material adhered to the rocks. Apparently, the presence of *B. atlanticus* was not altered by frequent survey and handling of the same stones in the short sampling period. *Buchnerillo* shared habitat with three other halophilic woodlice: *Armadilloniscus candidus* Budde-Lund, 1885, *Halophiloscia couchii* (Kinahan, 1859) and *Ligia oceanica* (Linnaeus, 1767). *Buchnerillo atlanticus* did not present particular conspecific aggregations. Other arthropods present in the area were the pseudoscorpion *Neobisium maritimum* Leach, 1817 and the chilopod *Geophilus easoni* Arthur *et al.,* 2001 both potential predators of *B. atlanticus*. Several species of halophilic Collembola, staphylinid Coleoptera and tiny mites were also present in the study area, in addition to some other accidental arthropod taxa from the cliff. Regarding its behaviour, it was always seen moving slowly among the organic material and small grains of sand stuck to the lower face of the stone (Fig. 2A–B). In case of disturbance the individuals rolled into an ovoid ball that remained adhered to the surface due to the humidity (Fig. 2C). The shape and colour of *Buchnerillo* provides this woodlouse with an almost perfect camouflage, looking like one more sand grain in the microhabitat under the stone (Fig. 2A). In case of a major or continuous disturbance it ended up opening slightly and releasing itself from the stone, falling to the substrate where they turn complete untraceable. The specimens showed some photophobic behaviour (Supplemental material). When the stones were lifted, *B. atlanticus* moved into the shade. This species is thought to be very sensible to dehydration. When specimens were removed from their habitat it only took a few minutes

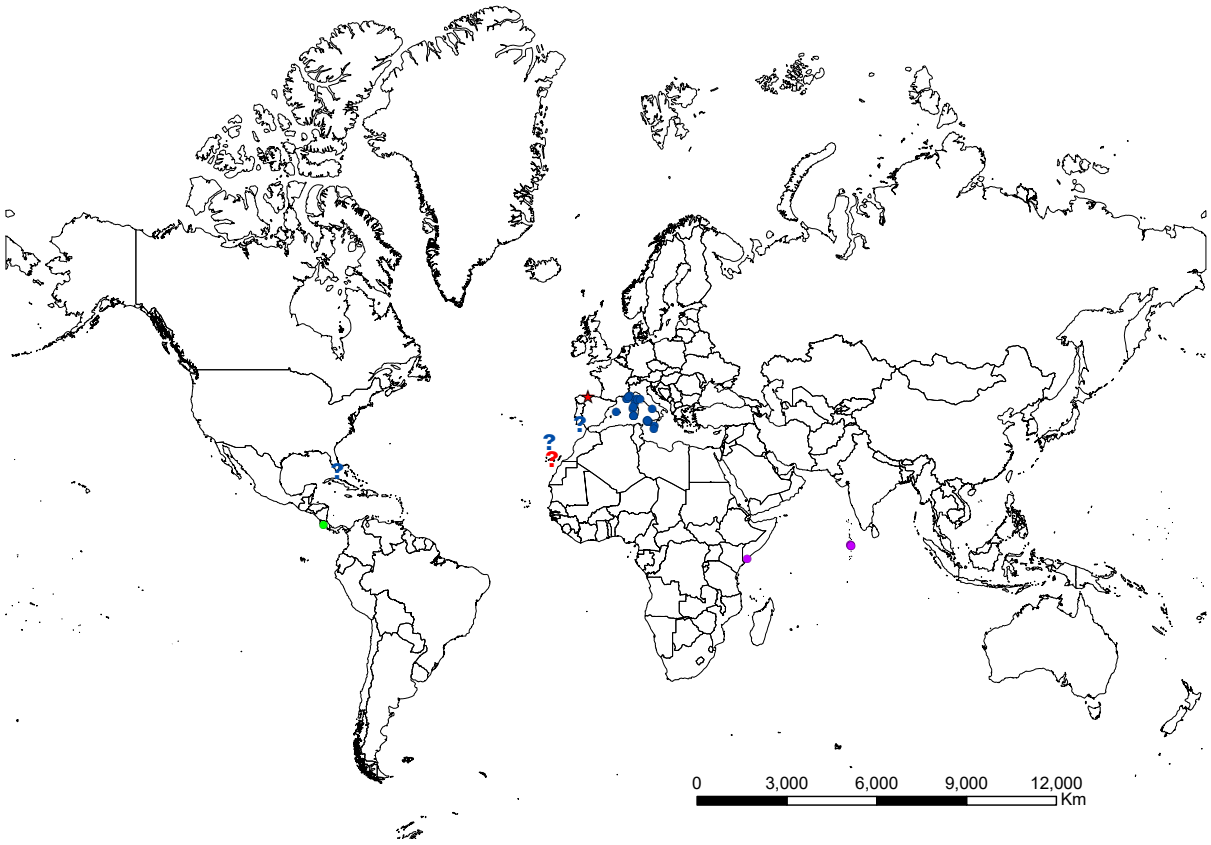

Fig. 7. Distribution of different species of *Buchnerillo* Verhoeff, 1942: *B. litoralis* Verhoeff, 1942 (●), unconfirmed records of *B. litoralis* (**?**), *B. oceanicus* Ferrara, 1974 (●), *B. neotropicalis* Taiti, Montesanto & Vargas, 2018 (●), *B. atlanticus* sp. nov. (★) and unconfirmed records of *B. atlanticus* sp. nov. (**?**).

to die. *Buchnerillo atlanticus* needs constant humidity, present in its habitat under stones embedded in humid substrate. Its habitat is subject to tidal influence with occasional submersion. Specimens of *B. atlanticus* were seen between July and September, with a slightly variation in population abundance among consecutive days.

Discussion

The recent discovery of a fourth species of *Buchnerillo* that inhabits the Atlantic coasts of Europe represents an important breakthrough to continue studying hard-to-find halophilic woodlice such as the species of this genus. Although the Atlantic coastal fauna of the continent has been explored intensively since the end of the 19th century (Vandel 1960a; Legrand 1953a, 1953b, 1954a, 1954b; Harding & Sutton 1985; Gregory *et al.* 2012; Cherpitel *et al.* 2019; Garcia & Robla 2021), this species was never reported. There are records of *Buchnerillo litoralis* in the Atlantic coastal areas of Portugal (da Gama *et al*. 2000) and the island of Madeira (Vandel 1960b). However, these specimens were poorly described or documented with figures to ensure that it was really the Mediterranean species described in the mid-twentieth century. It is possible that these records correspond to *B. atlanticus* sp. nov. This hypothesis is supported by the fact that several specimens, apparently identical to the new species, were collected years ago in the Canary Islands (S. Taiti pers. com.). However, it remained undescribed because only one female was preserved and the rest of the specimens could not be located (S. Taiti pers. com.). It cannot be completely ruled out that *B. litoralis* may be distributed beyond the Mediterranean Sea. However, *B. litoralis* seem to have an endogean way of life and are not usually found associated with driftwood or other remains susceptible to be transported by currents. Taiti *et al*. (2018) also remarked that the record of *B. litoralis* in the Florida Keys, on the Atlantic coast of North America (Paoletti & Stinner 1989), is very doubtful and should be reviewed. It is interesting to note that the four known species of *Buchnerillo* are linked to different marine basins. Consequently, gene flow among their populations might have been hindered by the separate ocean current systems for millions of years. A complete and exhaustive review of the genus based on molecular data would be of great interest in establishing the phylogenetic relationships among species of *Buchnerillo* as well as the taxonomic position of the genus. However, at the moment there is very little material available. The small size and cryptic habits of species of *Buchnerillo* probably have hindered the discovery of these species and could also affect the collection of more specimens. It will be necessary to develop more meticulous and appropriate sampling techniques (Nöel & Séchet 2017) and to actively explore other shores around the world to find new populations of *Buchnerillo* and maybe new species of this unknown genus of uncertain systematic position. Regarding its ecology, species of *Buchnerillo* are poorly known. The few bibliographic records correspond to taxonomic or faunistic works, revealing an important gap in ecological and ethological knowledge. Since the habitat of *Buchnerillo atlanticus* slightly differs from that of other species (algae vs plant remains), more studies are needed to assess the species habitat preferences. However, this species was found in the same microhabitat of other species of *Buchnerillo* (Vandel 1960a; Chelazzi & Ferrara 1978; Pezzino 2015). In addition, although the interactions between species of *Buchnerillo* and other woodlice are far from known, *B. atlanticus* has been found coexisting with other halophilic species as those found in other locations (Chelazzi & Ferrara 1978; Nöel & Séchet 2017; Garcia & Robla 2021). Regarding ethology, little is known about the behaviour of species of *Buchnerillo*. Chelazzi & Ferrara (1978) carried out an exhaustive ecological study that involved *Buchnerillo oceanicus*. They discovered that *B. oceanicus* is a nocturnal and stationary strictly halophilic woodlouse limited to very humid places. We observed that *B. atlanticus* always occurs in very humid microhabitats, has a slight photophobic behaviour and moves slowly under stones, fitting with previous references (Chelazzi & Ferrara 1978). However, the accessible information is scarce, and the life cycle and way of living remains unsolved. Finally, variations in the abundance and detectability among consecutive days probably depend on climatic and tidal conditions as seen in other isopod populations from coastal areas (Messina *et al.* 2016; Garcia & Robla 2021).

In conclusion, distribution, ecological and biological knowledge of species of *Buchnerillo* continues to be scarce and insufficient. With a new species described and with the data provided, it is necessary to carry out sampling campaigns to locate new populations, to carry out new studies to understand the biology of *Buchnerillo atlanticus* sp. nov. and the other species and to solve the uncertain taxonomic position of the genus *Buchnerillo*.

Acknowledgements

We would like to express our gratitude to Álvaro Alonso, Omar Sánchez and Ricardo López for helping us sampling the type locality. We would also like to thank M. Álvarez Fidalgo for taking photographs of conglobated specimens and Nacho Noval for his sampling help, his patience with photos of alive specimens and his valuable comments. We would also like to thank Stefano Taiti for his information of an undescribed species of *Buchnerillo* from the Canary Islands, probably the same as the new species. We want to express our gratitude to David Cabanillas for the identification of the Geophilomorpha specimen. We would like to thank Jorge Rodríguez and Melissa León for helping us with figures edition. We would also like to express our gratitude to André Burgers for reviewing the English text and the two anonymous referees for providing useful comments and an exhaustive and constructive criticism. Finally, we would like to express our gratitude to Consejería del Medio Rural y Cohesión Territorial del Principado de Asturias for granting the permits for the collection of specimens.

References

Argano R., Ferrara F., Guglielmo L., Riggio S. & Ruffo S. 1995. Crustacea Malacostraca II (Tanaidacea, Isopoda, Amphipoda, Euphausiacea). *In*: Minelli A., Ruffo S. & La Posta S. (eds) *Checklist delle Specie della Fauna Italiana*: 1–52. Edizioni Calderini, Bologna.

Argano R. & Manicastri C. 1991. A preliminary report on Oniscidean fauna (Crustacea, Isopoda) from central Tyrrhenian islands. *In*: Juchault P. & Mocquard J.P. (eds) *The Biology of Terrestrial Isopods*. *III. Proceedings of the Third International Symposium on the Biology of Terrestrial Isopods*: 3–8. Université de Poitiers, France.

Argano R. & Manicastri C. 1996. Gli isopodi terrestri delle piccole isole circumsarde (Crustacea, Oniscidea). *Biogeographia – The Journal of Integrative Biogeography* 18 (1): 283–298. https://doi.org/10.21426/B618110446

Berner L. 1966. Les Crustacés Isopodes des environs marseillais. *Bulletin mensuel de la Société Linnéenne de Lyon* 35 (4): 193–197.

Caruso D. 1973. Isopodi terrestri delle isole Eolie ed Egadi. *Biogeographia – The Journal of Integrative Biogeography* 3 (1): 315–326. https://doi.org/10.21426/B63110508

Caruso D. & Lombardo B.M. 1982. Isopodi terrestri delle isolate Maltesi. *Animalia* 9 (1/3): 5–52.

Chelazzi G. & Ferrara F. 1978. Researches of the coast of Somalia. The shore and the dune of Sar Uanle. 19. Zonation and activity of terrestrial isopods (Oniscoidea). *Monitore Zoologico Italiano. Supplemento* 11 (8): 189–219. https://doi.org/10.1080/03749444.1978.10736581

Cherpitel T., Filipe M. & Braud Y. 2019. À propos de quelques Arthropodes (Dermaptera, Isopoda, Geophilomorpha) découverts sur la plage de Lafitenia à Saint-Jean-de-Luz (Pyrénées-Atlantiques, France). *L'Entomologiste* 75 (2): 77–83.

Cruz A. 1991. Especies nuevas o poco conocidas de isópodos terrestres de la Península Ibérica. II. Isópodos epígeos de España y Portugal (Crustacea, Oniscidea). *Bulletin de la Société d'histoire naturelle de Toulouse* 127: 71–75.

da Gama M.M., Sousa J.P., Ferreira C.S. & Barrocas H.M. 2000. Analysis of the distribution of endemic and rare arthropods in high endemism areas of Algarve-South Portugal. *Pedobiologia* 44 (3–4): 386–401. https://doi.org/10.1078/S0031-4056(04)70057-8

Ferrara F. 1974. Researches on the coast of Somalia. The shore and the dune of Sar Uanle. 3. Terrestrial isopods. *Monitore Zoologico Italiano. Supplemento* 5 (15): 191–220. https://doi.org/10.1080/03749444.1974.10736801

Ferrara F. & Taiti S. 1979. A check-list of terrestrial isopods from Africa (South of the Sahara). *Monitore Zoologico Italiano. Supplemento* 12 (10): 89–215. https://doi.org/10.1080/03749444.1979.10736595

Ferrara F. & Taiti S. 1978. Gli isopodi terrestri dell'Arcipelago Toscano. Studio sistematico e biogeografico. *Redia* 61: 1–106.

Garcia L. & Cruz A. 1996. Els isòpodes terrestres (Crustacea: Isopoda: Oniscidea) de les Illes Balears: catàleg d'espècies. *Bolletí de la Societat d'Història Natural de les Balears* 39: 77–99.

Garcia L. & Robla J. 2021. First record of *Armadilloniscus candidus* Budde-Lund, 1885 in the coastal areas of the Iberian Peninsula (Crustacea: Oniscidea: Detonidae). *Bolletí de la Societat d'Història Natural de les Balears* 64: 39–46.

Gregory S., Lee P., Read H.J. & Richards P. 2012. Woodlice (Isopoda: Oniscidea) collected from northwest Spain and northern Portugal in 2004 by the British Myriapod and Isopod Group. *Bulletin of the British Myriapod & Isopod Group* 26: 6–23.

Harding P.T. & Sutton S.L. 1985. *Woodlice in Britain and Ireland: Distribution and Habitat*. Lavenham Press, Great Britain.

Legrand J. 1953a. Les Isopodes terrestres des îles du littoral atlantique. *Bulletin de la Société zoologique de France* 78: 388–403.

Legrand J. 1953b. Évolution récente par ségrégation insulaire chez les Oniscoïdes (Crustacés Isopodes terrestres) des îles atlantiques françaises. *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences de Paris* 236: 2109–2111.

Legrand J. 1954a. Les Isopodes terrestres du Poitou et du littoral charentais. Contribution à l'étude du peuplement atlantique. *Mémoires du Muséum national d'Histoire naturelle, Série A* 6 (3): 139–180.

Legrand J. 1954b. Les Isopodes terrestres des îles du littoral atlantique. Contribution à l'étude du peuplement antlantique (II). *Bulletin de la Société zoologique de France* 78: 388–403.

Messina G., Gatti R.C., Sciandrello S. & Lombardo B.M. 2016. The influence of coastal zonation and meteorological variables on terrestrial isopod populations: a case study in western Sicily (Italy). *Italian Journal of Zoology* 83 (4): 571–578. https://doi.org/10.1080/11250003.2016.1222558

Montesanto G. 2015. A fast GNU method to draw accurate scientific illustrations for taxonomy. *ZooKeys* 515: 191–206. https://doi.org/10.3897/zookeys.515.9459

Noël F. & Séchet E. 2017. Inventaire actualisé des Isopodes terrestres (Crustacea, Isopoda, Oniscidea) du Parc national de Port-Cros et de l'aire optimale d'adhésion (Var, Provence, France). *Scientific Reports of Port-Cros National Park* 31: 213–274.

Paoletti M.G. & Stinner B. 1989. Two new terrestrial Isopoda from coralline cays of Venezuela's Caribbean coast. *Proceedings of the Entomological Society of Washington* 91: 71–80.

Pezzino E. 2015. *Gli Isopodi Oniscidei di Sicilia e delle Isole Circumsiciliane: Studio Faunistico, Sistematico e Biogeografico (Crustacea, Isopoda)*. PhD thesis, Universita' Degli Study di Catania, Sicily.

Rivas-Martínez S., Penas Á., Díaz González T.E., Cantó P., del Río S., Costa J.C., Herrero L. & Molero J. 2017. Chapter 5: Biogeographic Units of the Iberian Peninsula and Baelaric Islands to District Level.

A Concise Synopsis. *In*: Joidi J. (ed.) *The Vegetation of the Iberian Peninsula*: 131–188. Springer, Cham. https://doi.org/10.1007/978-3-319-54784-8_5

Schmalfuss H. 2003. World catalog of terrestrial isopods (Isopoda: Oniscidea). *Stuttgarter Beiträge zur Naturkunde Serie A* 654: 1–341.

Tabacaru I. 1993. Sur la classification des Trichoniscidae et la position systématique de *Thaumatoniscellus orghidani* Tabacaru, 1973 (Crustacea, Isopoda, Oniscidea). *Travaux de l'Institut de Spéologie Émile Racovitza* 32: 43–85.

Taiti S. 2014. The terrestrial Isopoda (Crustacea, Oniscidea) of the Maldives. *Tropical Zoology* 27 (1): 9–33. https://doi.org/10.1080/03946975.2014.894397

Taiti S. & Argano R. 2011. Oniscidea di Sardegna (Crustacea, Isopoda). *In*: Nardi G., Whitmore D., Bardiani M., Birtele D., Mason F., Spada L. & Cerretti P. (eds) *Biodiversity of Marganai and Montimannu (Sardinia). Research in the Framework of the ICP Forests Network. Conservazione Habitat Invertebrati*: 163–222. Edizioni Calderini, Verona.

Taiti S. & Ferrara F. 1989. Biogeography and ecology of terrestrial isopods from Tuscany. *Monitore Zoologico Italiano* 4: 75–101.

Taiti S. & Ferrara F. 1991. Terrestrial Isopods (Crustacea) from the Hawaiian Islands. *Occasional Papers of the Bishop Museum* 31: 202–227.

Taiti S. & Ferrara F. 1996. The terrestrial Isopoda of Corsica (Crustacea, Oniscidea). *Bulletin du Muséum national d'Histoire naturelle* 18: 459–545.

Taiti S., Montesanto G. & Vargas, J.A. 2018. Terrestrial Isopoda (Crustacea, Oniscidea) from the coasts of Costa Rica, with descriptions of three new species. *Revista de Biología Tropical* 66 (1–1): S187–S210. https://doi.org/10.15517/rbt.v66i1.33296

Vandel A. 1945. Isopodes terrestres récoltés par M. Remy au cours de son voyage en Corse. III. La famille des Buddelundiellidae. *Archives de Zoologie expérimentale et générale* 84: 100–113.

Vandel A. 1960a. Isopodes terrestres (première partie). *Faune de France* 64: 1–416.

Vandel A. 1960b. Les Isopodes terrestres de l'archipel Maderien. *Mémoires du Muséum national d'histoire naturelle*, *Série A, Zoologie* 22 (1): 1–156.

Verhoeff K.W. 1942. Sphaeromiden-studien und *Buchnerillo* NG 83. Isopoden-aufsatz. *Zeitschrift für Morphologie und Oekologie der Tiere* 39 (2): 153–175.

Manuscript received: 25 January 2022
Manuscript accepted: 10 March 2022
Published on: 23 May 2022
Topic editor: Tony Robillard
Section editor: Fabio Stoch
Desk editor: Pepe Fernández