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Terrestrial isopods from the Oued Laou basin, north-eastern Morocco (Crustacea: Oniscidea), with descriptions of two new genera and seven new species

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Thirty-four species of terrestrial isopods (Crustacea: Oniscidea) from the Oued Laou basin, in the Rif area of north-eastern Morocco, are recorded. One genus (*Paractenoscia*) and seven species (*Trichoniscus microphthalmus*, *Paractenoscia cavernicola*, *Bathytropa rifensis*, *Soteriscus gibbosus*, *S. laouensis*, *Porcellio pseudornatus*, and *Eluma praticola*) are described as new. The genus *Soteriscus*, unavailable according to article 13.3 of the International Commission on Zoological Nomenclature (ICZN), is here revalidated by choosing *S. gaditanus* as type species. Six species (*Graeconiscus thermophilus*, *Ctenoscia minima*, *Platyarthrus parisii*, *Porcellio humberti*, *Porcellio flavocinctus* and *Eluma caelata*) have been fully illustrated to facilitate their identifications. *Ctenoscia dorsalis* Verhoeff is considered to be a junior synonym of *C. minima* Dollfus. *Porcellio ornatus* from southern Spain is also figured for comparison with *P. pseudornatus* sp. nov. The composition and origin of the oniscidean fauna of the Rif region is briefly discussed.

<http://zoobank.org/urn:lsid:zoobank.org:pub:DCBF3103-1463-4A32-9BC0-A4CFE8B762AE>

Keywords: terrestrial Isopoda; taxonomy; new genera; new species; Morocco

Introduction

This paper deals with the terrestrial Isopoda collected in the Oued Laou valley in Morocco during a biodiversity survey within the European Union project MEDCORE. The area belongs to the Rif, the coastal mountain chain in the north-eastern part of Morocco. In the Oligocene (*c.* 30 Ma), this chain together with the Betic cordillera was connected to the Iberian peninsula and southern France, and formed a continuous orogenic belt together with the Kabylies, Calabria, Corsica and Sardinia (see the palaeogeographic reconstruction in Rosenbaum et al. 2002). During the Miocene, the Rif–Betic belt moved westward and the formation of the Alboran Sea split the mountain belt into the present Betic cordillera in the south-western Iberian Peninsula and the Rif chain in north-eastern Morocco.

The Oniscidea of this area have been studied in the past by Vandel (1956a, 1956b, 1958a, 1958b, 1958c), Schmalfuss (1987), Caruso and Di Maio (1990) and more recently by Achouri et al. (2008a, 2008c), Colombini et al. (2008), Charfi-Cheikhrouha and El Gtari (2008) and Achouri and Charfi-Cheikhrouha (2009).

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Vandel (1958a, 1958b) listed 17 species for the whole Rif region while Achouri et al. (2008c) in a paper on the same area of this study (the Oued Laou basin) recognized 20 species, some of which were only identified at genus level. In the present paper 34 species of Oniscidea are recorded, of which seven are described as new. A new genus (*Paractenoscia*) in the family Philosciidae is described and the genus *Soteriscus* (Porcellionidae) is revalidated by choosing a type species.

Material and methods

The specimens were collected in 26 stations (St.) (Table 1) during two visits to the Oued Laou valley in May 2004 and September 2005. The area investigated comprehends the Oued Laou basin from the river spring to the mouth in the Mediterranean, including some minor tributaries. All different habitats present in the study area have been investigated, i.e. sandy and rocky littoral shores, cultivated fields, meadows, bushes, woods and some caves.

Table 1. List of sampling stations in the Oued Laou basin.

Station	Locality	Altitude (m)	Latitude N (WGS84)	Longitude W (WGS84)
1	West of Oued Laou		35°28'32.2"	5°06'20.4"
2	West of Oued Laou		35°28'29.2"	5°06'23.5"
3	Oued Laou estuary, left bank		35°26'09.7"	5°04'56.4"
4	Oued Laou estuary, right bank		35°25'40.6"	5°04'41.8"
5	Oued Laou bay, East of Tizgane		35°24'18.6"	5°03'30.4"
6	Tizrharine	20	35°23'42.5"	5°09'05.8"
7	Right side of Oued Tassikesté, near Bnehassan	50–110	35°23'08.6"	5°12'40.9"
8	Ghar-Knadel Cave	220	35°22'18.4"	5°10'56.0"
9	Larvha	100	35°22'13.9"	5°10'42.1"
10	Along gorges between Afertane and Ghboula	50	35°20'36.1"	5°11'11.7"
11	Tirinesse, along Oued Kefhammar	50	35°20'32.8"	5°10'37.6"
12	Gorge near Ghboula spring	50	35°20'25.0"	5°11'25.4"
13	Kefhammar Cave	100	35°20'23.3"	5°10'34.6"
14	Tirinesse	260	35°19'38.2"	5°10'18.5"
15	Tirinesse, Hama	330	35°19'33.4"	5°09'36.2"
16	Tirinesse	200	35°19'29.9"	5°10'49.9"
17	Left side of Oued Abyet	120	35°17'56.0"	5°12'52.4"
18	Fahsa	210	35°17'45.1"	5°13'40.7"
19	Tarhzoute	350	35°15'52.6"	5°13'59.8"
20	Near Akchour		35°13'33.6"	5°08'56.1"
21	South of Akchour, Oued Farda valley, Taskala spring	817	35°12'45.7"	5°10'54.5"
22	South of Akchour, along Oued Farda	775	35°11'41.9"	5°10'44.5"
23	Oued Laou spring, North of Majjo	900	35°07'26.0"	5°11'55.4"
24	Dardara	380	35°05'51.0"	5°15'45.1"
25	Near Oued Ouara	670	35°03'48.5"	5°14'06.8"
26	El Khizana	900	35°02'42.9"	5°13'44.9"

The specimens were stored in 75% ethanol and identifications are based on morphological characters. For each new species the material examined, description, etymology and remarks are given. For each species already recorded from Morocco their bibliographic references, material examined, distribution and remarks (when necessary) are given. Some poorly known species have been illustrated to facilitate their recognition. The taxa are illustrated with figures prepared with the aid of a camera lucida mounted on Wild M5 and M20 microscopes. For some species pictures were taken with a scanning electron microscope.

The material is deposited in the collections of the Museo Zoologico 'La Specola' of the University of Florence, Italy (MZUF) and in the Staatliches Museum für Naturkunde, Stuttgart, Germany (SMNS).

Systematic account

Family **LIGIIDAE** Leach
Genus *Ligia* Fabricius, 1798
Ligia italica Fabricius, 1798

Material examined

1 ♂, 2 ♀♀, St. 1, on rocks near sea, leg. S. Taiti and C. Rossano, 28 September 2005 (MZUF 9449).

Distribution

Coasts of Black Sea and Mediterranean Sea, Atlantic coasts of the Iberian Peninsula and northern Africa down to Cape Vert, and Macaronesian islands. New record for the Rif region.

Remarks

For diagnostic characters of *L. italica* see Vandel (1960a, p. 122, Figures 54 and 55).

Family **TYLIDAE** Milne-Edwards
Genus *Tylos* Audouin, 1826
Tylos europaeus Arcangeli, 1938

Tylos europaeus; Achouri et al., 2008c, pp. 76–78; Colombini et al., 2008, p. 86; Charfi-Cheikhrouha and El Gtari, 2008, p. 95.

Material examined

12 ♂♂, 12 ♀♀, 8 juvs, St. 1, under debris on beach, leg. S. Taiti and C. Rossano, 28 September 2005 (MZUF 9450); 14 ♂♂, 14 ♀♀, St. 5, beach under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9451); 1 ♀, same locality and collectors, 1 October 2005 (MZUF 9452).

Previous Rif records

Oued Laou region (Achouri et al. 2008c); Oued Laou (Colombini et al. 2008); Aouchtane (Charfi-Cheikhrouha and El Gtari 2008).

Distribution

This littoral species is known with certainty from the whole Mediterranean Sea, Black Sea, Atlantic coasts of Europe as far north as Brittany, and the Azores.

Remarks

The exact distribution of *T. europaeus* is difficult to be defined since in the past it has been often recorded as *Tylos latreillii* Audouin, 1826 together with the other Mediterranean species *T. ponticus* Grebnitzky, 1874. For comments on the taxonomy and diagnostic characters of this species see Taiti and Ferrara (1996).

Family **TRICHONISCIDAE** Sars
Genus *Trichoniscus* Brandt, 1833
Trichoniscus microphthalmus sp. nov.
(Figures 1 and 2)

Material examined

Holotype: ♂, St. 8, leg. S. Taiti and C. Rossano, 28 September 2005 (MZUF 9453).
Paratypes: 25 ♂♂, 75 ♀♀, same data as holotype (MZUF 9453); 3 ♂♂, 5 ♀♀ same locality and collectors, 28 April 2004 (MZUF 9454).

Description

Maximum length: ♂, 2.0 mm; ♀, 2.5 mm. Body colourless, ovoidal, with pleon narrower than pereon (Figure 1A). Back almost smooth covered with numerous cordiform scale-setae (Figure 1B). Cephalon (Figure 1C) with suprantennal line bent downwards; antennal lobes rounded, distinctly visible in dorsal view; eye reduced, visible as one to three small dots of dark pigment. Distal part of telson with concave sides and truncate apex (Figure 1D). Antennule (Figure 1E) of three articles; distal article longer than second, bearing three aesthetascs on apical margin. Antenna (Figure 1F) fifth article as long as flagellum; flagellum of three articles with one row of five aesthetascs on second article. Mandibles with one penicil in the right (Figure 1G) and two penicils in the left (Figure 1H). Outer branch of maxillule with 5 + 5 teeth, apically entire, and three slender stalks; inner branch with three penicils (Figure 2A). Maxilla with setose and bilobate apex, inner lobe smaller (Figure 2B). Maxilliped endite narrow, with a large apical penicil (Figure 2C). Pereopods with an unguis seta and a large, bifid and setose dactylar seta (Figure 2D, 2E). Uropod (Figure 1D) with protopod not grooved on outer margin; endopod slightly shorter than exopod, inserted at the same level.

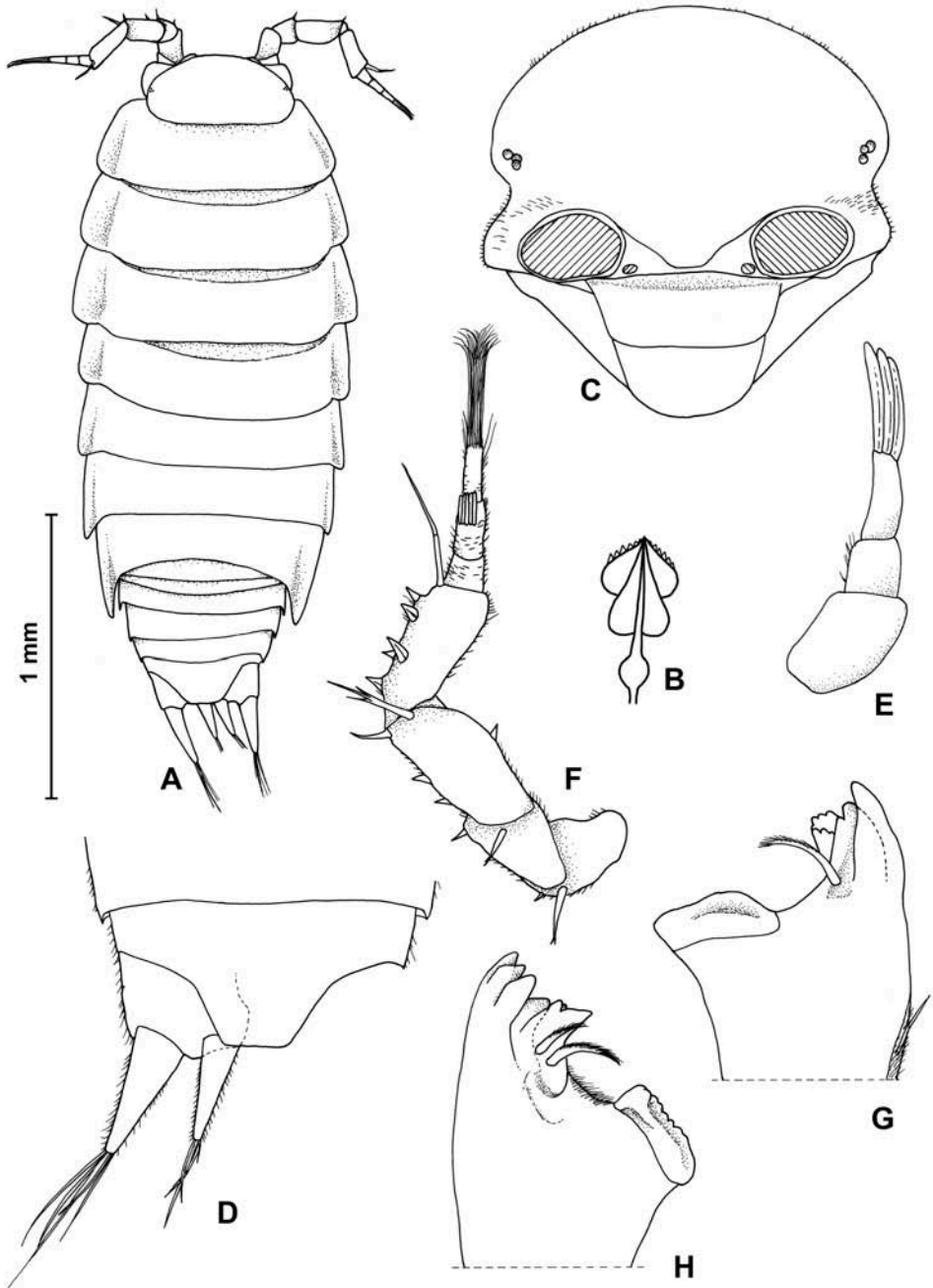


Figure 1. *Trichoniscus micropthalmus* sp. nov. from St. 8, paratype ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) cephalon, frontal view; (D) pleonite 5, telson and left uropod; (E) antennule; (F) antenna; (G) right mandible; (H) left mandible.

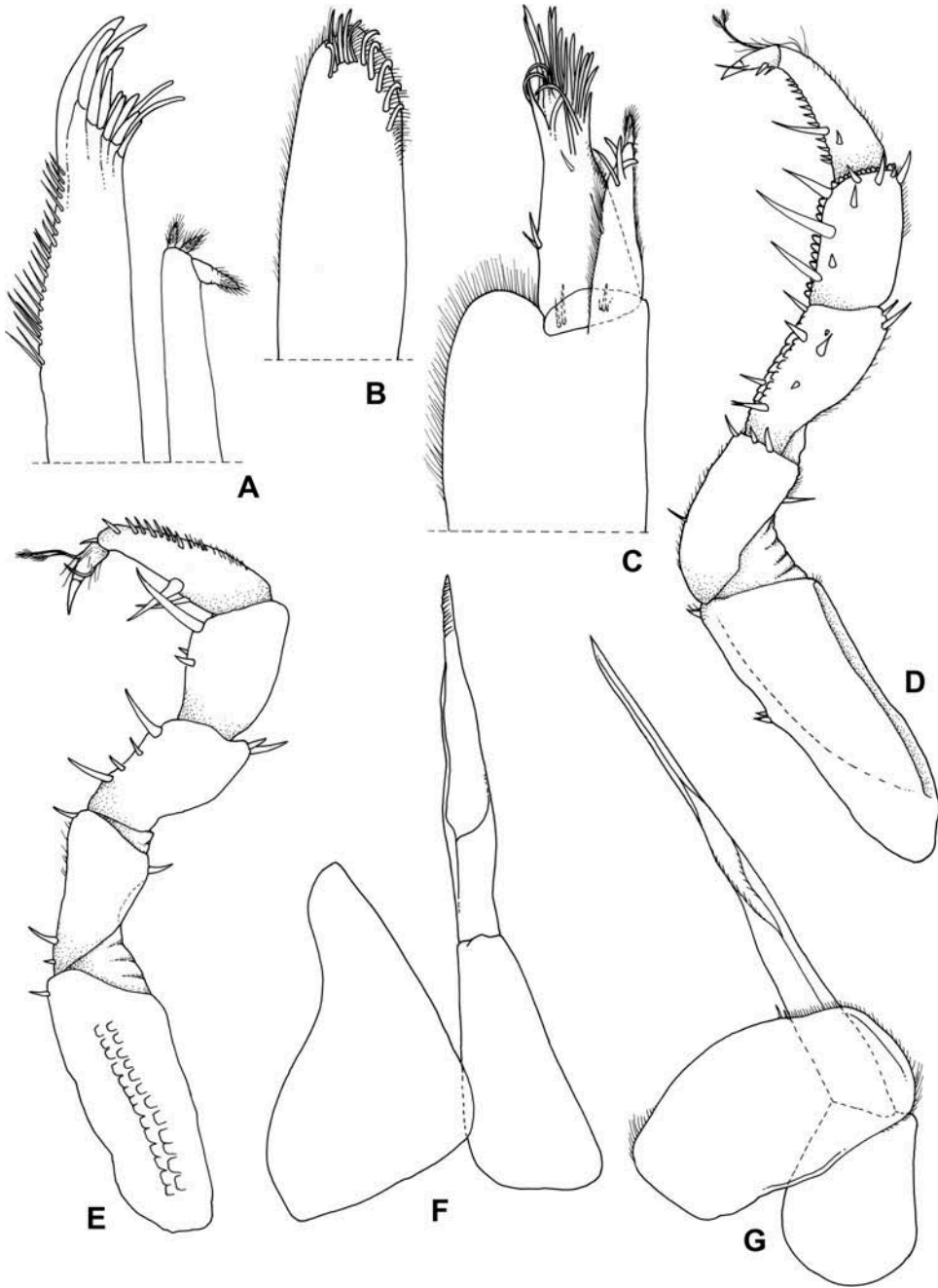


Figure 2. *Trichoniscus micropthalmus* sp. nov. from St. 8, paratype ♀: (A) maxillule; (B) maxilla; (C) maxilliped. Paratype ♂: (D) pereopod 1; (E) pereopod 7; (F) pleopod 1; (G) pleopod 2.

Male: Pereopods 1–4 (Figure 2D) with carpus and merus bearing numerous short scales on sternal margin. Pereopod 7 (Figure 2E) ischium with straight sternal margin. Pleopod 1 (Figure 2F) exopod with straight medial margin and sinuous outer margin; endopod of two articles, distal article tapering to a point, apical part shagreened. Pleopod 2 (Figure 2G) exopod subrectangular with distal margin slightly convex; endopod of two articles, distal article styliform, about three times as long as basal one.

Etymology

From the Greek ‘mikrós’ = small + ‘ophthalmós’ = eye. The name refers to the reduced eye visible as one to three small dots of dark pigment.

Remarks

The genus *Trichoniscus* was previously known in Morocco only for the widespread species *T. pygmaeus* Sars, 1899 (Vandel 1959). A second species, *Trichoniscus solisensis* Vandel, 1959, from a cave near Safi, western Morocco, has been proved to belong to the genus *Adoniscus* Vandel, 1955c (Olibrinidae) (Taiti and Ferrara 2004). In Algeria four species of *Trichoniscus* are known: *T. gachassini* (Giard, 1899), *T. fragilis* Racovitza, 1908, *T. provisorius* Racovitza, 1908, and *T. peyerimhoffi* Vandel, 1955a (Schmalfuss 2003). Another species of *Trichoniscus* (*T. gordonii* Vandel, 1955a) is known from several caves in southern Spain and Gibraltar (Vandel 1955a). The new species *T. microphthalmus* is readily distinguishable from all these species by the male pereopods 1–4 with sternal margin of carpus and merus bearing a fringe of scales, and by the shape of the male pleopod 1 exopod.

Genus *Graeconiscus* Strouhal, 1940
Graeconiscus thermophilus (Çağlar, 1948)
 (Figures 3–5)

Material examined

72 ♂♂, 132 ♀♀, 3 juvs, St. 8, leg. S. Taiti and C. Rossano, 28 September 2005 (MZUF 9455); 2 ♂♂, 2 ♀♀, same data (SMNS 15676); 2 ♂♂, 1 ♀, same locality and collectors, 28 April 2004 (MZUF 9456).

Distribution

Graeconiscus thermophilus was previously known from the southern Aegean islands including Crete and western Turkey. New record for the Rif region.

Remarks

Haplophthalmus thermophilus was described by Çağlar (1948) on specimens from a warm spring at Armutlu, near Gemlik (Turkey). Strouhal (1963) redescribed and figured this species from the type locality. Schmalfuss et al. (2004) included the

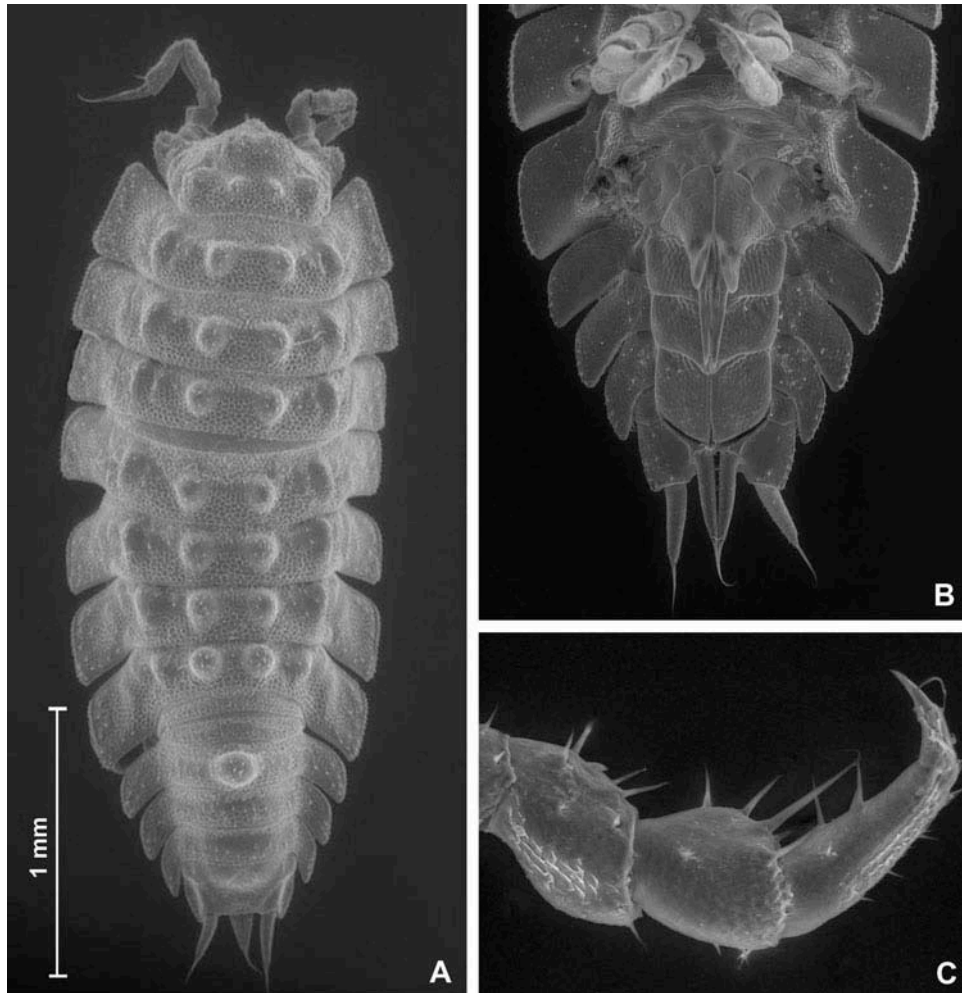


Figure 3. *Graeconiscus thermophilus* from St. 8, ♂: (A) adult specimen, dorsal view; (B) pereonites 6, 7 and pleon, ventral view; (C) pereopod 7.

species in the genus *Graeconiscus* and considered *Calconischellus aegeus* Schmalzfuss, 1972 recorded from Crete and several southern Aegean islands as a junior synonym of *G. thermophilus*. The specimens from Ghar-Knadel Cave (maximum length ♂ 3 mm, ♀ 3.7 mm) are tentatively identified as *Graeconiscus thermophilus* since they correspond to the redescription provided by Strouhal (1963, p. 392, Figures 22–26); in the disposition of dorsal ornamentation and the morphology of the male pereopod 7 and pleopod 1. They differ in lacking the eyes and in the shape of the tubercles on pereonite 7 and pleonite 3. In *G. thermophilus* the pereonite 7 has 3 + 3 tubercles as in the Moroccan specimens but the medial tubercle on each side is much smaller, and the single tubercle on pleonite 3 is transversally elongated while it is rounded in the Ghar-Knadel Cave specimens. The main characters of these specimens are illustrated in Figures 3–5.

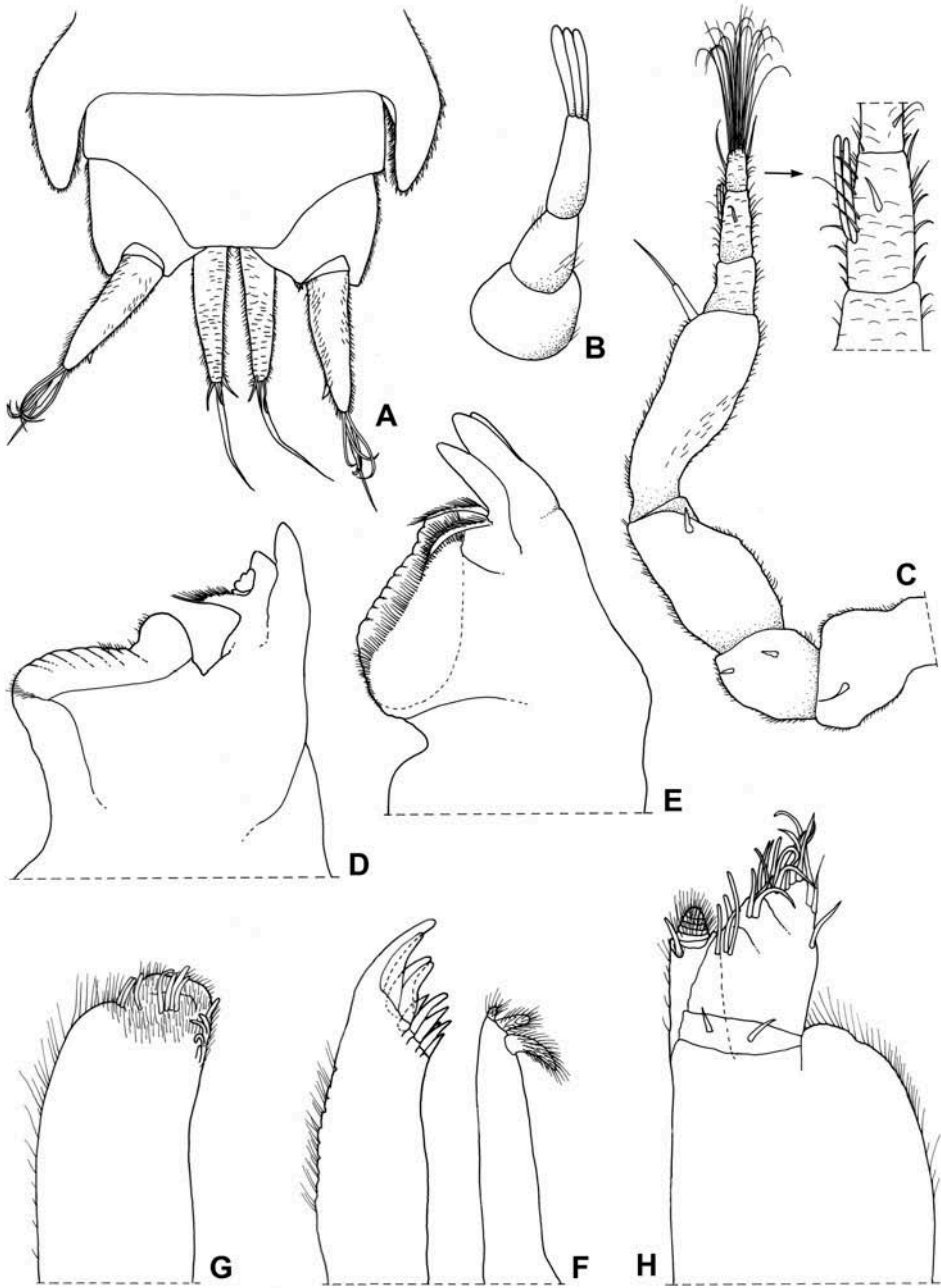


Figure 4. *Graeconiscus thermophilus* from St. 8, ♀: (A) pleonite 5, telson and uropods; (B) antennule; (C) antenna; (D) right mandible; (E) left mandible; (F) maxillule; (G) maxilla; (H) maxilliped.

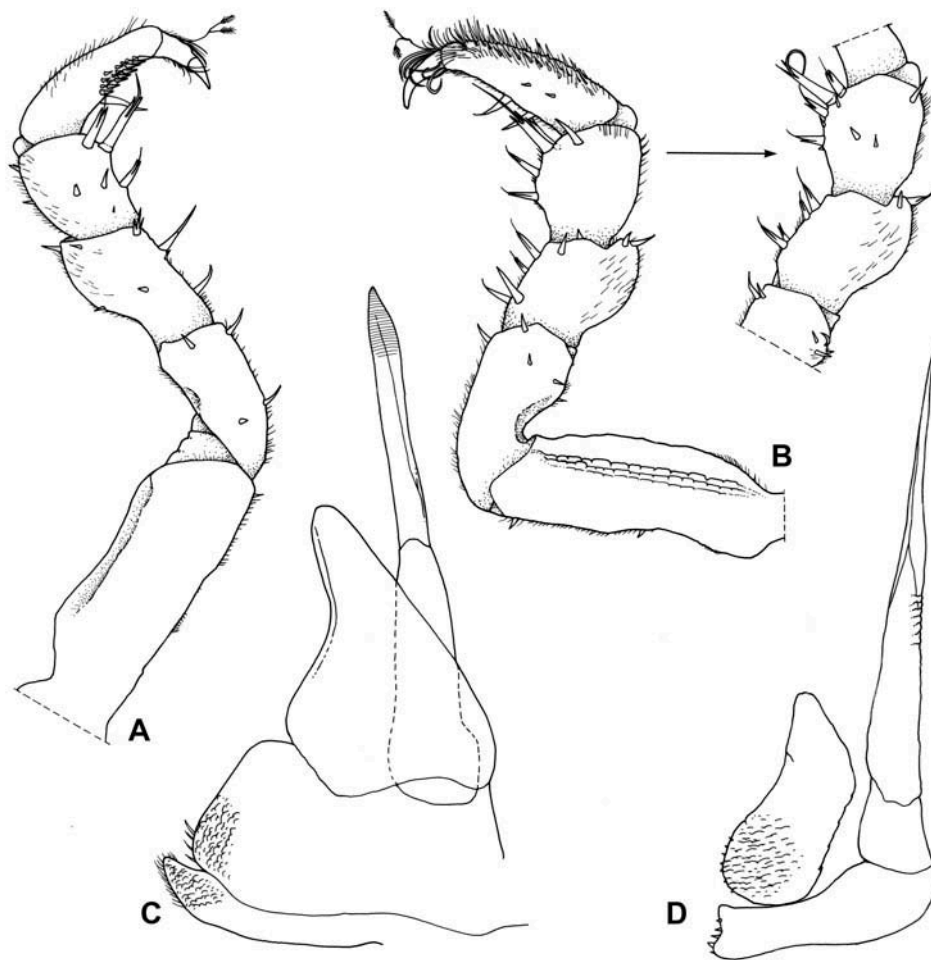


Figure 5. *Graeconiscus thermophilus* from St. 8, ♂: (A) pereopod 1; (B) pereopod 7; (C) pleopod 1; (D) pleopod 2.

Family **HALOPHILOSCIIDAE** Verhoeff

Genus *Halophiloscia* Verhoeff, 1908

Halophiloscia couchii (Kinahan, 1858)

Philoscia couchii; Dollfus, 1896, p. 548

Philoscia Couchii; Paulian de Félice, 1939, p. 192

Halophiloscia couchi; Vandel, 1958a p. 128

Halophiloscia couchii; Taiti and López, 2008, p. 44, [Figures 1A–C, 8A,B, 9](#)

Material examined

10 ♂♂, 21 ♀♀, St. 1, under debris on beach, leg. S. Taiti and C. Rossano, 28 September 2005 (MZUF 9457, 9458); 7 ♂♂, 6 ♀♀, St. 5, beach under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9459).

Previous Rif records

Melilla, Mar Chica (Vandel 1958a); Oued Laou (Taiti and López 2008).

Distribution

Coasts of the Atlantic Ocean from Senegal to the British Isles, Azores, Madeira, Canary Islands, Cape Verde, Mediterranean and Black Sea. Introduced to North and South America, Hawaii and Australia.

Remarks

For diagnostic characters of *H. couchii* see Schmidt (2003, Figures 52–57) and Taiti and López (2008, p. 44, Figures 1A–C, 8A,B).

Genus *Stenophiloscia* Verhoeff, 1908
Stenophiloscia glarearum Verhoeff, 1908

Stenophiloscia glarearum; Colombini et al., 2008, p. 86

Previous Rif records

Oued Laou (Colombini et al. 2008).

Material examined

16 ♂♂, 8 ♀♀, 2 juvs, St. 1, under debris on beach, leg. S. Taiti and C. Rossano, 28 September 2005 (MZUF 9460, 9461); 2 ♂♂, 1 ♀, St. 5, beach under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9462); 11 ♂♂, 10 ♀♀, 1 juv., same locality and collectors, 1 October 2005 (MZUF 9463).

Distribution

Southern England, Canary Islands, Morocco, eastern Spain, Balearic Islands, south-east France, Italy, Malta, Croatia, and Ionian coasts of Greece (Schmalfuss 2003).

Remarks

For diagnostic characters of *S. glarearum* see Vandel (1962, p. 488, Figures 244 and 245) and Ferrara and Taiti (1978, p. 22, Figure 5) as *Halophiloscia* (*Stenophiloscia*) *zosteriae* Verhoeff, 1928, junior synonym of *S. glarearum* (see Schmalfuss 2003).

Family **PHILOSCIIDAE** Kinahan
Genus *Ctenoscia* Verhoeff, 1928
Ctenoscia minima (Dollfus, 1892)
(Figures 6–8)

Chaetophiloscia dorsalis Verhoeff, 1928, p. 137, Figures 34, 37, 38, syn. nov.
Ctenoscia minima; Vandel, 1961, p. 256

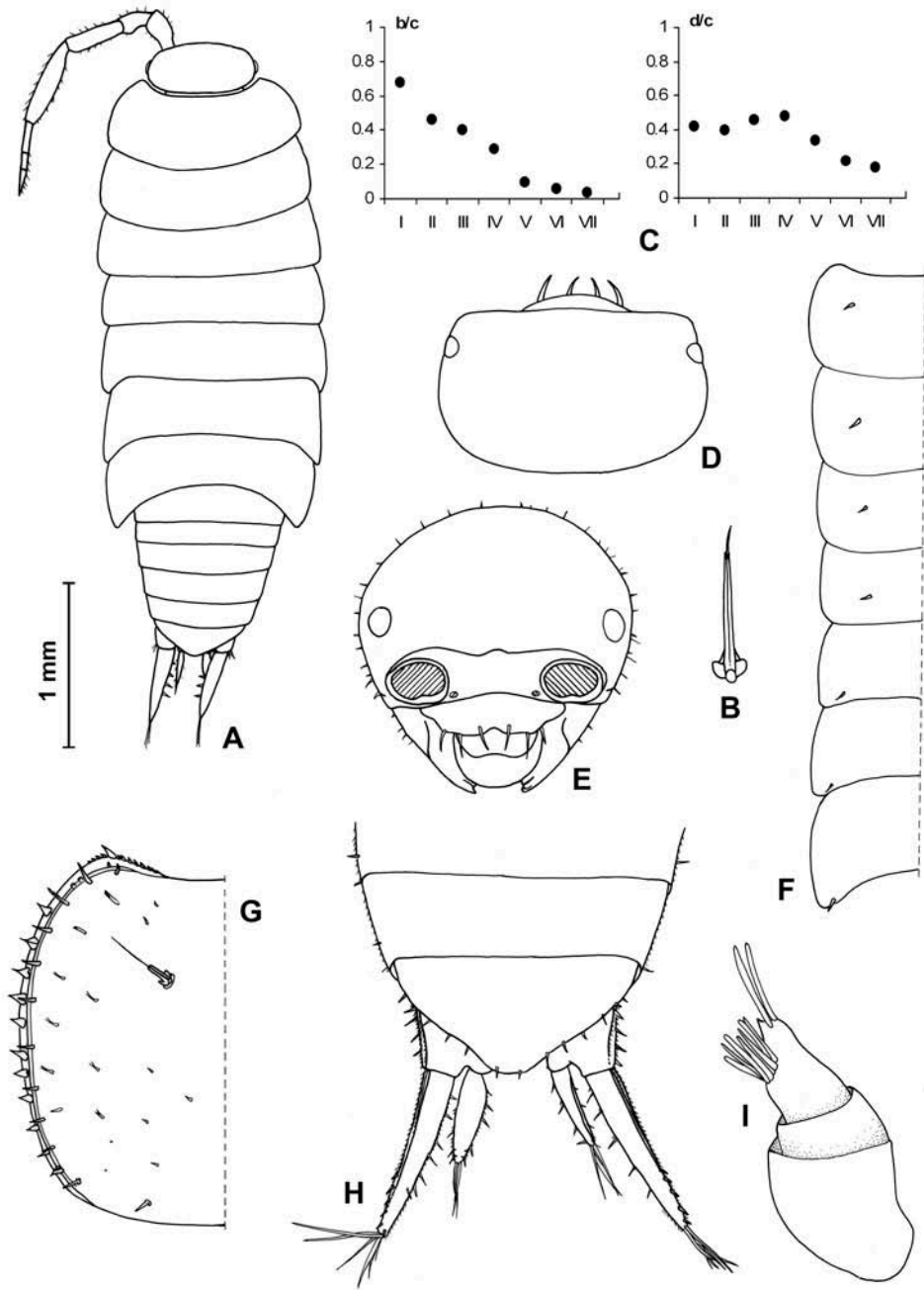


Figure 6. *Ctenoscia minima* from St. 14, ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) co-ordinates of noduli laterales; (D) cephalon, dorsal view; (E) cephalon, frontal view; (F) left side of pereon showing disposition of noduli laterales; (G) pereonite 1, left side; (H) pleonites 4, 5, telson and uropods; (I) antennule.

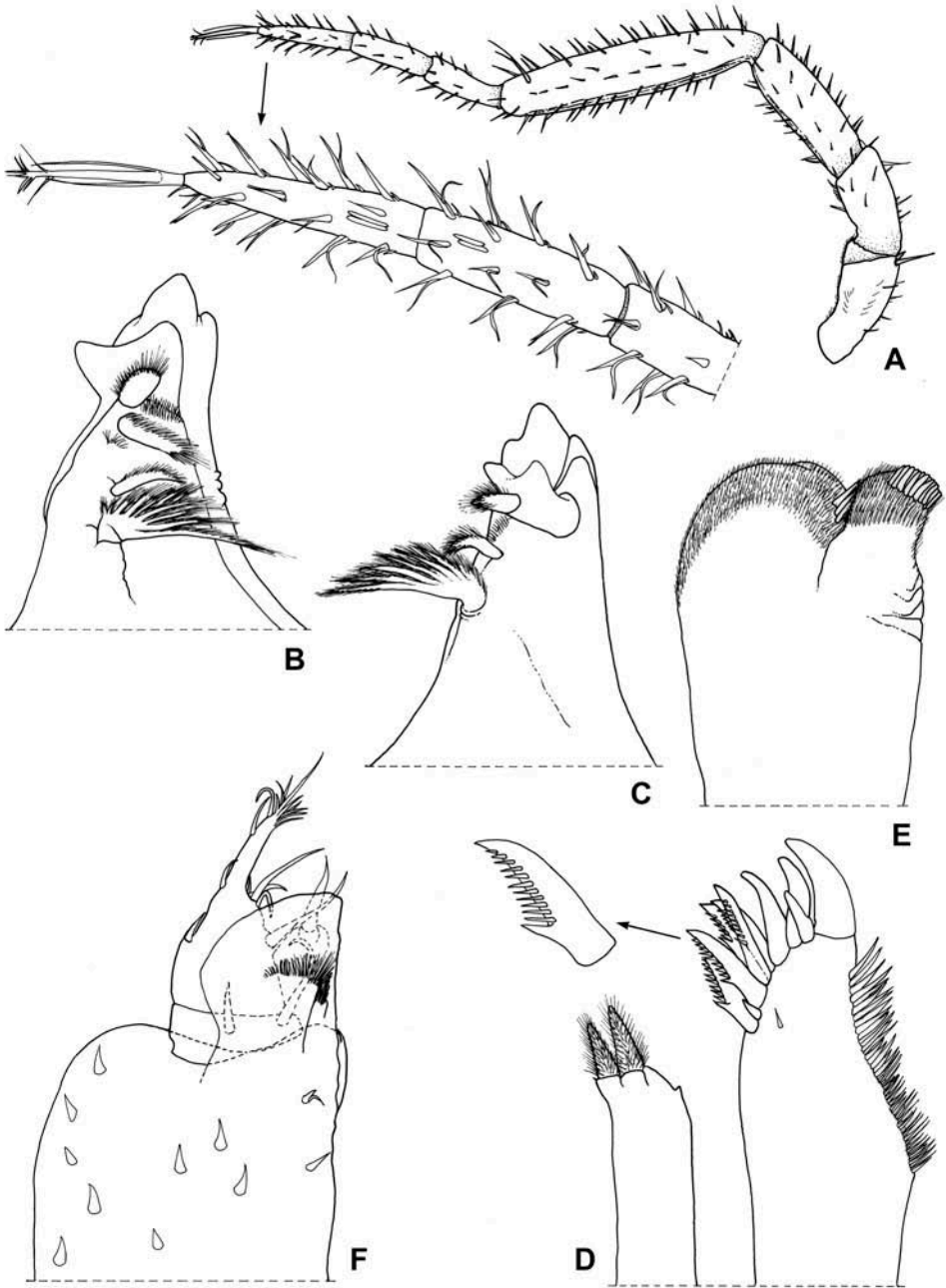


Figure 7. *Ctenoscia minima* from St. 14, ♀: (A) antenna; (B) left mandible; (C) right mandible; (D) maxillule; (E) maxilla; (F) maxilliped.

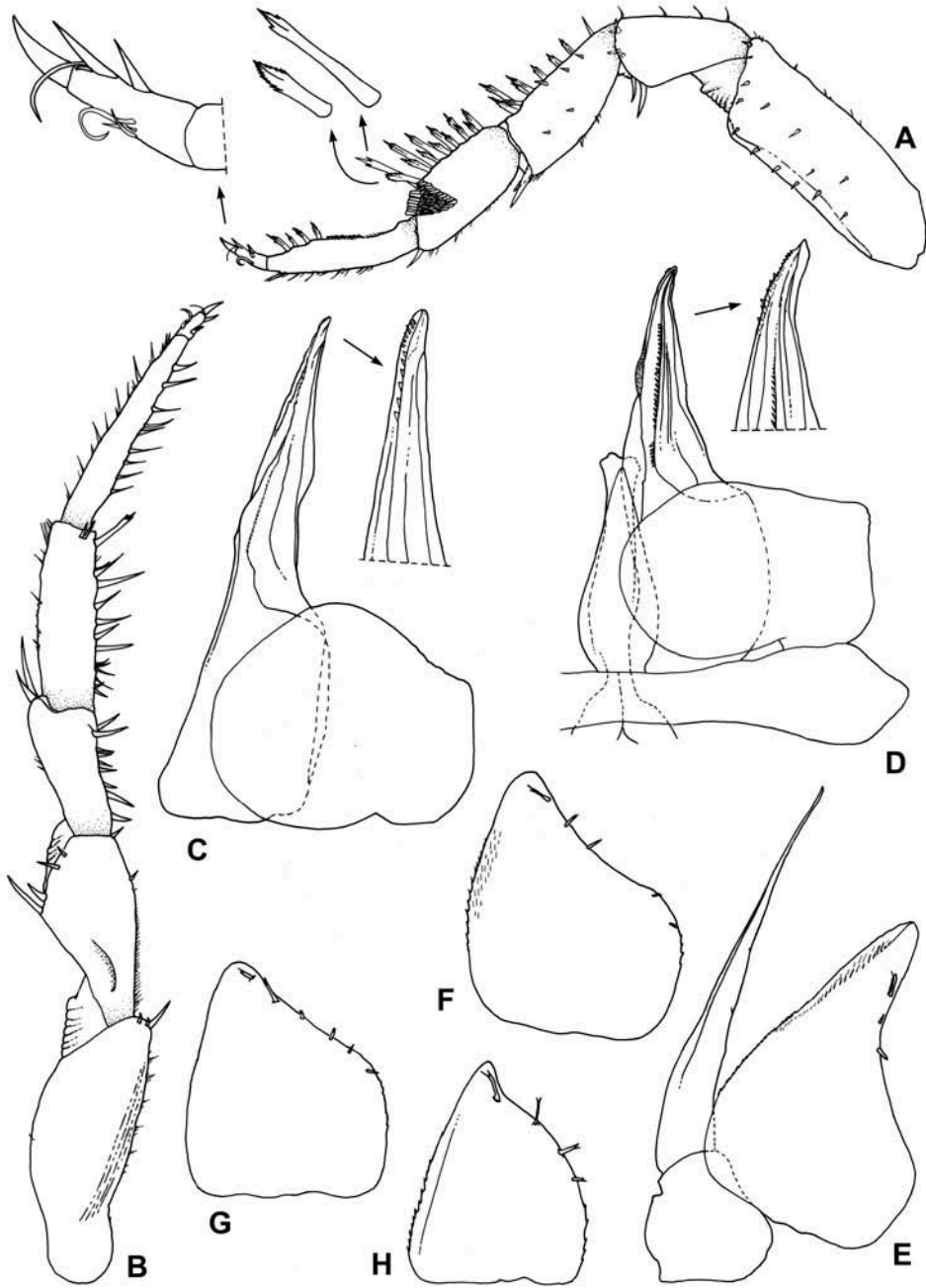


Figure 8. *Ctenoscia minima* from St. 14, ♂: (A) pereopod 1; (B) pereopod 7; (C) pleopod 1 (specimen 4.5 mm long); (D) genital papilla and pleopod 1 (specimen 4.0 mm long); (E) pleopod 2; (F) pleopod 3 exopod; (G) pleopod 4 exopod; (H) pleopod 5 exopod.

Material examined

2 ♂♂, 16 ♀♀, 1 juv., St. 8, leg. S. Taiti and C. Rossano, 28 April 2004 (MZUF 9464); 4 ♂♂, 14 ♀♀, St. 10, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9465); 1 ♀, St. 12, leg. C. Rossano, 26 April 2004 (MZUF 9466); 12 ♂♂, 20 ♀♀, St. 14, *Phillyrea* wood, leg. S. Taiti, 27 April 2004 (MZUF 9467); many ♂♂ and ♀♀, St. 15, sieved ground near stream, leg. S. Taiti, 27 April 2004 (MZUF 9468); 1 ♀, St. 17, leg. S. Taiti, 29 April 2004 (MZUF 9469); 1 ♀, St. 18, cork-oak wood, leg. S. Taiti, 29 April 2004 (MZUF 9470); 1 ♂, 2 ♀♀, St. 21, leg. S. Taiti and C. Rossano, 30.IX.2005 (MZUF 9471); 2 ♀♀, St. 24, cork-oak wood, leg. S. Taiti, 29 April 2004 (MZUF 9472).

Remarks

Ctenoscia minima was originally described by Dollfus (1892) from Grenada, Spain, and later recorded for several localities in Spain, including the Canary and Balearic islands, Portugal (see Schmalfuss 2003 for previous citations), and Morocco (Vandel 1961). This species has been illustrated by Vandel (1946) and Rodríguez and Barrientos (1993). The genus *Ctenoscia* also includes another species, *C. dorsalis* (Verhoeff, 1928), originally described from San Remo and Grimaldi (Liguria, Italy), and later recorded from several localities in mainland Spain and the Balearic Islands, Corsica, Italy including Sardinia and Sicily, Malta (see Schmalfuss 2003 for previous citations), and Tunisia (Achouri et al. 2008b).

According to the descriptions, *C. minima* differs from *C. dorsalis* in having the distal part of the male pleopod 1 endopod bent outwards instead of straight, while all the other characters are identical in the two species. The examination of many specimens of *Ctenoscia* from the Oued Laou valley showed that *C. dorsalis* has to be considered as a junior synonym of *C. minima*. In fact, the distal part of the male pleopod 1 endopod is straight or bent outwards according to the size of the specimens. In the population from St. 14 (Tirinese), 4 mm long males show the endopod bent outwards as in *C. minima* (Figure 8D), while in 4.5 mm long males this appendage is straight as in *C. dorsalis* (Figure 8C), showing that this character varies according to the age and size of the specimens. For the same reason also the distal margin of the male pleopod 1 exopod is more or less convex.

Ctenoscia minima is here fully illustrated to facilitate its identification (Figures 6–8).

Distribution

Portugal, Spain (including Canary and Balearic islands), Corsica, Italy (including Sardinia, Sicily and surrounding islands), Malta, Morocco and Tunisia. New record for the Rif region.

Genus *Paractenoscia* gen. nov.*Diagnosis*

Pereonites with one line of noduli laterales per side, noduli inserted more or less at the same distance from the lateral margins and at the same distance from the

posterior margins of the pereonites. No visible gland pores on lateral margins of pereonites. Cephalon with suprantennal line and without frontal line. Pleon distinctly narrower than pereon; epimera of pleonites 3–5 adpressed, ventrally with small posterior points not visible in dorsal view. Antennule with petaliform aesthetascs. Molar process of mandible dichotomized (i.e. consisting of some plumose setae each arising separately). Outer branch of maxillule with some pectinate teeth; inner branch with short and stout penicils and without posterior point. Inner lobe of maxilla with verruca-like protuberances and a tuft of short segmented sticks. Maxilliped endite without penicil. Pereopods with inner claw of dactylus enlarged. Pleopodal exopod without respiratory structures. Uropods with protopod and exopod grooved on outer margin; insertion of endopod and exopod almost at the same level.

Etymology

From the Greek ‘pará’ = beside, near + *Ctenoscia*. The name refers to the similarities with the genus *Ctenoscia*.

Remarks

Paractenoscia is very similar to the genera *Ctenoscia* and *Anaphiloscia* Racovitza, 1907 from the Mediterranean area. It is readily distinguished from both in the maxilla with verruca-like protuberances and a tuft of short sticks on outer lobe; from *Ctenoscia* also in having the noduli laterales all close to the posterior margin of the pereonites, antennule with petaliform instead of thin aesthetascs, molar process of the mandible dichotomized instead of semidichotomized (i.e. consisting of some plumose setae arising from a common stem, see Ferrara et al. 1995), and maxillular inner branch with short and stout penicils and without posterior point; from *Anaphiloscia* also in having pointed instead of fan-shaped dorsal scale-setae and dichotomized instead of simple molar penicil. Pectinate maxillular teeth are present also in the genera *Benthanops* Barnard, 1932 from South Africa, *Benthana* Budde-Lund, 1908, *Benthanoides* Lemos de Castro, 1958 and *Alboscia* Schultz, 1995 from South America. *Paractenoscia* differs from *Benthanops* in the number and position of the noduli laterales (see Taiti and Ferrara 1982), from *Benthana*, *Benthanoides* and *Alboscia* in the inner branch of the maxillule with short and stout instead of long and thin penicils and in the peculiar shape of the maxilla with the inner lobe covered with verruca-like protuberances and with a tuft of short segmented sticks near the medial margin, features not present in any other genera of Philosciidae.

Paractenoscia cavernicola sp. nov.

(Figures 9–11)

Material examined

Holotype: ♂, St. 8, leg. S. Taiti and C. Rossano, 28 April 2004 (MZUF 9473). Paratypes: 3 ♂, 9 ♀♀, same data as holotype (MZUF 9473).

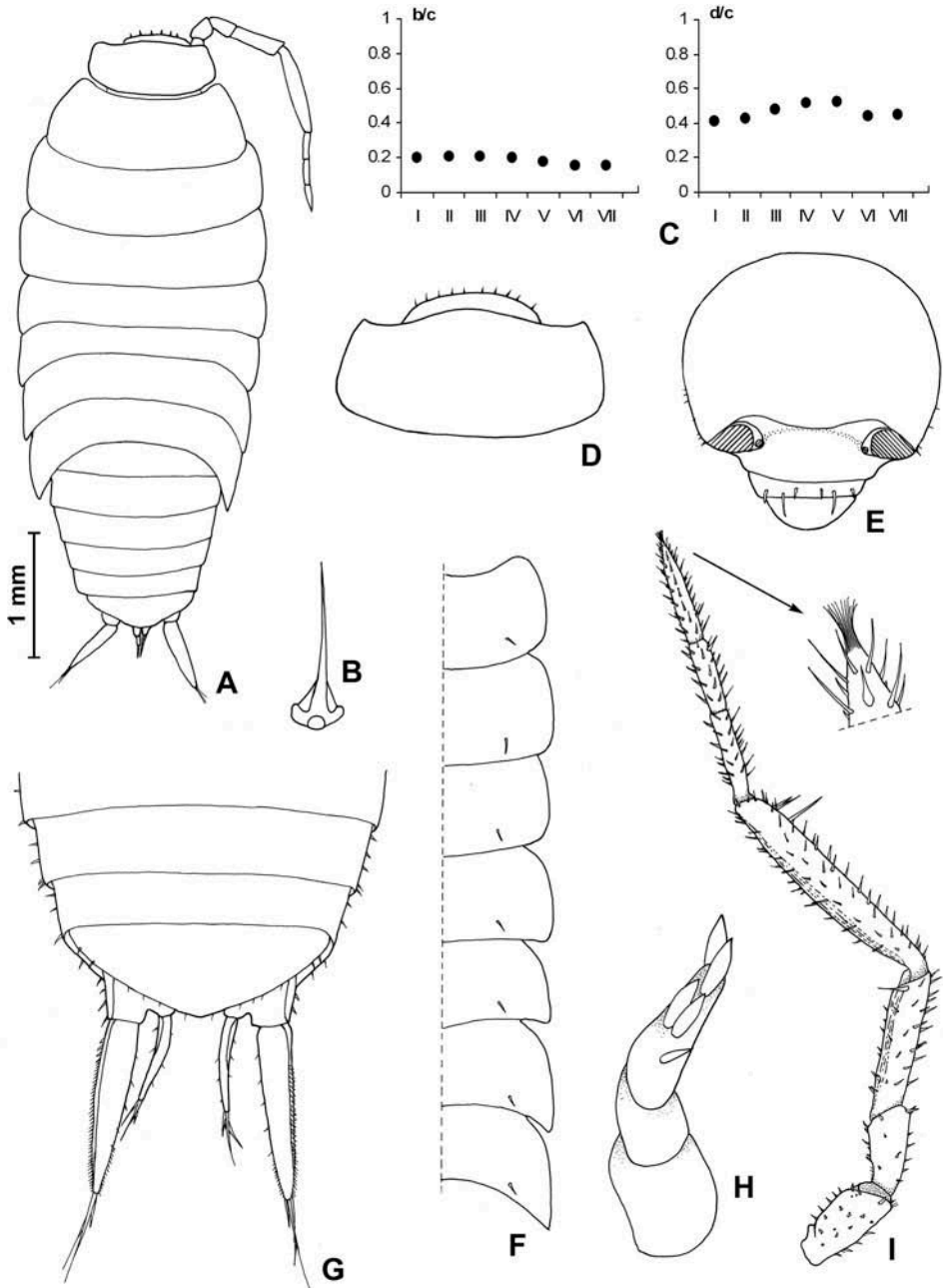


Figure 9. *Paractenosia cavernicola* sp. nov. from St. 8, paratype ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) co-ordinates of noduli laterales; (D) cephalon, dorsal view; (E) cephalon, frontal view; (F) right side of pereon showing disposition of noduli laterales; (G) pleonites 3–5, telson and uropods; (H) antennule; (I) antenna.

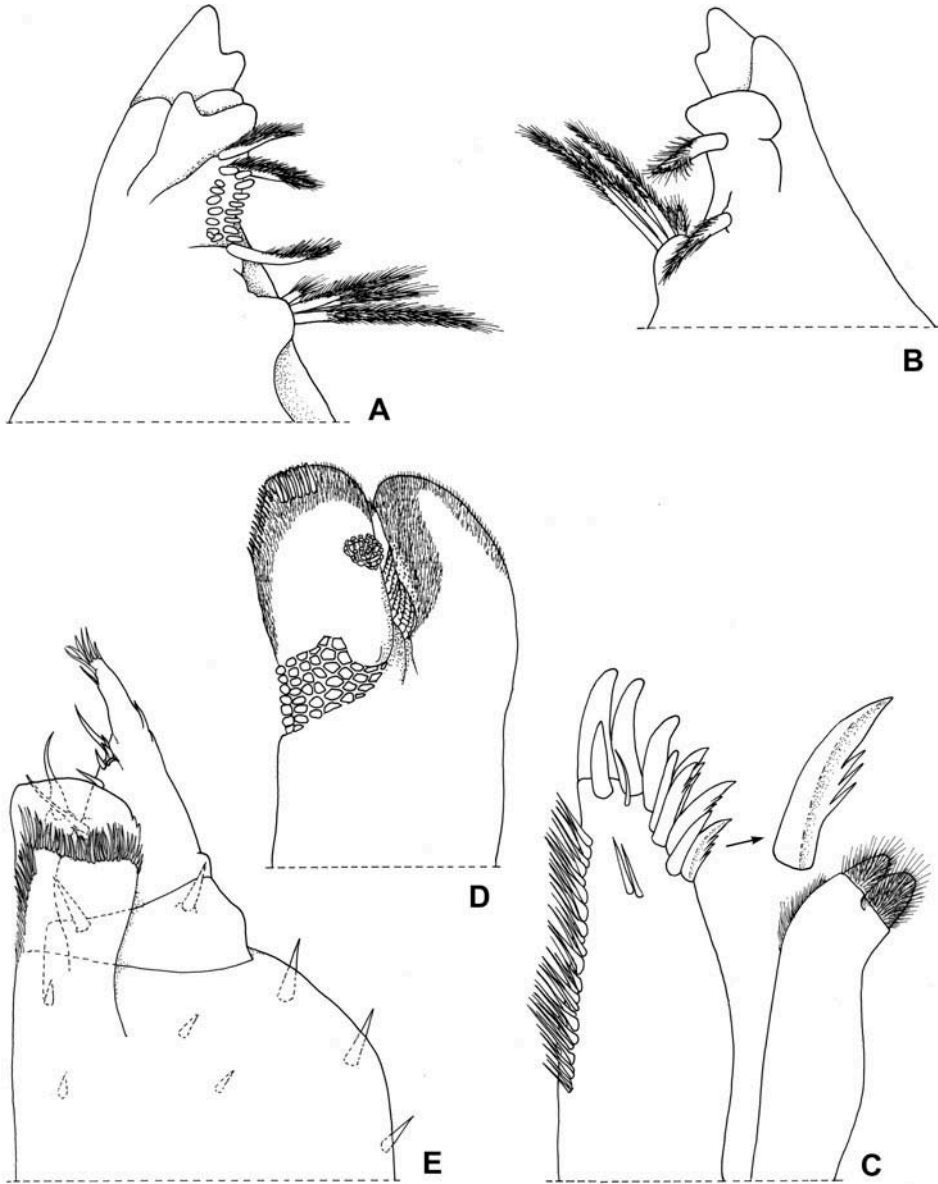


Figure 10. *Paractenosia cavernicola* sp. nov. from St. 8, paratype ♀: (A) left mandible; (B) right mandible; (C) maxillule; (D) maxilla; (E) maxilliped.

Description

Maximum length: ♂, 3.5 mm; ♀, 4.8 mm. Body outline as in Figure 9A. Colourless body. Back smooth with some scattered pointed scale-setae (Figure 9B); noduli laterales with b/c and d/c co-ordinates as in Figure 9C. Cephalon (Figure 9D, 9E) with suprantennal line slightly bent downwards in the middle; eyes absent. Pereonites 1–3 with convex distal margins and rounded posterior corners; pereonites 4–7 with

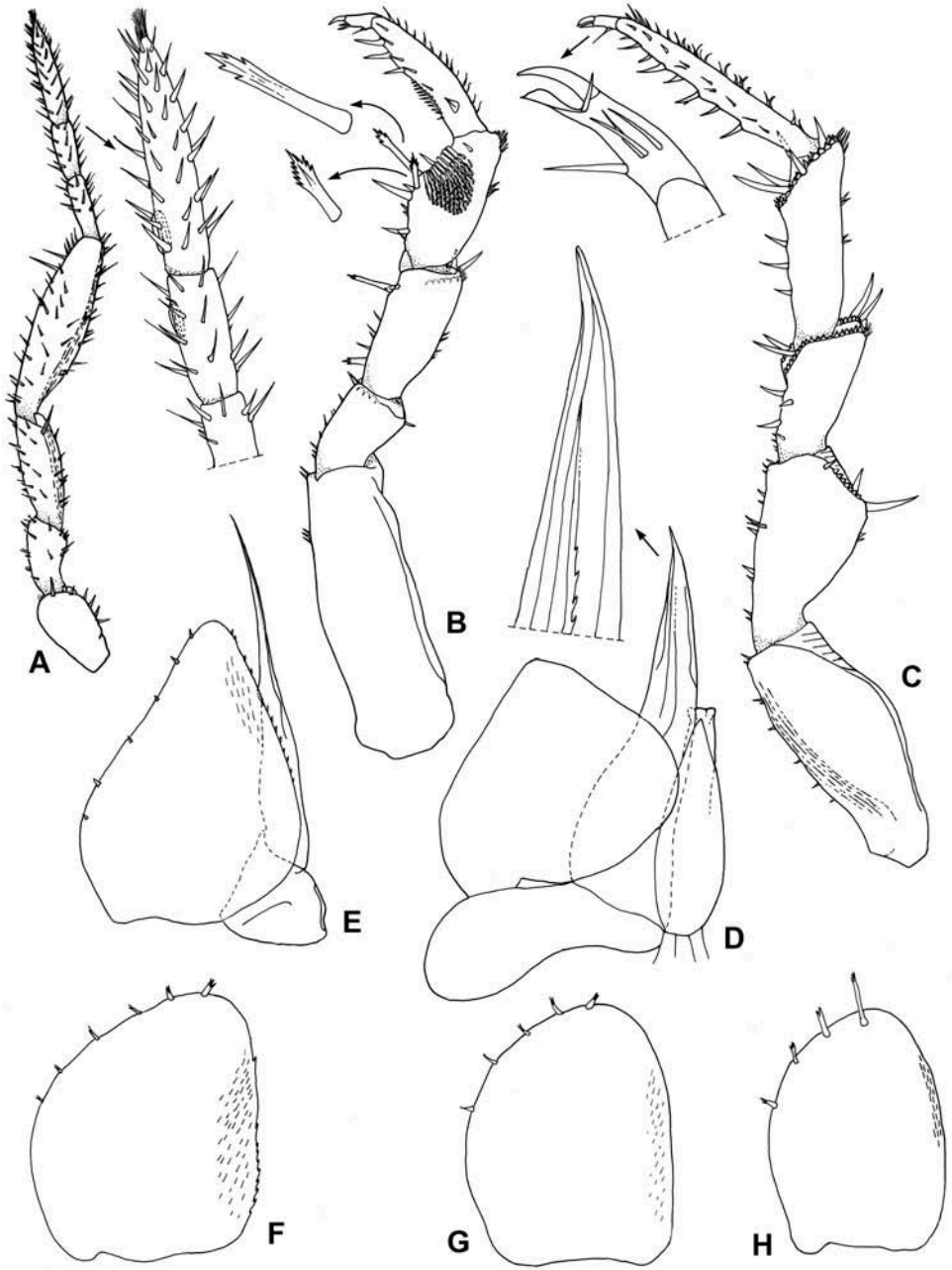


Figure 11. *Paractenosia cavernicola* sp. nov. from St. 8, paratype ♂: (A) antenna; (B) pereopod 1; (C) pereopod 7; (D) genital papilla and pleopod 1; (E) pleopod 2; (F) pleopod 3 exopod; (G) pleopod 4 exopod; (H) pleopod 5 exopod.

progressively more acute corners (Figure 9F). Telson triangular with slightly convex sides (Figure 9G). Antennule (Figure 9H) with third article longer than first and second; third article with two petaliform apical aesthetascs, two petaliform aesthetascs in the middle and one pointed aesthetasc closer to proximal margin. Antenna (Figures 9I, 11A) with flagellum slightly longer than fifth article of peduncle; flagellar articles subequal in length; a row of three aesthetascs on second and four aesthetascs on third flagellar article. Mandible with molar penicil consisting of three long and two short setae; left mandible (Figure 10A) with 2 + 1 free penicils and two lines of scales between the two groups of free penicils; right mandible (Figure 10B) with 1 + 1 free penicils. Maxillule outer branch with 4 + 6 (4 pectinate) teeth; inner branch with two short stout penicils (Figure 10C). Maxilla (Figure 10D) deeply bilobate with setose apex, inner lobe slightly larger than outer one, bearing verruca-like protuberances at the base and with tuft of short segmented sticks near medial margin. Maxilliped (Figure 10E) endite with a line of setae in the middle and no penicil; first article of palp with two strong setae. Pereopods with a row of scales on distal margins of ischium, merus and carpus.

Male: Antenna with fifth article of the peduncle distinctly enlarged (Figure 11A). Pereopod 1 (Figure 11B) with no distinct sexual modifications. Pereopod 7 (Figure 11C) ischium with straight sternal margin. Pleopod 1 (Figure 11D) exopod subtriangular; endopod with pointed apical part slightly bent outwards. Pleopod 2 (Figure 11E) endopod with apical part flagelliform, distinctly longer than exopod. Pleopod 3–5 exopods as in Figure 11F–H.

Etymology

From the Latin '*cavernicolus*' = cavernicolous, cave-dwelling. The name refers to the locality of collection: Ghar-Knadel Cave.

Family **BATHYTROPIDAE** Vandel

Genus *Bathytropa* Budde-Lund, 1885

Bathytropa rifensis sp. nov.

(Figures 12–14)

Material examined

Holotype: ♂, St. 15, sieved ground near stream, leg. S. Taiti, 27 April 2004 (MZUF 9474). Paratypes: 2 ♂♂, 5 ♀♀, same data as holotype (MZUF 9474).

Description

Maximum length: ♂, 2.8 mm; ♀, 4.0 mm. Colour pale. Body strongly convex with epimera of pereon and pleon enlarged, obliquely directed, clinger type (Schmalzfuss 1984). Dorsal surface of cephalon, pereon and pleon with large tubercles and ribs arranged as in Figure 12A. Back covered with triangular scale-setae (Figure 12B); posterior margins of the body segments with rectangular scale-setae (Figure 12C); one line of noduli laterales per side arranged on top of the outmost tubercle of the

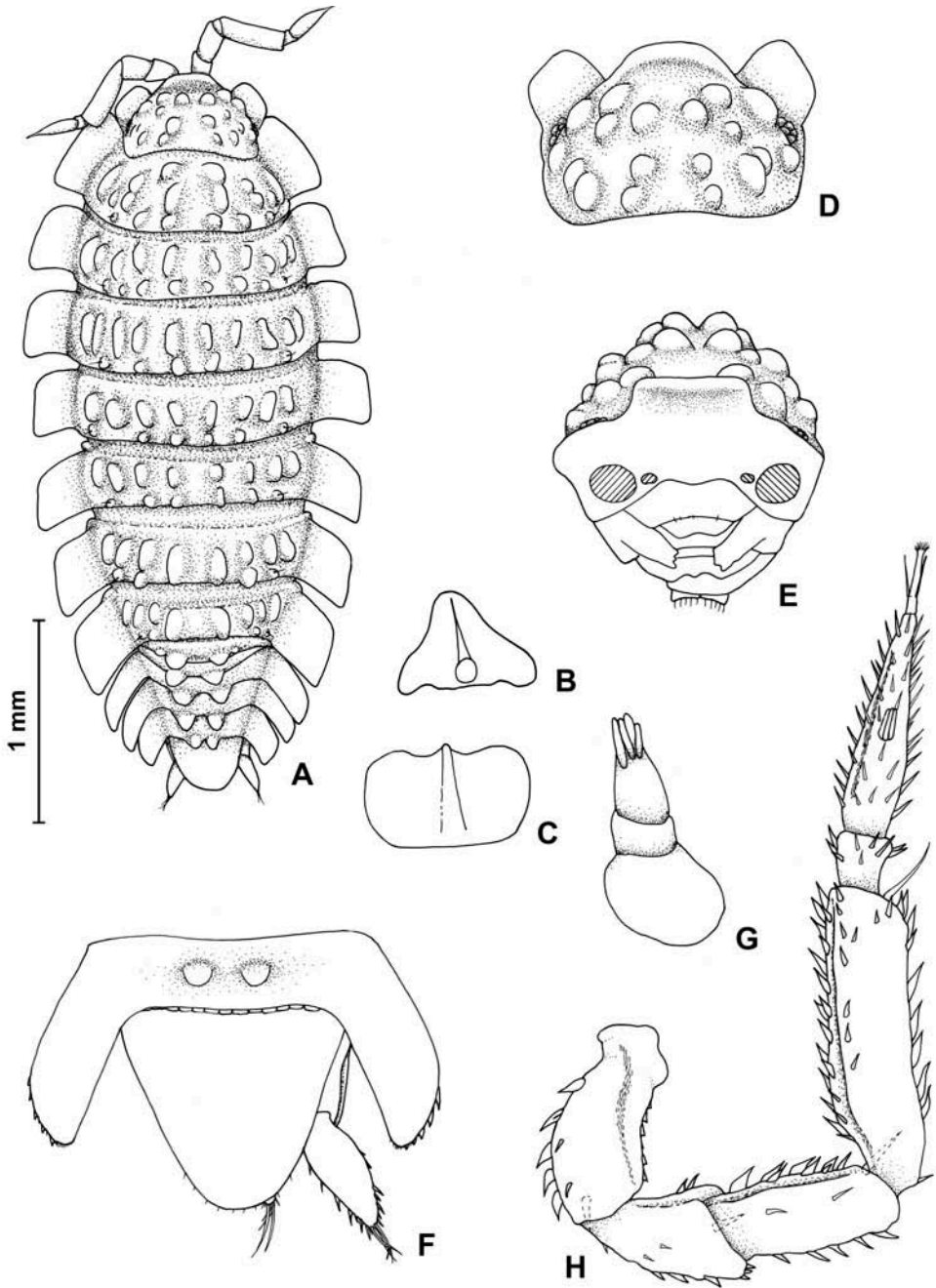


Figure 12. *Bathytropa rifensis* sp. nov. from St. 15, paratype ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) scale-seta on posterior margins of segments; (D) cephalon, dorsal view; (E) cephalon, frontal view; (F) pleonite 5, telson and right uropod; (G) antennule; (H) antenna.

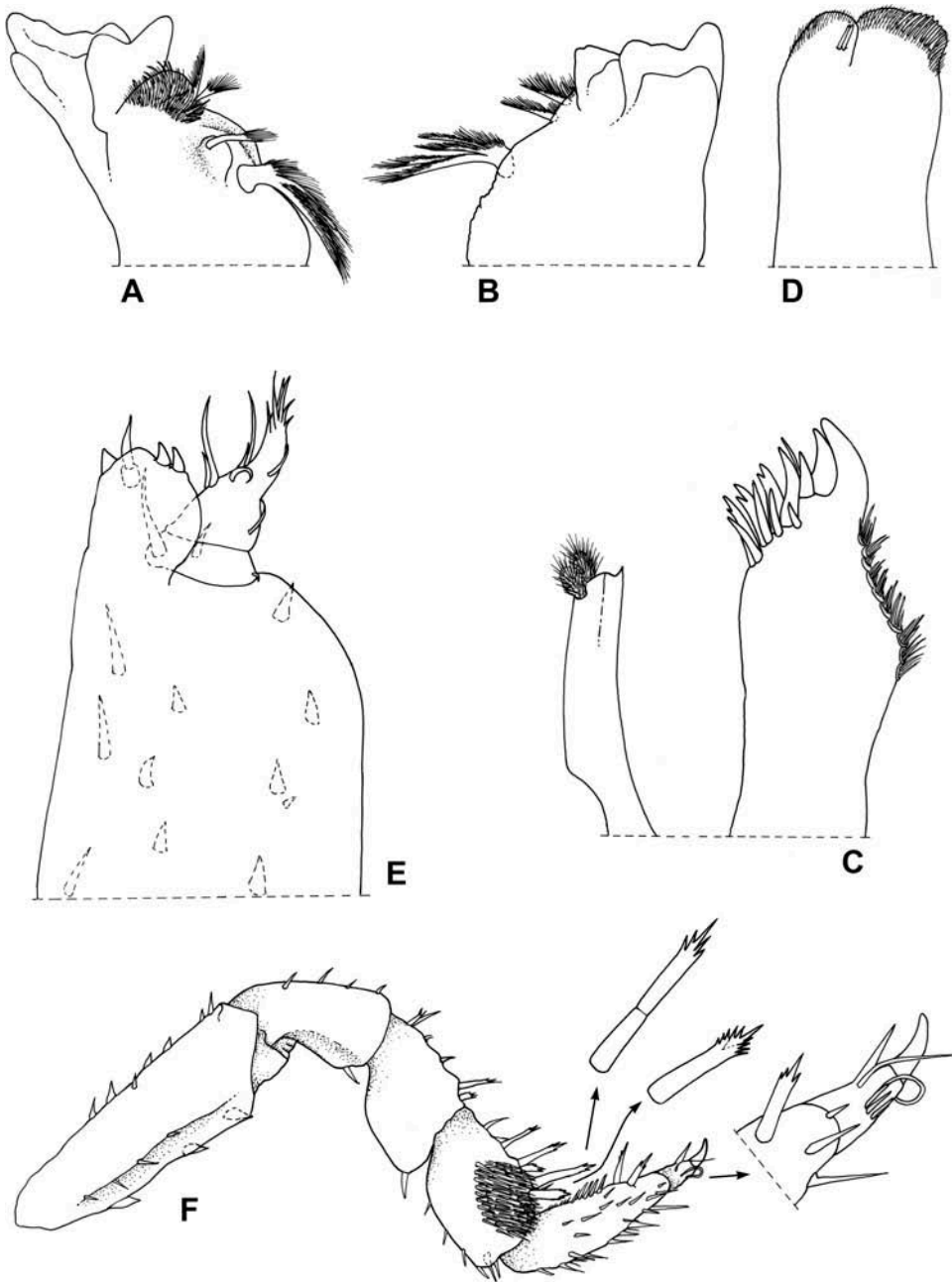


Figure 13. *Bathytropa rifensis* sp. nov. from St. 15, paratype ♂: (A) left mandible; (B) right mandible; (C) maxillule; (D) maxilla; (E) maxilliped; (F) pereopod 1.

posterior row of each pereonite. Cephalon (Figure 12D, E) with median lobe raised up, broadly rounded in dorsal view and rectangular in frontal view; quadrangular lateral lobes, obliquely directed and slightly more protruding frontwards than median

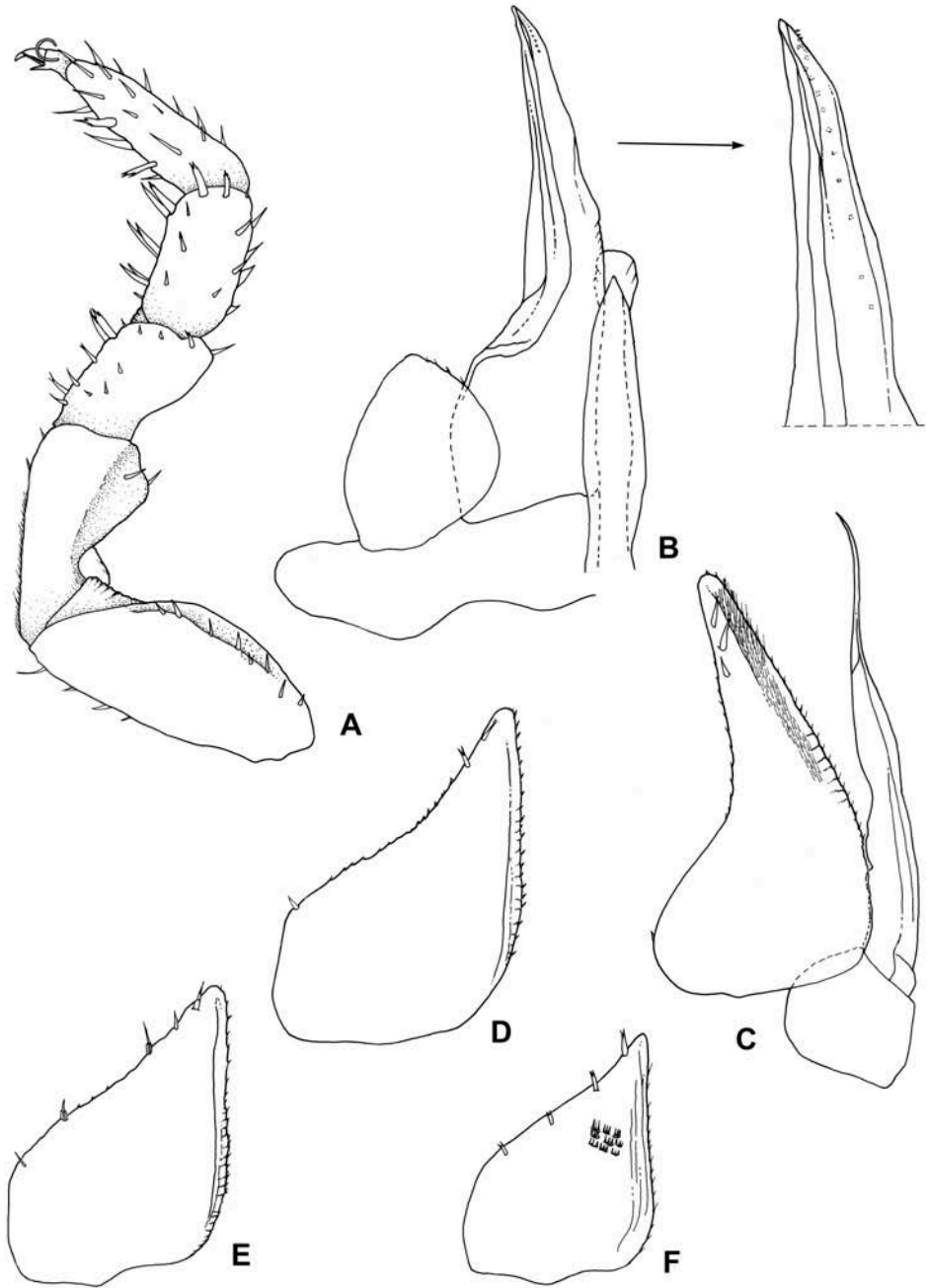


Figure 14. *Bathytropa rifensis* sp. nov. from St. 8, paratype ♂: (A) pereopod 7; (B) genital papilla and pleopod 1; (C) pleopod 2; (D) pleopod 3 exopod; (E) pleopod 4 exopod; (F) pleopod 5 exopod.

lobe; no suprantennal line; eye small with five ommatidia. Pereon with quadrangular epimera progressively pointing backwards from first to seventh; posterior margin of the first pereonite slightly sinuous at sides. Pleonites 3–5 with subrectangular epimera continuing the outline of the pereon. Telson slightly wider than long, triangular with straight sides and broadly rounded apex (Figure 12F). Antennule (Figure 12G) with second article much shorter than first and third; third article with an apical tuft of four aesthetascs. Antenna (Figure 12H) with flagellum about as long as fifth article of peduncle; second flagellar article about four times as long as first, bearing a row of four aesthetascs in the middle. Mandibles with molar penicil consisting of four or five hairy setae; left mandible (Figure 13A) with 2 + 1 free penicils; right mandible (Figure 13B) with 1 + 1 free penicils. Maxillule (Figure 13C) outer branch with 4 + 7 (3 cleft) teeth; inner branch with two short stout penicils and a distinct apical point. Maxilla (Figure 13D) distally bilobate with setose apex; inner lobe much wider than outer one. Maxilliped (Figure 13E) endite with three triangular stout teeth on distal margin and no penicil; first article of palp with two setae, the medial one much longer than the outer one. Pleopodal exopods with no respiratory structures as in most species of the genus.

Male: Pereopod 1 (Figure 13F) with no distinct sexual modifications. Pereopod 7 (Figure 14A) ischium enlarged in the distal part, with straight sternal margin. Pleopod 1 (Figure 14B) exopod subtriangular with rounded distal part; endopod with pointed apical part slightly bent outwards. Pleopod 2 (Figure 14C) endopod with apical part flagelliform, slightly longer than exopod. Pleopod 3–5 exopods as in Figure 14D–F.

Etymology

The name refers to Rif where the specimens have been collected.

Remarks

At present the genus *Bathytropa* includes 10 species distributed in the Mediterranean area (Schmalfuss 2003). According to Vandel (1962), *B. meinertii* Budde-Lund, 1885 includes two subspecies: *B. m. meinertii* and *B. m. costata* Budde-Lund, 1885. The new species is readily distinguishable from *B. meinertii costata*, *B. tuberculata* Racovitza, 1908, and *B. schembrii* Caruso and Lombardo, 1982 in the presence of two paramedian tubercles instead of a single median tubercle on pleonites; from *B. granulata* Aubert and Dollfus, 1890 and *B. graevei* (Verhoeff, 1940) in having distinct dorsal ribs and tubercles instead of granulations; from *B. wahrmani* Strouhal, 1968 in the telson triangular with rounded apex, instead of hour-glass-shaped, and the absence of respiratory structures on the pleopods; from *B. meinertii meinertii*, *B. colasi* Vandel, 1954, *B. dollfusi* Strouhal, 1936, *B. patanei* Caruso, 1973a and *B. ruffoi* Caruso, 1973b in the number and disposition of dorsal ornamentation. In northern Africa three species of *Bathytropa* were previously recorded: *B. tuberculata* and *B. meinertii*, with both subspecies *B. m. meinertii* and *B. m. costata*, from Algeria, and *B. colasi* Vandel, 1954 from 'Berberie' (Vandel 1955b).

Family **STENONISCIDAE** Budde-Lund
Genus *Stenoniscus* Aubert and Dollfus, 1890
Stenoniscus carinatus Silvestri, 1897

Material examined

1 ♀, St. 5, beach under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9475).

Distribution

This littoral species is common along the coasts of Canary Islands, Portugal, Corsica, Italy, Malta and Croatia. It is also recorded from Florida (Taiti and Ferrara 1996), where it is most probably introduced. New record for the Rif region and northern Africa.

Remarks

For diagnostic characters of *S. carinatus* see Schmidt (2003, Figures 67–72).

Family **PLATYARTHRIIDAE** Verhoeff
Genus *Platyarthrus* Brandt, 1833
Platyarthrus caudatus Aubert and Dollfus, 1890

Material examined

9 ♂♂, 12 ♀♀, St. 20, under stones along path to waterfall, leg. S. Taiti and C. Rossano, 2 May 2004 (MZUF 9476).

Distribution

Known from most lands of the western Mediterranean. New record for the Rif region.

Remarks

For diagnostic characters of *P. caudatus* see Vandel (1962, p. 457, Figures 228, 229).

Platyarthrus parisii Arcangeli, 1930
(Figure 15)

Platyarthrus schöbli parisii; Vandel, 1946, p. 219

Platyarthrus Parisii; Arcangeli, 1952, p. 137

Material examined

1 ♂, 1 ♀, St. 25, under stones in meadow, leg. S. Taiti, 30 April 2004 (MZUF 9477).

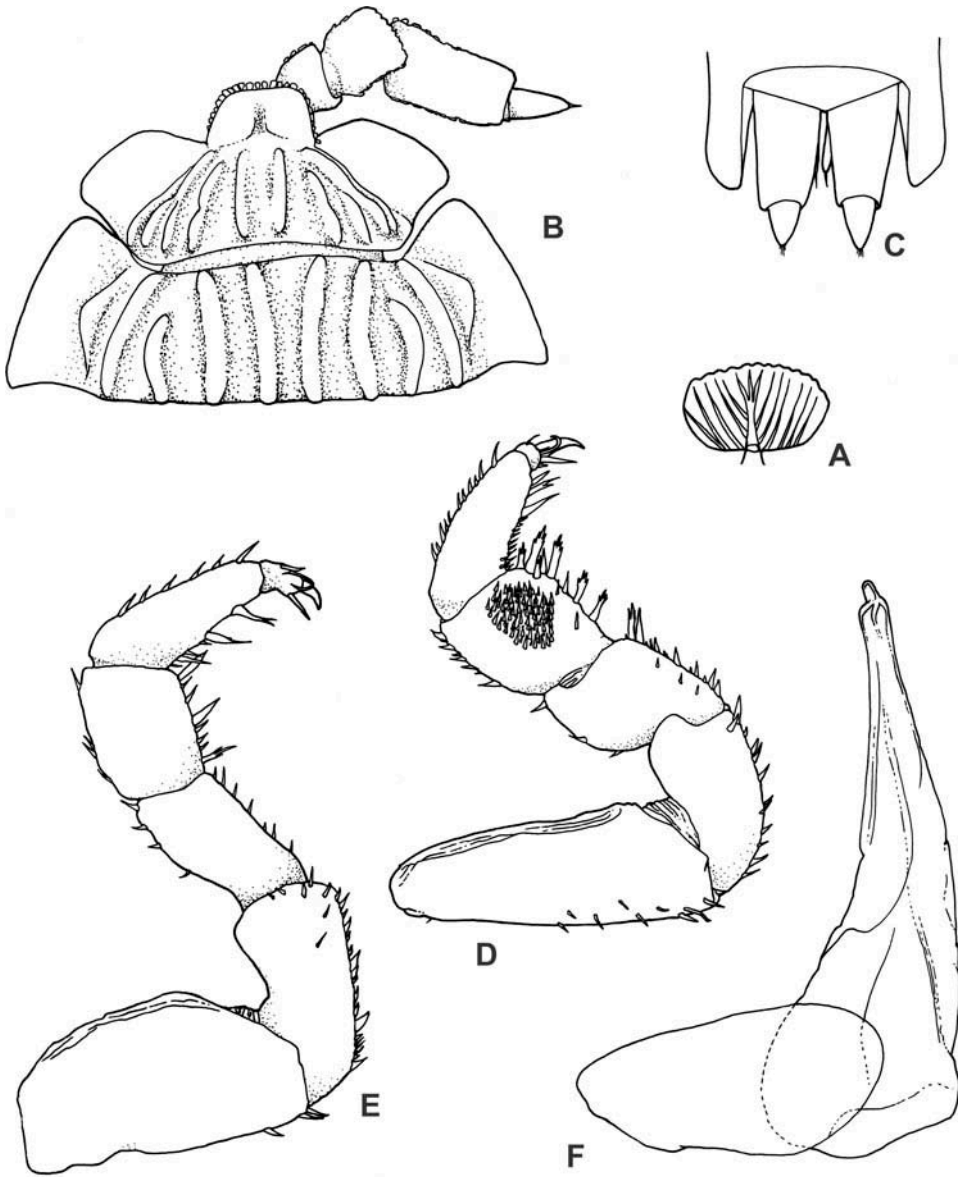


Figure 15. *Platyarthrus parisii* from St. 25, ♂: (A) dorsal scale-seta; (B) cephalon and pereonite 1, dorsal view; (C) pleonite 5, telson and uropods; (D) pereopod 1; (E) pereopod 7; (F) pleopod 1.

Distribution

Canary Islands and Morocco. New record for the Rif region.

Remarks

Platyarthrus parisii was described by Arcangeli (1930) on female specimens from the Canary Islands (Gran Canaria and Tenerife). Vandel (1946) considers this form as a

subspecies of *P. schoblii* Budde-Lund, 1885 and adds a record for Morocco (Mamora Forest, between Rabat and Meknès). Arcangeli (1952) in a discussion on the various subspecies of *P. schoblii* definitely considers this form as a species (see also Schmalfuss 2003). The specimens from the St. 25 (near Oued Ouara) examined by us show the same large lateral lobes of the cepalon and the same disposition of the dorsal ribs as *P. parisii*, but differ in the more protruding median frontal lobe. It is difficult to say whether this character can be enough to distinguish a distinct species or it falls within the variability of *P. parisii*. In order to facilitate a future comparison with the species from the Canary Islands the main characters of the specimens from Oued Ouara are illustrated in Figure 15.

Family **PORCELLIONIDAE** Brandt
Genus *Leptotrichus* Budde-Lund, 1885
Leptotrichus panzerii (Audouin, 1826)

Leptotrichus Panzeri; Dollfus, 1896, p. 542; Paulian de Félice, 1939, p. 212
Leptotrichus panzeri; Achouri et al., 2008c, p. 76–78
Leptotrichus panzerii; Colombini et al., 2008, p. 86

Material examined

2 ♂♂, 5 ♀♀, St. 3, leg. C. Rossano, 28 April 2004 (MZUF 9478); 1 ♀, same locality, under stones, leg. S. Taiti and C. Rossano, 1 October 2005 (MZUF 9479); 3 ♂♂, 5 ♀♀, St. 4, dune under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9480).

Previous Rif records

Oued Laou region (Achouri et al. 2008c); Oued Laou (Colombini et al. 2008).

Distribution

Countries encompassed by the Mediterranean Sea, Azores, Madeira, Canary Islands, Cape Verde, Saint Helena and Bermuda.

Remarks

For diagnostic characters of *L. panzerii* see Vandel (1962, p. 645, Figures 317, 318).

Genus *Agabiformius* Verhoeff, 1908
Agabiformius lentus (Budde-Lund, 1885)

Agabiformius lentus; Achouri et al., 2008c, p. 76–78; Achouri et al., 2008a, p. 129

Material examined

2 ♂♂, 1 ♀, St. 7, leg. S. Taiti and C. Rossano, 29 September 2005 (MZUF 9481).

2094 *S. Taiti and C. Rossano*

Previous Rif records

Oued Laou region (Achouri et al. 2008a, 2008c).

Distribution

This species is common in all the lands of the Mediterranean basin where it is native. It has been introduced with human activities in many parts of the world.

Agabiformius obtusus (Budde-Lund, 1909)

Agabiformius obtusus; Colombini et al., 2008, p. 86

Material examined

4 ♀♀, St. 4, dune under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9482); 1 ♀, St. 5, beach under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9483).

Previous Rif records

Oued Laou (Colombini et al. 2008).

Distribution

This species occurs in the lands of the Mediterranean, where it is very common along sandy beaches. It is also recorded from Kuwait and Sudan.

Remarks

For diagnostic characters of *A. lentus* see Vandel (1962, p. 640, Figures 315, 316).

Genus ***Lucasius*** Kinahan, 1859
Lucasius pallidus (Budde-Lund, 1885)

Material examined

5 ♂♂, 2 ♀♀, St. 8, 220 m, leg. S. Taiti and C. Rossano, 28 April 2004 (MZUF 9484); 26 ♂♂, 18 ♀♀, 2 juvs, same locality and collectors, 28 September 2005 (MZUF 9485); 11 ♂♂, 21 ♀♀, St. 25, under stones in meadow, leg. S. Taiti, 30 April 2004 (MZUF 9486); 2 ♀♀, St. 26, cork-oak wood, leg. S. Taiti, 30 April 2004 (MZUF 9487).

Distribution

Morocco, southern Spain, southern France, Corsica, Sardinia and Tuscany. New record for the Rif region.

Remarks

In Morocco two species of *Lucasius* have been recorded: *L. myrmecophilus* Kinahan, 1859, originally described from Algeria (Kinahan 1859); and *L. pallidus*, originally described from southern France, Sicily, southern Spain and Algeria. In Sicily this species was confused with *Mica tardus* (Budde-Lund, 1885) and, according to Caruso and Di Maio (1996), it is not present. Achouri et al. (2008c) cite *L. myrmecophilus* from the Oued Laou basin. The specimens from the same area examined by us definitely fit the description of *L. pallidus*, but the differences of this species with *L. myrmecophilus* are still unclear. According to Vandel (1962) and Schmölzer (1965) *L. myrmecophilus* differs from *L. pallidus* in having a smooth instead of granulated dorsum, but in the original description by Kinahan (1859) and in the redescription by Budde-Lund (1885, p. 135) it is clearly stated that the dorsum of the body is granulated. Therefore there is a possibility that the two species are synonymous, but a re-examination of the type material of *L. myrmecophilus* is necessary to confirm this hypothesis.

For diagnostic characters of *L. pallidus* see Vandel (1962, p. 651, Figure 321).

Genus *Porcellionides* Miers, 1877
Porcellionides pruinosus (Brandt, 1833)

Metoponorthus (Metoponorthus) pruinosus; Vandel, 1958a, p. 129

Porcellionides pruinosus; Achouri et al., 2008c, p. 76–78; Achouri et al., 2008a, p. 129

Material examined

1 ♂, 1 ♀, St. 13, cave entrance, leg. C. Rossano, 28 April 2004 (MZUF 9488).

Previous Rif records

Peñón de Alhucemas (Vandel 1958a); Oued Laou region (Achouri et al. 2008a, 2008c).

Distribution

Species of Mediterranean origin with a cosmopolitan distribution.

Remarks

For diagnostic characters of *P. pruinosus* see Vandel (1962, p. 618, Figures 306, 307) and Gruner (1966, p. 251, Figures 190–193).

Porcellionides sexfasciatus lusitanus (Vandel, 1946)

Metoponorthus sexfasciatus lusitanus Vandel, 1946, p. 269, Figures 80B–D, 84, 85

? *Porcellionides sexfasciatus*; Achouri and Charfi-Cheikhrouha, 2009, p. 1048

Material examined

1 ♂, St. 2, under stones at base of cliff, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9489); 1 ♂, 1 ♀, St. 3, under stones, leg. S. Taiti and C. Rossano, 1 October 2005 (MZUF 9490); 1 ♀, St. 4, beach under logs, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9491); 1 ♂, 2 ♀♀, St. 6, near well and wheat field, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9492); 1 ♂, St. 7, leg. S. Taiti, 29 April 2004 (MZUF 9493); 1 ♂, same locality, leg. S. Taiti and C. Rossano, 29 September 2005 (MZUF 9494); 1 ♀, St. 9, under stones in meadow, leg. S. Taiti, 28 April 2004 (MZUF 9495); 3 ♂♂, 9 ♀♀, St. 10, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9496); 1 ♂, 2 ♀♀, St. 14, *Phillyrea* wood, leg. S. Taiti, 27 April 2004 (MZUF 9497); 5 ♂♂, 3 ♀♀, same locality, leg. S. Taiti and C. Rossano, 27 September 2005 (MZUF 9498); 4 ♂♂, 6 ♀♀, St. 19, leg. S. Taiti, 29 April 2004 (MZUF 9499); 3 ♀♀, St. 23, under stones, leg. S. Taiti, 30 April 2004 (MZUF 9500); 5 ♂♂, 11 ♀♀, St. 25, under stones in meadow, leg. S. Taiti, 30 April 2004 (MZUF 9501).

Distribution

Porcellionides sexfasciatus (Budde-Lund, 1885) is widely distributed in the western Mediterranean region, Atlantic coasts of Europe and northern Africa, including Atlantic islands. It has been also introduced to many other parts of the world. At present *P. sexfasciatus* includes several subspecies. The specimens from the Rif examined by us belong to *P. sexfasciatus lusitanus* distributed in Portugal and Morocco (Vandel 1946). New record for the Rif region.

***Porcellionides* sp.**
(Figures 16 and 17)

Material examined

1 ♀, St. 4, dune under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9502); 1 ♂, St. 6, near well and wheat field, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9503).

Remarks

These specimens certainly belong to the genus and subgenus *Porcellionides*, but they do not seem to belong to any of the species of *Porcellionides* recorded from Morocco or the Iberian Peninsula. This species is morphologically close to *P. pruinosus* from which it differs in the more granulated dorsum and shape of the male pleopod 2 with exopod having a triangular posterior lobe and endopod tip slightly bent inwards. Since only two specimens were examined, we illustrate the main characters of the species (Figures 16 and 17) but we prefer not to identify the species until a more abundant material can be analysed.

Genus ***Soteriscus*** gen. nov.

Type species: *Soteriscus gaditanus* Vandel, 1956b by present designation

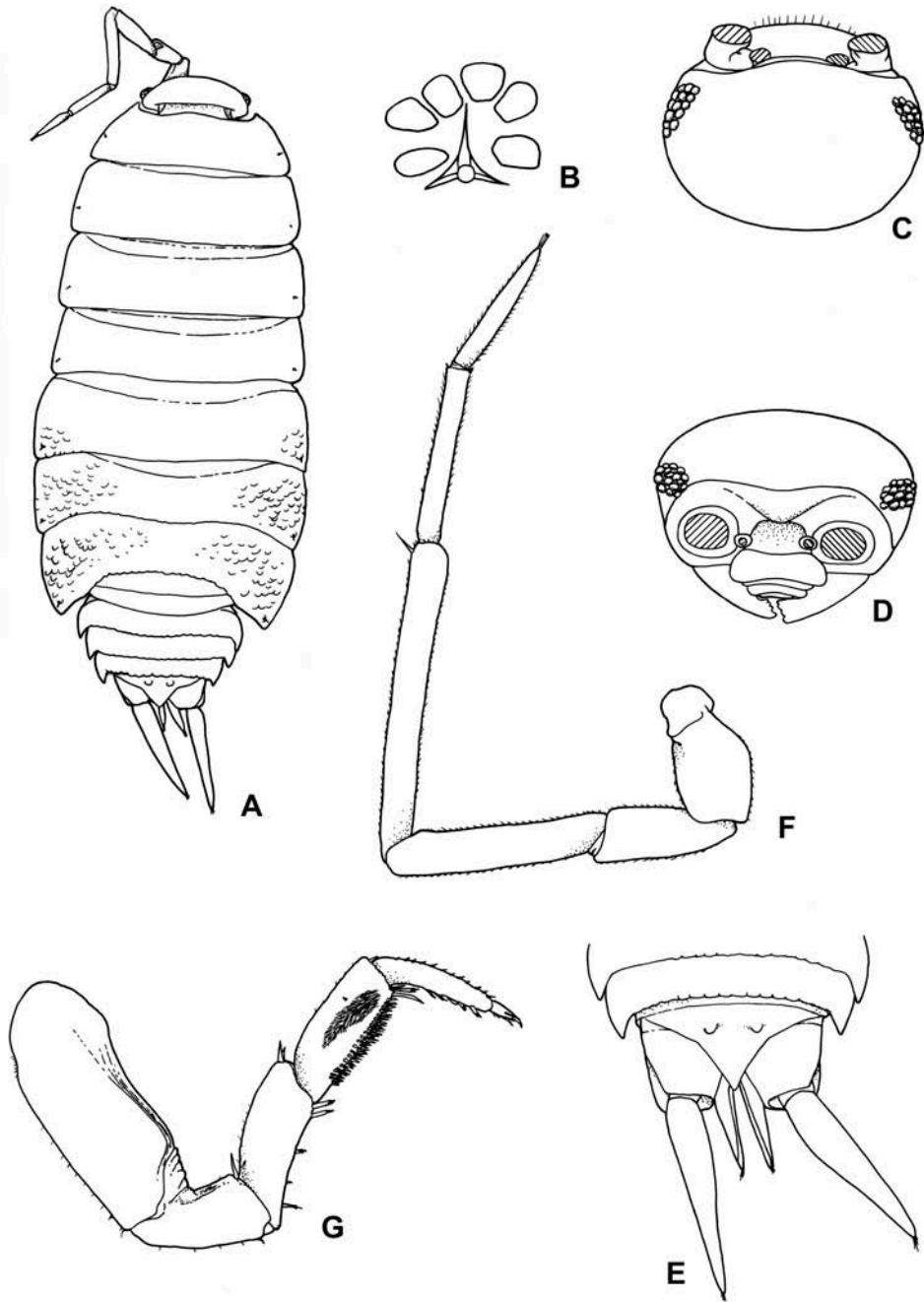


Figure 16. *Porcellionides* sp., ♀ from St. 4: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) cephalon, dorsal view; (D) cephalon, frontal view; (E) pleonites 4, 5, telson and uropods; (F) antenna. ♂ from St. 6: (G) pereopod 1.

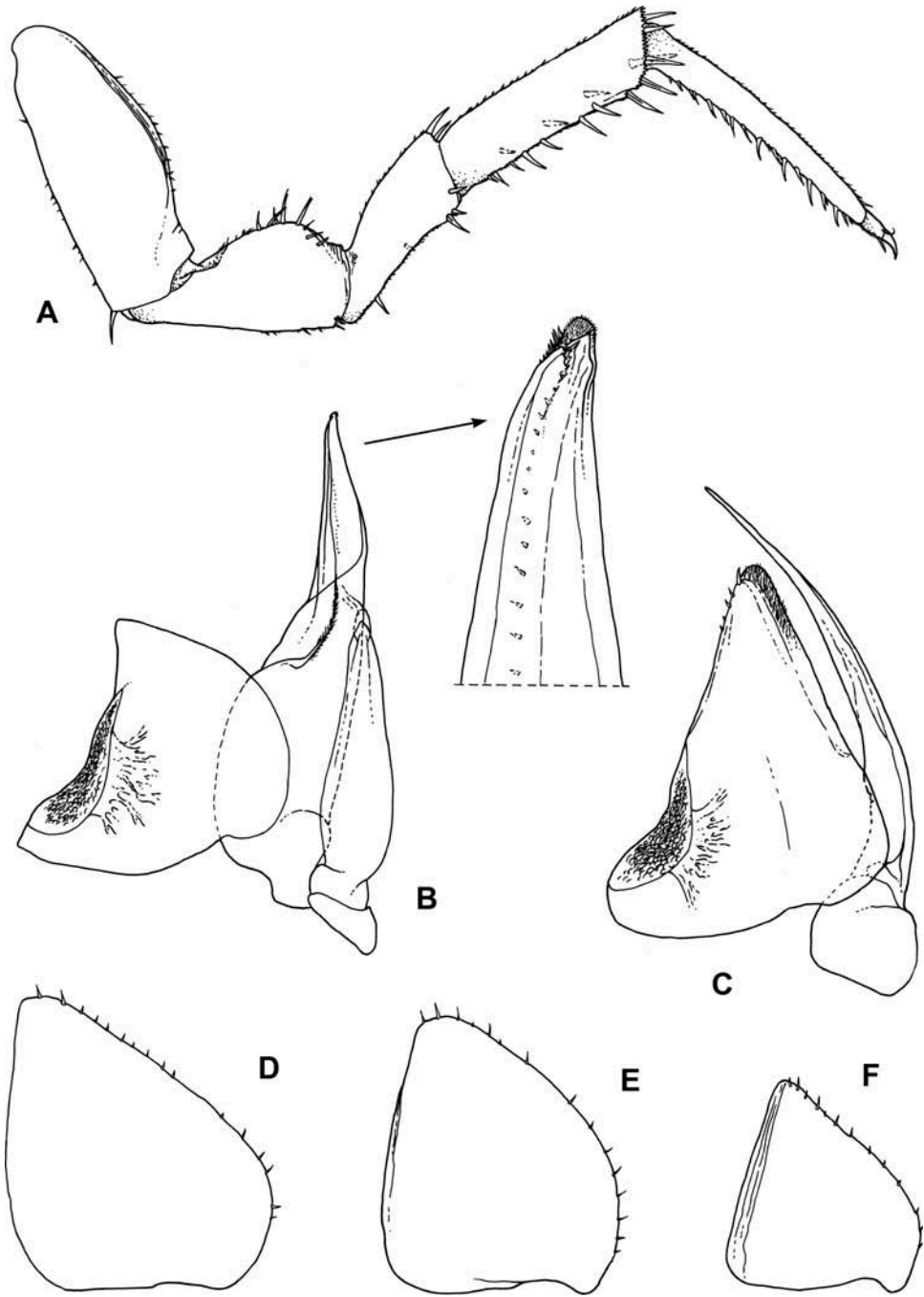


Figure 17. *Porcellionides* sp., ♂ from St. 6: (A) pereopod 7; (B) genital papilla and pleopod 1; (C) pleopod 2; (D) pleopod 3 exopod; (E) pleopod 4 exopod; (F) pleopod 5 exopod.

Remarks

Soteriscus was erected by Vandel (1956b) as a subgenus of *Metoponorthus* Budde-Lund, 1879 (junior synonym of *Porcellionides*) to accommodate four species: *Metoponorthus* (*Soteriscus*) *stricticauda* Dollfus, 1893 from the Canary Islands; *Metoponorthus* (*Soteriscus*) *wollastoni* Paulian de Félice, 1939 from Madera Island; *Metoponorthus* (*Soteriscus*) *fuscovariegatus* (Lucas, 1849) from Algeria; and the new species *Metoponorthus* (*Soteriscus*) *gaditanus* from south-western Spain and north-western Morocco. No type species for the subgenus *Soteriscus* was selected neither by Vandel (1956b), nor by Vandel and Matsakis (1959) when the subgenus was elevated to genus rank, nor in any other subsequent publication dealing with this genus. Thus, according to article 13.3 of ICZN (1999), the name is unavailable (see also Schmidt and Leistikow 2004). In order to revalidate the genus we designate here *Metoponorthus* (*Soteriscus*) *gaditanus* as type species of the genus *Soteriscus*. For the diagnosis of the genus see Vandel (1960b).

***Soteriscus gibbosus* sp. nov.**
(Figures 18–20)

Material examined

Holotype: ♂, St. 14, *Phillyrea* wood, leg. S. Taiti, 27 April 2004 (MZUF 9504). Paratypes: 3 ♂♂, 11 ♀♀, same data as holotype (MZUF 9504); 1 ♂, 6 ♀♀, same locality, leg. S. Taiti and C. Rossano, 27 September 2005 (MZUF 9505); 1 ♀, St. 10, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9506); 1 ♀, St. 12, leg. C. Rossano, 26 April 2004 (MZUF 9507); 1 ♀, St. 20, under stones along path to waterfall, leg. S. Taiti and C. Rossano, 2 May 2004 (MZUF 9508).

Description

Maximum length: ♂, 11 mm; ♀, 15 mm. Body outline as in Figure 18A. Brown colour with numerous yellowish muscle spots; a round pale spot at the base of pereon epimera in the frontal half of the segment; an elongated pale spot in the middle of pereonites and second or third to fifth pleonite; males darker than females. Back smooth with some scattered pointed scale-setae (Figure 18B); a distinct sulcus marginalis at the sides of pereon epimera with numerous gland pores along its whole length (Figure 18G); numerous gland pores scattered on the whole dorsal surface of the body; noduli laterales clearly visible, more or less at the same distance from the lateral margin of the pereonites, b/c and d/c co-ordinates as in Figure 18C. Cephalon (Figure 18D–F) with no suprantennal line, frontal line straight; very small lateral lobes bent downwards and not protruding frontwards; eye with about 25 ommatidia. Pereonites 1–3 with posterior margin regularly convex; pereonite 4 with posterior margin straight; pereonites 5–7 with posterior corners pointing backwards. Pleonites 3–5 with distinct but short posterior points (Figure 18H). Telson triangular with distinctly concave sides (Figure 18H). Antennule (Figure 18I) with first article longer than second and third; third article with a tuft of elongated aesthetascs at apex. Antenna (Figure 19A) reaching back the posterior margin of pereonite 3; fifth article of peduncle slightly curved, as long as flagellum; first flagellar article about 1.6 as

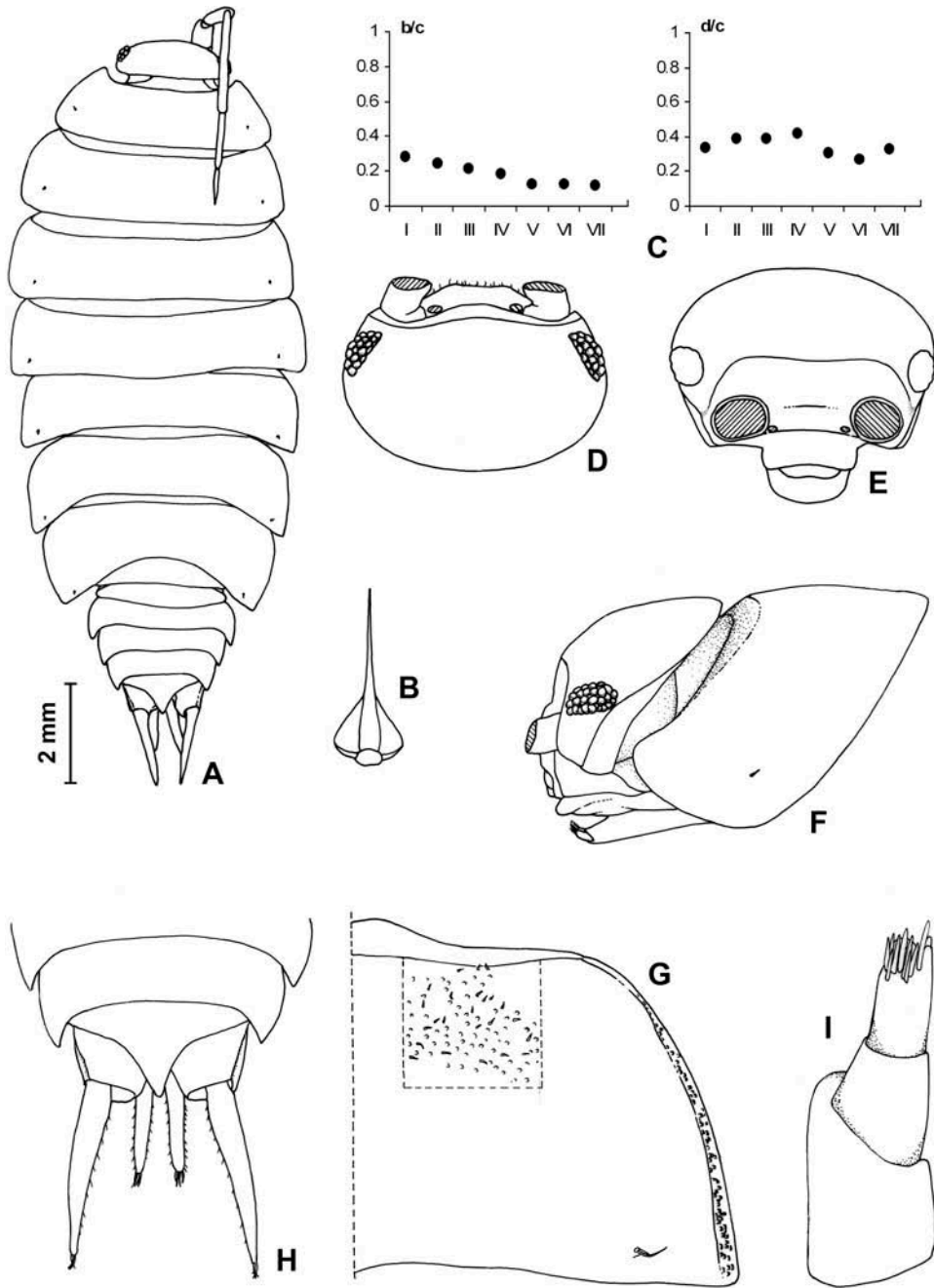


Figure 18. *Soteriscus gibbosus* sp. nov. from St. 14, paratype ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) co-ordinates of noduli laterales; (D) cephalon, dorsal view; (E) cephalon, frontal view; (F) cephalon and pereonite 1, lateral view; (G) pereonite 7, right side; (H) pleonites 4, 5, telson and uropods; (I) antennule.

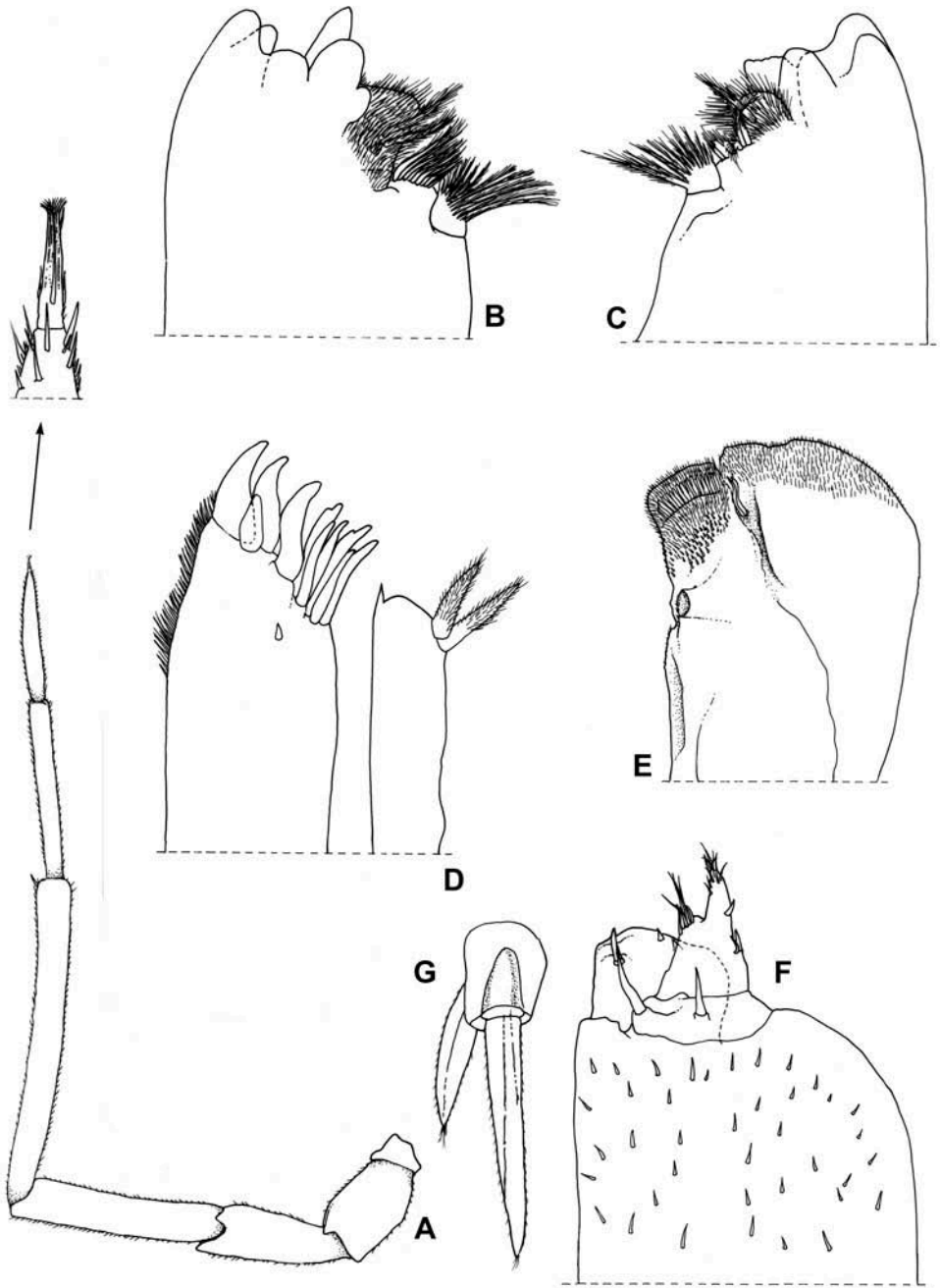


Figure 19. *Soteriscus gibbosus* sp. nov. from St. 14, paratype ♂: (A) antenna. Paratype ♀: (B) left mandible; (C) right mandible; (D) maxillule; (E) maxilla; (F) maxilliped; (G) uropod, lateral view.

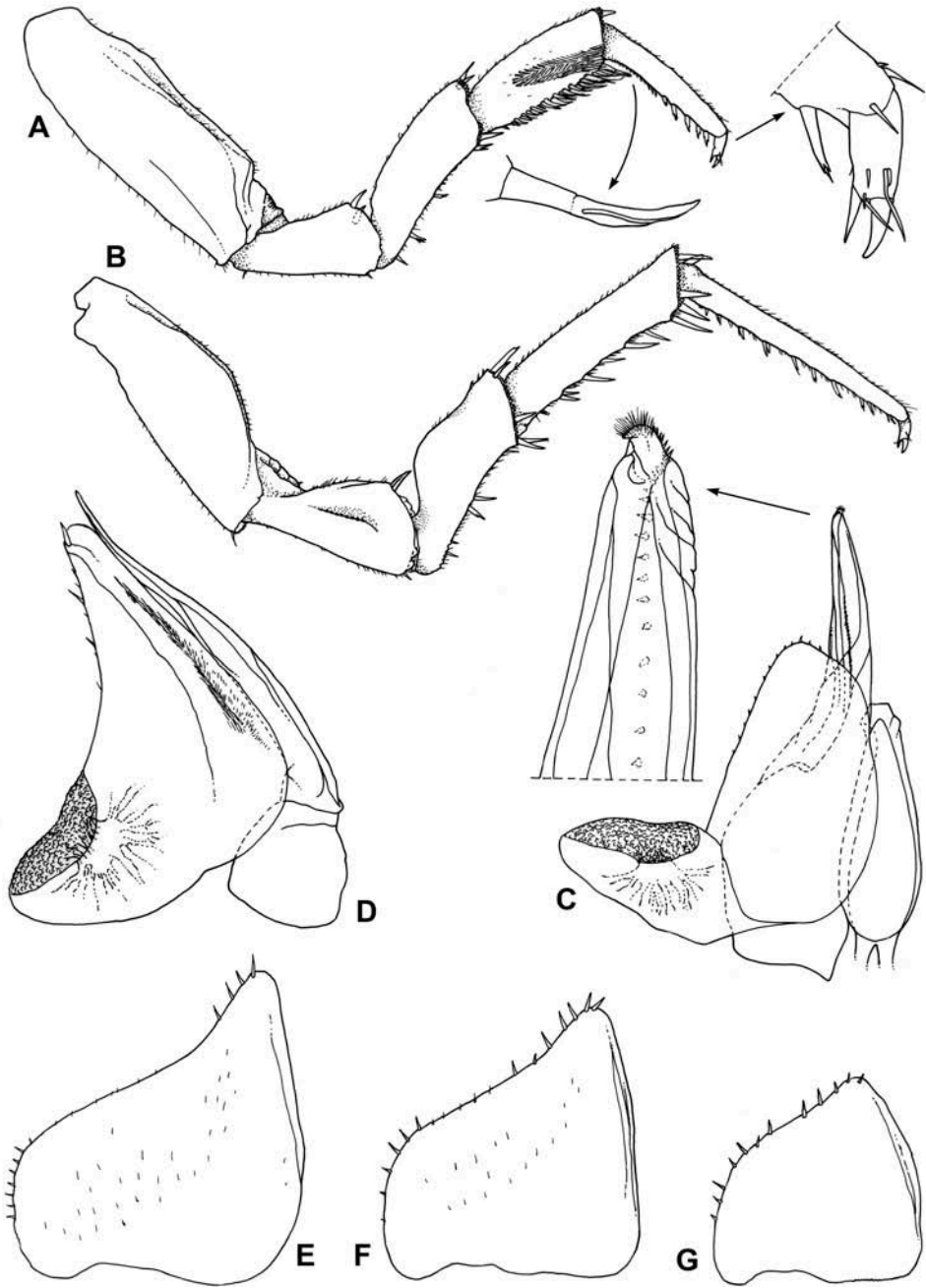


Figure 20. *Soteriscus gibbosus* sp. nov. from St. 14, paratype ♂: (A) pereopod 1; (B) pereopod 7; (C) genital papilla and pleopod 1; (D) pleopod 2; (E) pleopod 3 exopod; (F) pleopod 4 exopod; (G) pleopod 5 exopod.

long as second. Mandibles (Figure 19B, C) with molar penicil dichotomized and a line of several free penicils. Maxillule outer branch with 4 + 6 teeth (3 slightly cleft); inner branch with a distinct posterior point and two long and thin penicils (Figure 19D). Maxilla (Figure 19E) bilobate with setose apex, inner lobe quadrangular, much smaller than outer one; two long setae on the margin between the two lobes. Maxilliped (Figure 19F) endite with two small triangular setae on distal margin and no penicil; first article of palp with two strong setae. Pleopod 1 and 2 exopods with monospiracular covered lungs. Uropod (Figure 18H) with a triangular depression on protopodal outer margin; exopod almost twice as long as endopod; endopod proximally inserted.

Male: Carpus of pereopod 1 (Figure 20A) to 3 with a brush of pointed setae increasing in length distally. Pereopod 7 (Figure 20B) ischium with straight sternal margin and a longitudinal depression in the middle of the rostral surface; merus with a distinct hump on the posterior half of tergal margin. Pleopod 1 (Figure 20C) exopod with large medial lobe about twice as long as wide, with largely rounded apex bearing a line of short setae; endopod with distal part with almost parallel sides and a tuft of short setae at apex. Pleopod 2 (Figure 20D) endopod slightly longer than exopod. Pleopod 3–5 exopods as in Figure 20E–G.

Etymology

From the Latin '*gibbosus*' = having a hump. The name refers to the male pereopod 7 merus which shows a distinct hump on the posterior half of tergal margin.

Remarks

At present the genus *Soteriscus* includes 15 species from Atlantic islands (Madeira Archipelago, Canary Islands and Cape Verde), northern Morocco, northern Algeria and southern Spain (Schmalfuss 2003). Three species have been recorded in north-eastern Africa (Vandel 1956b, 1958a, 1960b): *S. gaditanus*, *S. virescens* (Budde-Lund, 1885) and *S. fuscovariiegatus* (Lucas, 1849). Of these species, only *S. gaditanus* was recorded from the Rif region (Vandel 1956b, 1958a; Achouri et al. 2008a, 2008c), but this species has not been collected by us. Re-examination of the material identified as *S. gaditanus* from the Rif region is necessary to confirm its occurrence.

Soteriscus gibbosus differs from all the other species in the genus in having a distinct hump on the male pereopod 7 merus. In having the male pleopod 1 exopod with a large medial lobe, the new species shows affinities with *S. gaditanus* and *S. fuscovariiegatus*, but in both these two species the medial lobe is distinctly more slender. It also differs from the former in having a broadly rounded instead of triangular apical part of the medial lobe of the male pleopod 1 exopod (see Figure 2B in Vandel 1956b), and in the thicker and shorter uropodal exopods (see Figure 2A in Vandel 1956b); from the latter in having shorter frontal lateral lobes and longer and more slender uropodal exopods (see Figure 3A, B in Vandel 1956b).

Soteriscus laouensis sp. nov.
(Figures 21 and 22)

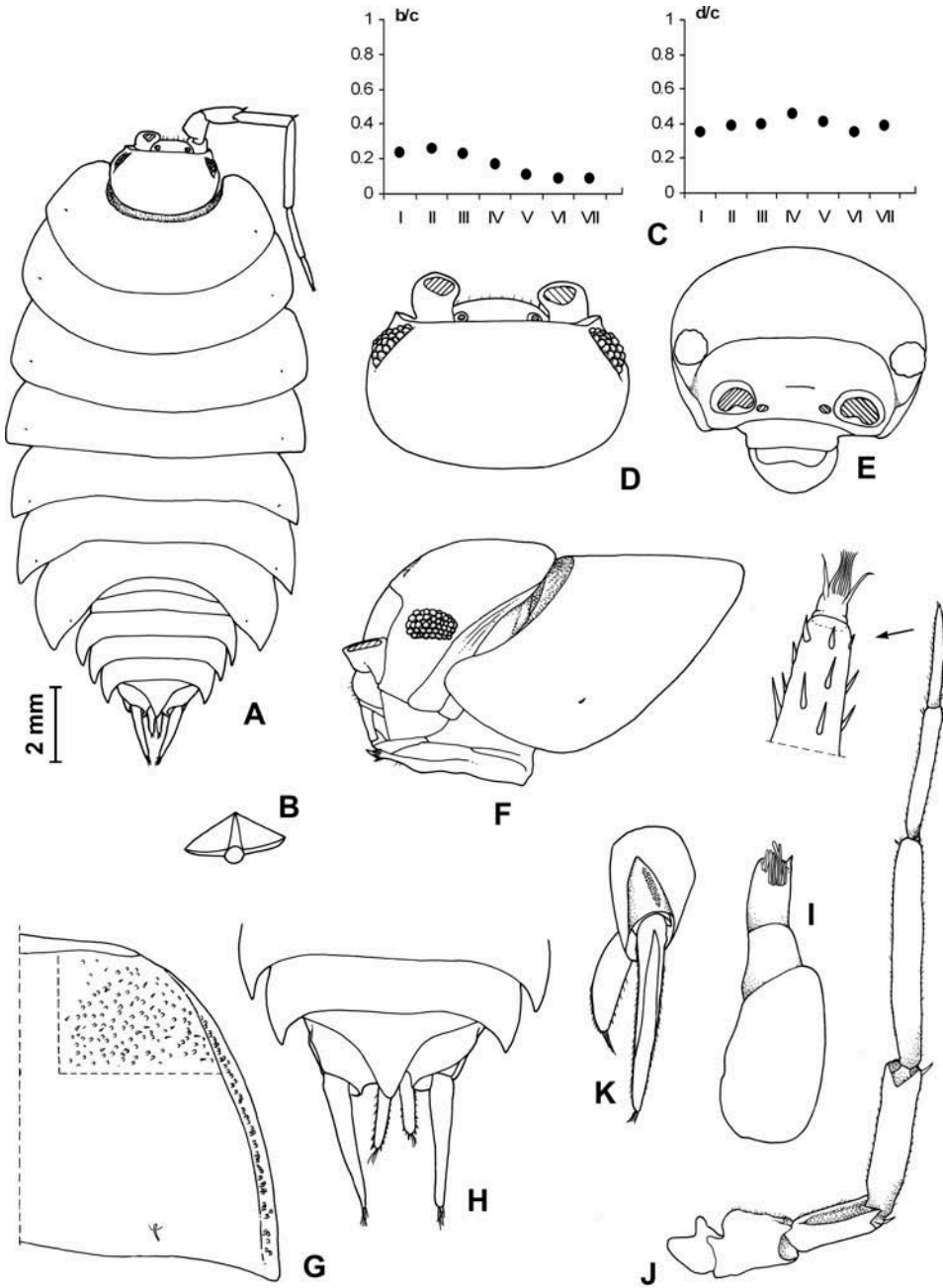


Figure 21. *Soteriscus laouensis* sp. nov. from St. 16, paratype ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) co-ordinates of noduli laterals; (D) cephalon, dorsal view; (E) cephalon, frontal view; (F) cephalon and pereonite 1, lateral view; (G) pereonite 7, right side; (H) pleonites 4, 5, telson and uropods; (I) antennule; (J) antenna; (K) uropod, lateral view.

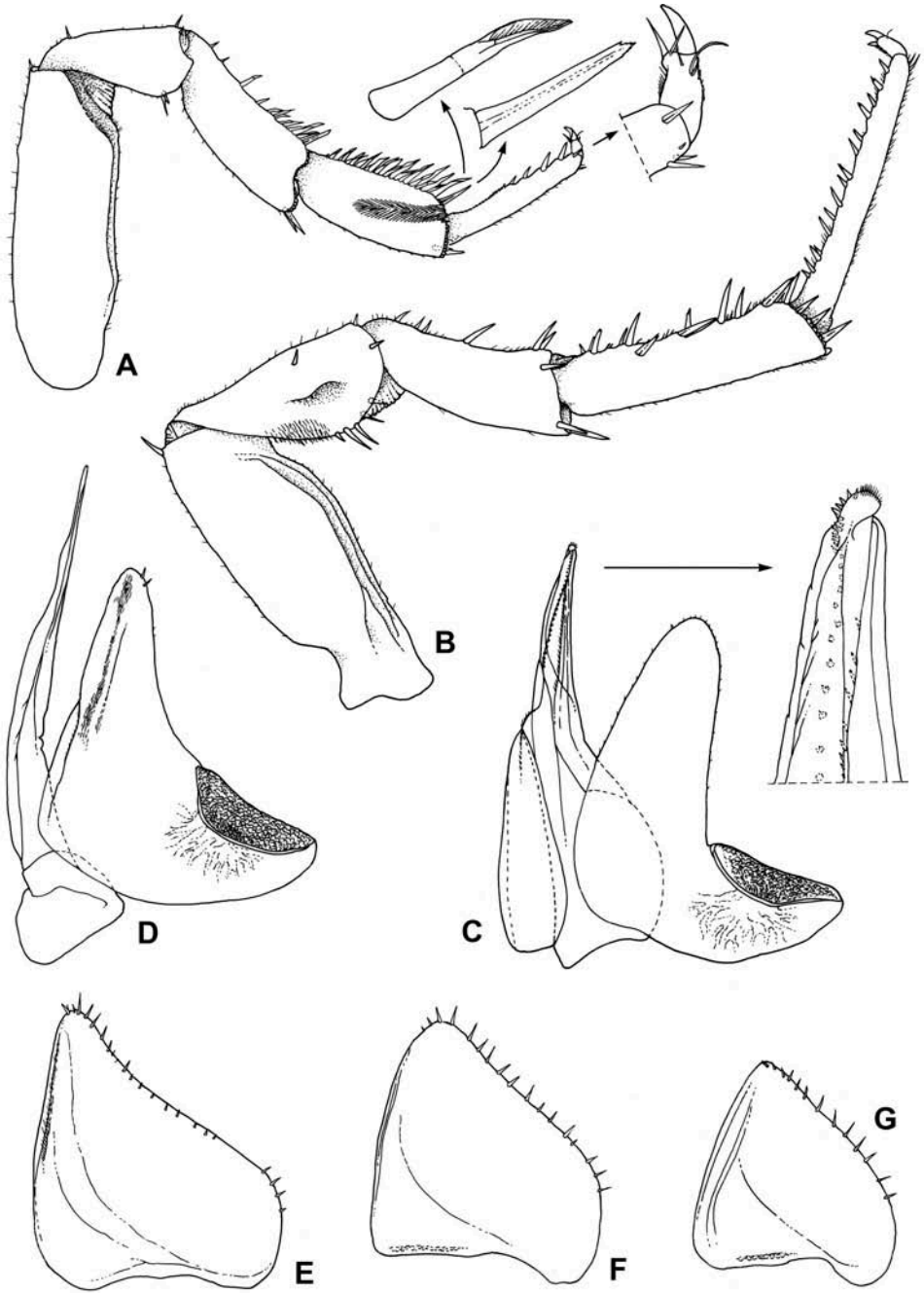


Figure 22. *Soteriscus laouensis* sp. nov. from St. 16, paratype ♂: (A) pereopod 1; (B) pereopod 7; (C) genital papilla and pleopod 1; (D) pleopod 2; (E) pleopod 3 exopod; (F) pleopod 4 exopod; (G) pleopod 5 exopod.

Material examined

Holotype: ♂, St. 16, along road margin under stones, leg. S. Taiti, 28 April 2004 (MZUF 9509). Paratypes: 1 ♂♂, 35 ♀♀, same data as holotype (MZUF 9509).

Description

Maximum length: ♂, 13 mm; ♀, 16 mm. Body enlarged, outline as in [Figure 21A](#). Colour: male brown-grey with the usual yellowish muscle spots; female light brown with a marbled pattern, two darker spots per side on the anterior part of pereonites; antennae uniformly grey; pereopods pale with numerous dark spots; pleopodal exopods dark. Back smooth with some scattered short triangular scale-setae ([Figure 21B](#)); a distinct sulcus marginalis on lateral margins of pereon epimera with numerous gland pores along its whole length ([Figure 21G](#)); numerous gland pores scattered on the whole dorsal surface of the body; noduli laterales clearly visible, inserted more or less at the same distance from the lateral margin of the pereonites, b/c and d/c co-ordinates as in [Figure 21C](#). Cephalon ([Figure 21D–F](#)) with no suprantennal line, frontal line straight; very small lateral lobes bent downwards and not protruding frontwards; eye with about 26 ommatidia. Pereonites 1–3 with posterior margin regularly convex; pereonite 4 with posterior margin straight; pereonites 5–6 with posterior corners pointing backwards, pereonite 7 with acute posterior corners and slightly sinuous posterior margin at sides. Pleonites 3–5 with well-developed falciform posterior points ([Figure 21H](#)). Telson triangular with distinctly concave sides ([Figure 21H](#)). Antennule ([Figure 21I](#)) with first article longer than second and third; third article with a short triangular point and a tuft of elongated aesthetascs at apex. Antenna ([Figure 21J](#)) reaching back posterior margin of pereonite 3; fifth article of peduncle almost as long as flagellum; first flagellar article about 1.5 longer than second. Buccal pieces as in the preceding species. Pleopodal exopods 1 and 2 with monospiracular covered lungs. Uropod ([Figure 21K](#)) with a triangular depression on protopodal outer margin; exopod about twice as long as endopod; endopod proximally inserted.

Male: Carpus and distal part of merus of pereopod 1 ([Figure 22A](#)), pereopod 2 and, to a lesser extent, pereopod 3 with a brush of pointed setae. Pereopod 7 ([Figure 22B](#)) ischium with slightly convex sternal margin and a longitudinal depression and a setose area on rostral surface; merus elongated, without peculiar structures. Pleopod 1 ([Figure 22C](#)) exopod with long medial lobe almost three times as long as wide, with some short setae along its margin and a broadly rounded apex; endopod with distal part with almost parallel sides and a tuft of short setae at apex. Pleopod 2 ([Figure 22D](#)) endopod distinctly longer than exopod. Pleopod 3–5 exopods as in [Figure 22E–G](#).

Etymology

The species is named after the Oued Laou basin, where the specimens were collected.

Remarks

In having the male pleopod 1 exopod with a long medial lobe *S. laouensis* is similar to *S. gaditanus*, *S. fuscovariegatus* and *S. gibbosus* sp. nov. It is readily distinguishable from *S. gaditanus* in having the male pleopod 1 exopod with broadly rounded instead of triangular apical part and shorter uropodal exopods; from *S. fuscovariegatus* in the less protruding lateral lobes of cephalon (see [Figure 3A](#) in [Vandel 1956b](#)) and comparatively longer and thinner uropods; and from *S. gibbosus* in lacking the hump on the male pereopod 7 merus and distinctly thinner medial lobe of the male pleopod 1 exopod.

Genus *Porcellio* Latreille, 1804

Porcellio pseudornatus sp. nov.

([Figures 23–25](#))

Material examined

Holotype: ♂, St. 5, under stones near beach, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9510). Paratypes: 7 ♂♂, 10 ♀♀, same data as holotype (MZUF 9510); 1 ♂, 1 ♀, same data as holotype (SMNS 15674); 1 ♂, 3 ♀♀, St. 2, under stones at base of cliff, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9511); 1 ♀, St. 7, leg. S. Taiti, 29 April 2004 (MZUF 9512); 2 ♂♂, 2 ♀♀, St. 9, under stones in meadow, leg. S. Taiti, 28 April 2004 (MZUF 9513); 1 ♂, 1 ♀, St. 14, *Phillyrea* wood, leg. S. Taiti, 27 April 2004 (MZUF 9514); 1 ♂, same locality, leg. S. Taiti and C. Rossano, 27 September 2005 (MZUF 9515); 3 ♂♂, 1 ♀, St. 16, along road margin under stones, leg. S. Taiti, 28 April 2004 (MZUF 9516); 2 ♀♀, St. 17, leg. S. Taiti, 29 April 2004 (MZUF 9517).

Other material examined

1 ♂, 1 ♀, Al Hoceima, near road under stones, leg. C. Rossano, 4 May 2004 (MZUF 9518).

Description

Maximum length: ♂, 22 mm; ♀, 23 mm. Body outline as in [Figure 23A](#). Colour brown-grey with pale marginal parts of frontal lateral lobes and epimera of pereon and pleon; sometimes with two paramedian yellowish round spots on pereonites 5–7 and pleonites 2–4; antennae uniformly grey, pereopods and pleopod 1–2 exopods pale, pleopod 3–5 exopods dark. Dorsal surface of cephalon, pereon and pleon distinctly granulated with many scattered short triangular scale-setae ([Figure 22B](#)); numerous gland pores in rounded fields disposed near the anterior corner of pereonite 1 and more or less in the middle of pereonites 2–7 close to the lateral margins of the segments ([Figure 22A, E](#)); noduli laterales small, the ones on pereonites 1–4 inserted about twice more distant from the lateral margin than those on pereonites 5–7 ([Figure 23A](#)). Cephalon ([Figure 22C, D](#)) with no suprantennal line; large rounded lateral lobes obliquely bent downwards and distinctly protruding frontwards, median lobe widely rounded, often slightly incised at the apex; eye with about 30 ommatidia. Pereonites 1–3 with hind margin slightly concave at sides, more distinct on pereonite

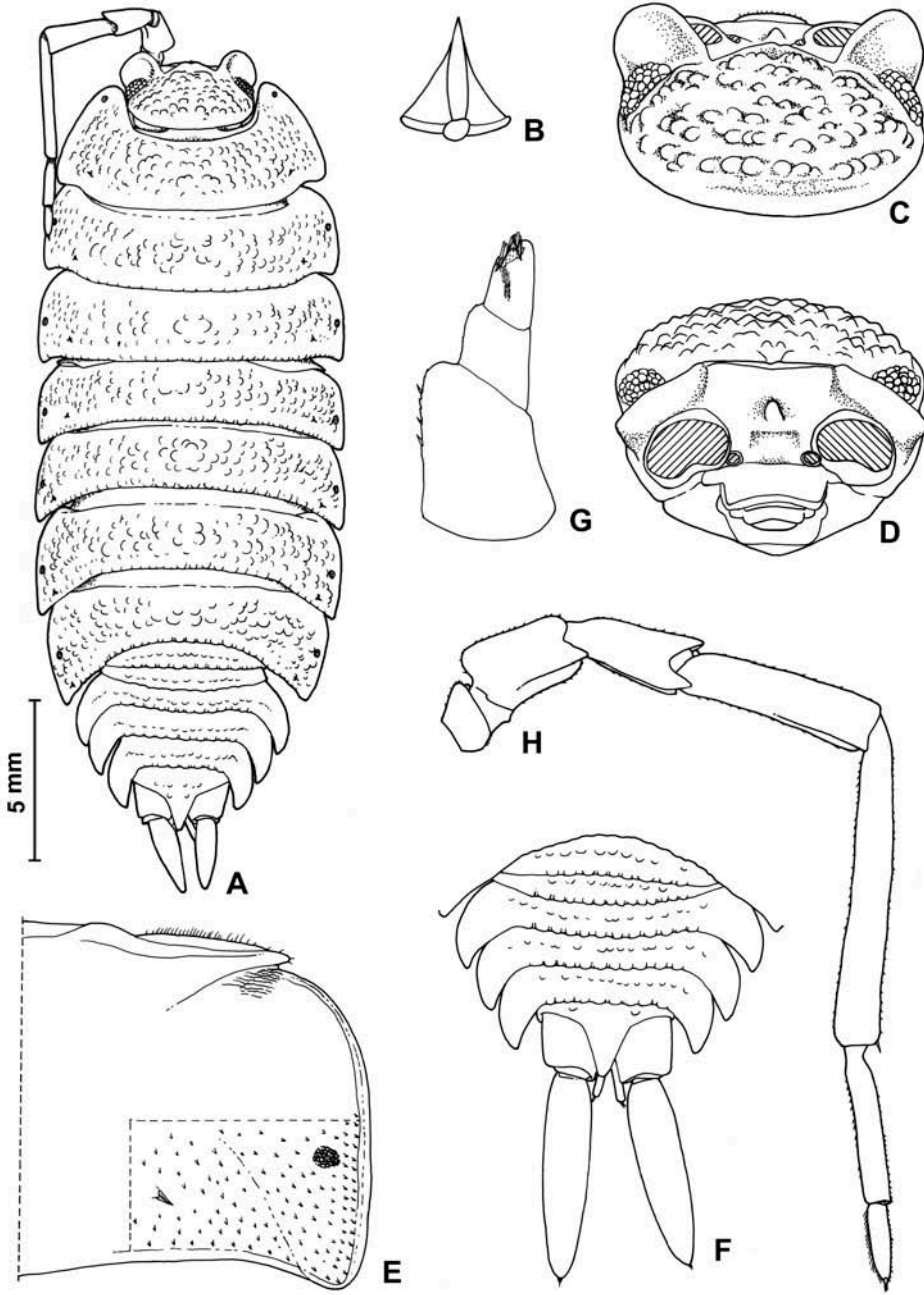


Figure 23. *Porcellio pseudornatus* sp. nov. from St. 5, paratype ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) cephalon, dorsal view; (D) cephalon, frontal view; (E) pereonite 3, right side. Paratype ♂: (F) pleon, telson and uropods; (G) antennule; (H) antenna.

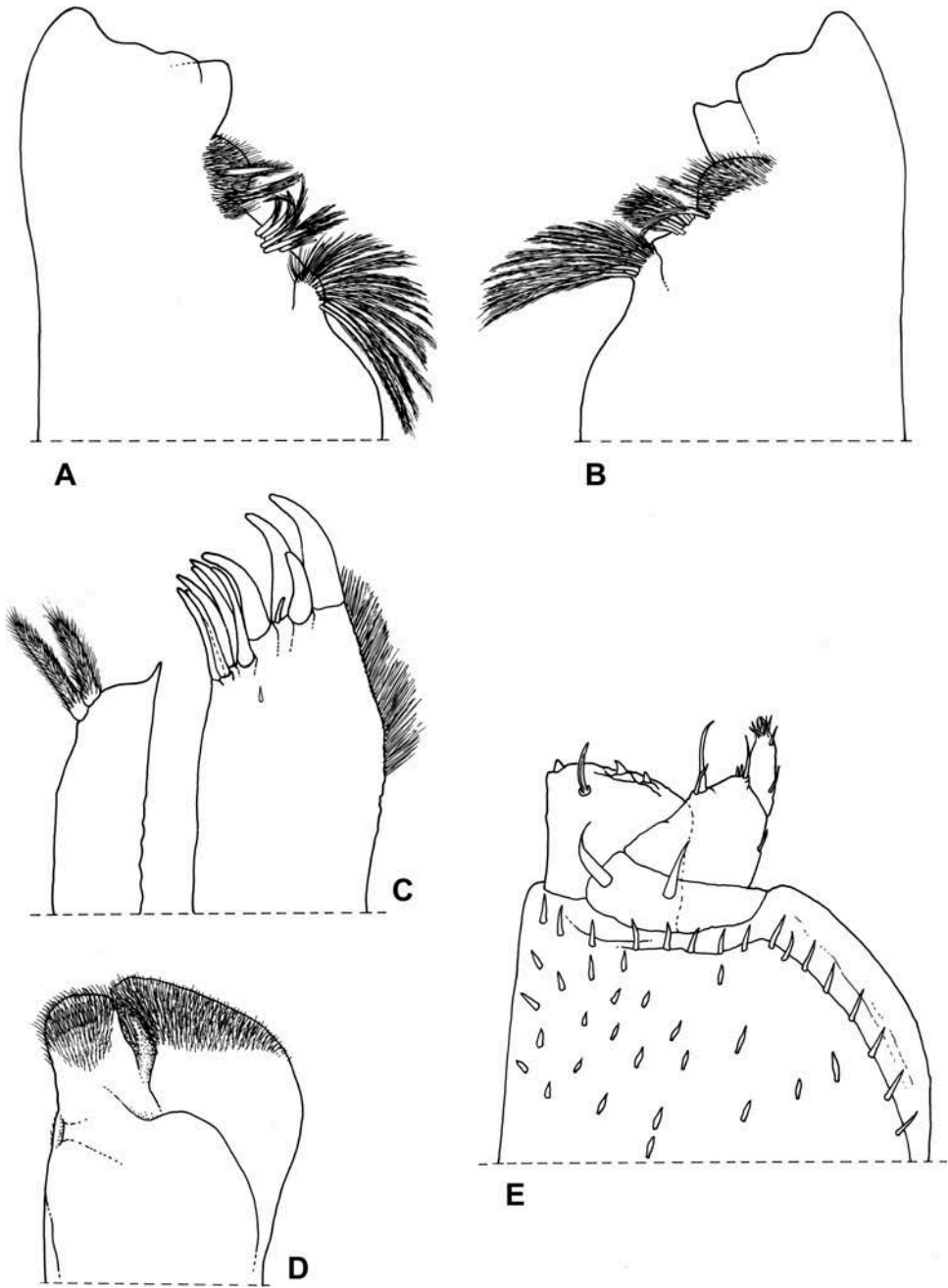


Figure 24. *Porcellio pseudornatus* sp. nov. from St. 5, paratype ♀: (A) left mandible; (B) right mandible; (C) maxillule; (D) maxilla; (E) maxilliped.

1; pereonites 3–7 with posterior corners bent backwards and progressively more acute. Pleonites 3–5 with falciform epimera (Figure 23A, F); tips of pleonite 5 epimera reaching $\frac{2}{3}$ of telson length. Telson (Figure 23F) about twice as wide as

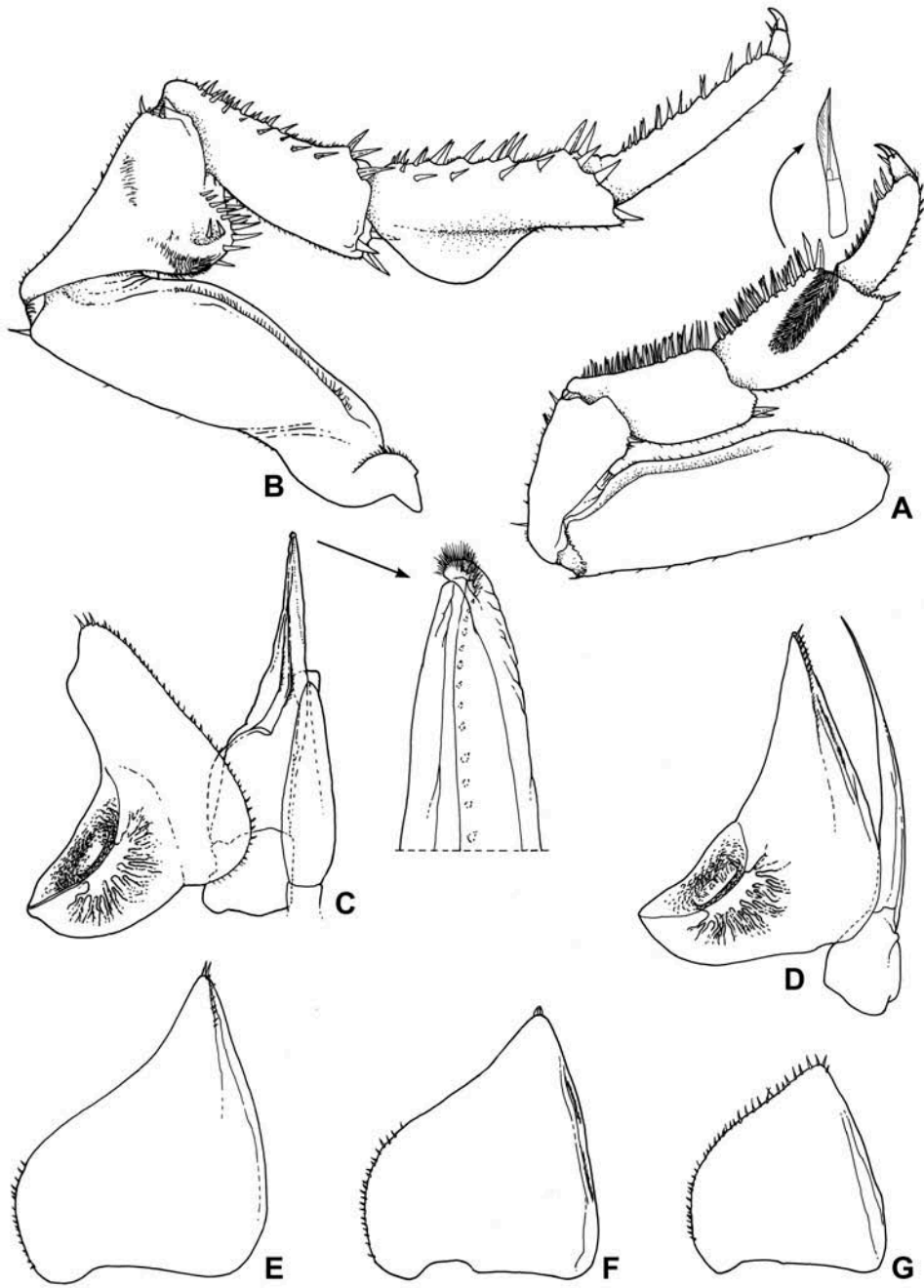


Figure 25. *Porcellio pseudornatus* sp. nov. from St. 5, paratype ♂: (A) pereopod 1; (B) pereopod 7; (C) genital papilla and pleopod 1; (D) pleopod 2; (E) pleopod 3 exopod; (F) pleopod 4 exopod; (G) pleopod 5 exopod.

long with a triangular distal part. Antennule (Figure 23G) with first article distinctly longer than second and third; third article with a tuft of short aesthetascs near the apex. Antenna (Figure 23H) reaching back or slightly surpassing the posterior margin of pereonite 3; fifth article of peduncle shorter than flagellum; first flagellar article about twice as long as second. Mandibles (Figure 24A, B) with molar penicil dichotomized and a line of eight free penicils. Maxillule (Figure 24C) outer branch with 4 + 6 teeth, all simple; inner branch with a distinct posterior point and two long and thin penicils. Maxilla (Figure 24D) bilobate with setose apex, inner lobe quadrangular, much smaller than outer one; two long setae on the margin between the two lobes. Maxilliped (Figure 24E) endite with two small triangular setae on distal margin and no penicil; first article of palp with two strong setae. Pleopodal exopods 1 and 2 with monospiracular covered lungs (Figure 25C, D). Uropod (Figure 23A, F) with a triangular depression on protopodal outer margin, not visible in dorsal view.

Male: Uropodal exopods (Figure 23F) flattened, elongated and much longer than in females (4 times as long as wide in males, less than 3 times in females). Merus and carpus of pereopod 1 (Figure 25A) to 4 and, to a lesser extent, 5 with a brush of pointed setae. Pereopod 7 (Figure 25B) ischium distally enlarged with a transversal depression and a setose area on rostral surface; sternal margin slightly convex; carpus with a large rounded lobe on distal half of tergal margin. Pleopod 1 (Figure 25C) exopod with long medial lobe with parallel sides, oblique and sinuous distal margin with three strong setae at apex, and some short setae along the medial margin; endopod with distal part straight, rounded and setose apex. Pleopod 2 (Figure 25D) exopod triangular and slightly shorter than endopod. Pleopod 3–5 exopods as in Figure 25E–G.

Etymology

From the stem of the Greek ‘Pseudes’ = false, erroneous + *ornatus*. The species name refers to the similarity with *Porcellio ornatus* Milne-Edwards, from south-eastern Spain.

Remarks

According to Vandel (1958a), four species of the Rif-Betic group of *Porcellio* occur in the Rif region: *P. ornatus* Milne-Edwards; *P. wagneri* Brandt, 1841; *P. hoffmannseggii* Brandt, 1833; and *P. echinatus* Lucas, 1849. The specimens here examined do not seem to belong to any of these four species, nor to any other species in this group, even if they are strictly related to *P. ornatus* and *P. wagneri*. Specimens of *P. ornatus* collected from the type locality in south-eastern Spain (many ♂♂ and ♀♀, Cartagena, Murcia, leg. M. Rizzotti Vlach, 4 August 1981, MZUF 9594) have been examined and are here illustrated (Figures 26 and 27) for comparison with our specimens from the Oued Laou basin. *Porcellio pseudornatus* differs from *P. ornatus* in the dorsal body surface more granulated, wider dorsal scale-setae, posterior margin of pereonites 1–3 more concave at the sides, thinner antennae, much longer male uropodal exopods and more pronounced rounded lobe on the male pereopod 7 carpus. According to the figures provided by Lucas (1849, plate 6, Figures 6A–C); for *P. wagneri* originally described from Algeria, the new species differs in having the

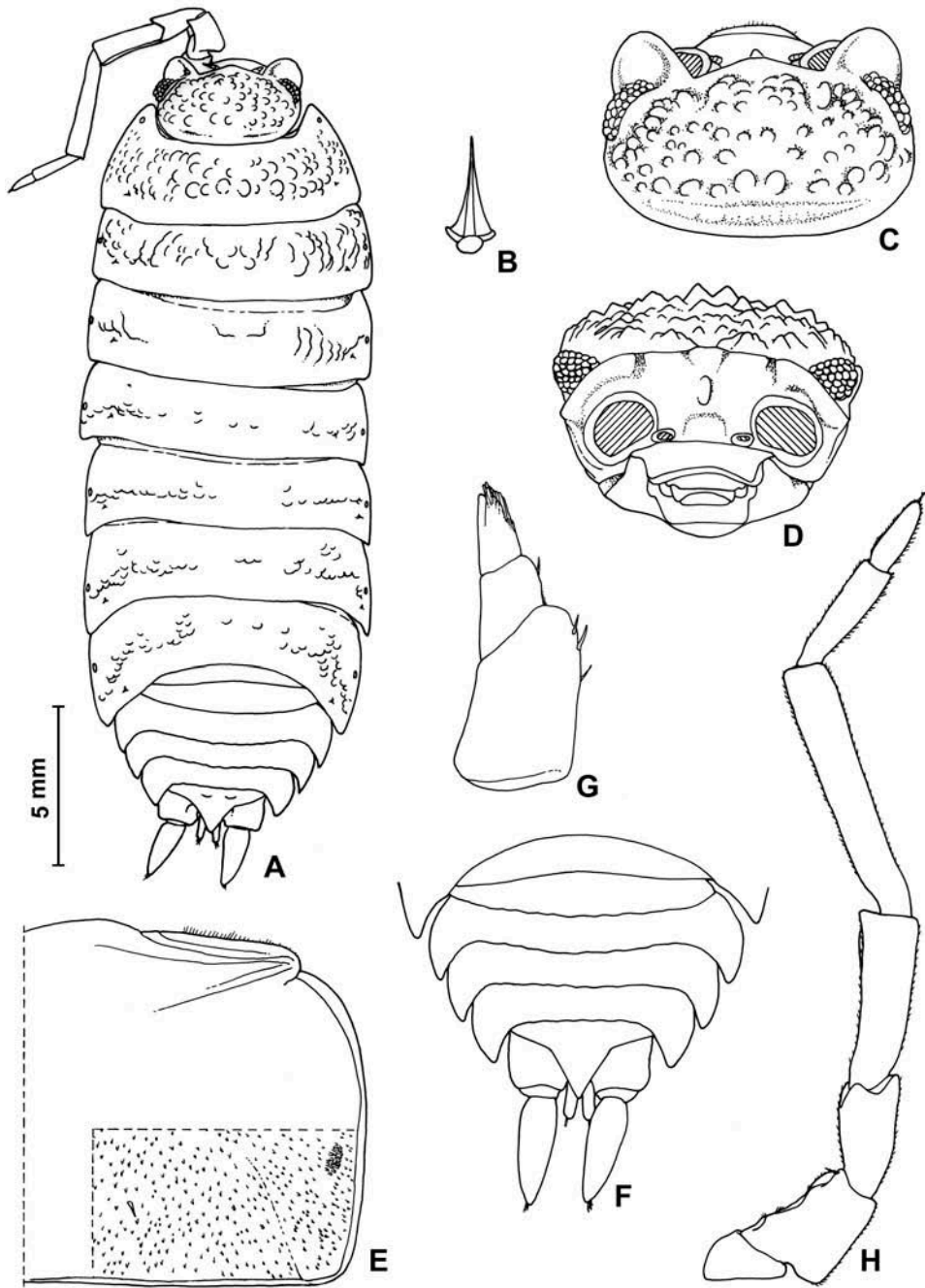


Figure 26. *Porcellio ornatus* from Cartagena, ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) cephalon, dorsal view; (D) cephalon, frontal view; (E) peronite 4, right side. ♂: (F) pleon, telson and uropods; (G) antennule; (H) antenna.

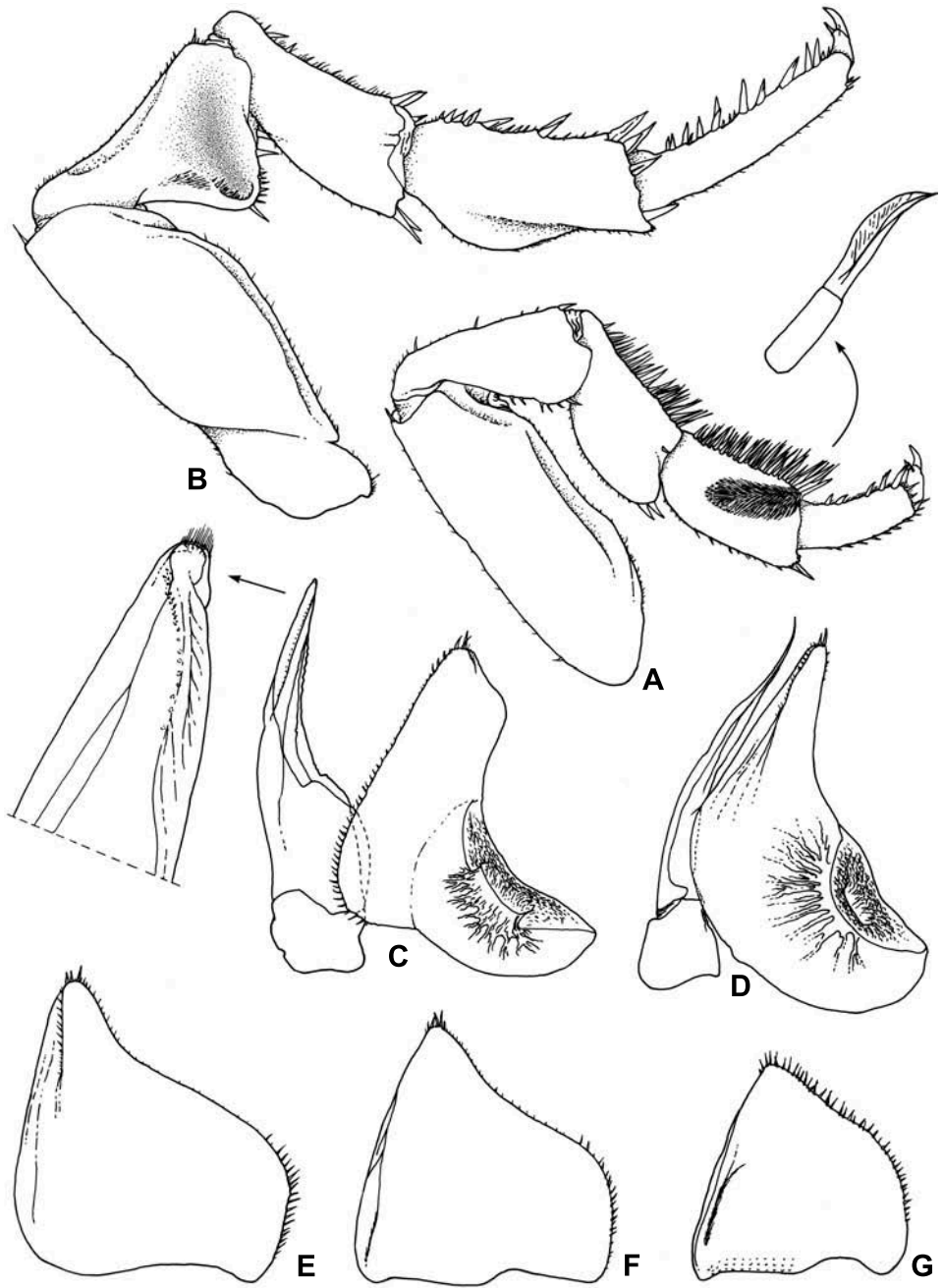


Figure 27. *Porcellio ornatus* from Cartagena, ♂: (A) pereopod 1; (B) pereopod 7; (C) pleopod 1; (D) pleopod 2; (E) pleopod 3 exopod; (F) pleopod 4 exopod; (G) pleopod 5 exopod.

male uropodal exopods much wider (4 times as long as wide vs. 7.5 times in *P. wagneri*). The material of *P. ornatus* and *P. wagneri* from the Rif studied by Vandel (1958a) needs to be re-examined to confirm that also these two species are present in the area.

***Porcellio hoffmannseggii hoffmannseggii* Brandt, 1833**

Porcellio Hoffmannseggii; Budde-Lund, 1879, p. 3; Budde-Lund, 1885, p. 108; Dollfus, 1896, p. 534; Dollfus, 1898, p. 134

Porcellio (Porcellio) Hoffmannseggii; (sic) Arcangeli, 1935, p. 14

Porcellio hoffmannseggii tamaricis; Verhoeff, 1937, p. 306, Figures 8, 9

Porcellio (Rogopus) Hoffmannseggii tamaricis; Paulian de Félice, 1939, p. 197, Figure 34

Porcellio hoffmannseggii; Vandel, 1946, p. 327; Schmölzer, 1971, p. 46

Porcellio hoffmannseggii hoffmannseggii; Vandel, 1958a, p. 129; Schmalfluss, 1987, p. 285, Figures 1–25

Porcellio hoffmannseggii; Schmalfluss, 2003, p. 226; Achouri et al., 2008c, pp. 76–78.

Material examined

1 ♂, 5 ♀♀, St. 3, under stones, leg. S. Taiti and C. Rossano, 1 October 2005 (MZUF 9519); 1 ♀, St. 4, dune under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9520); 1 ♂, St. 14, *Phillyrea* wood, leg. S. Taiti and C. Rossano, 27 September 2005 (MZUF 9521); 1 ♂, same data (SMNS 15675); 4 ♀♀, St. 23, under stones, leg. S. Taiti, 30 April 2004 (MZUF 9522); 1 ♀, St. 25, under stones in meadow, leg. S. Taiti, 30 April 2004 (MZUF 9523).

Previous Rif records

Taxdirt, west of Melilla; Djebel Kerker, south of Melilla; Tizi Ifri, south of Targuist; Beni-Bufrah, Tétouan; Benitez, near Ceuta (Vandel 1958a); Chechauen; Cap Spartel; 15 km south of Ceuta (Schmalfluss 1987); Oued Laou region (Achouri et al. 2008c).

Distribution

Portugal, southern Spain and northern Morocco.

Remarks

For diagnostic characters of *P. hoffmannseggii hoffmannseggii* see Schmalfluss (1987, p. 285, Figures 1–25).

***Porcellio flavocinctus* Budde-Lund, 1885**
(Figures 28 and 29)

Porcellio (Euporcellio) flavocinctus; Paulian de Félice, 1939, p. 199

Porcellio flavocinctus; Dollfus, 1896, p. 534; Vandel, 1958a, p. 129

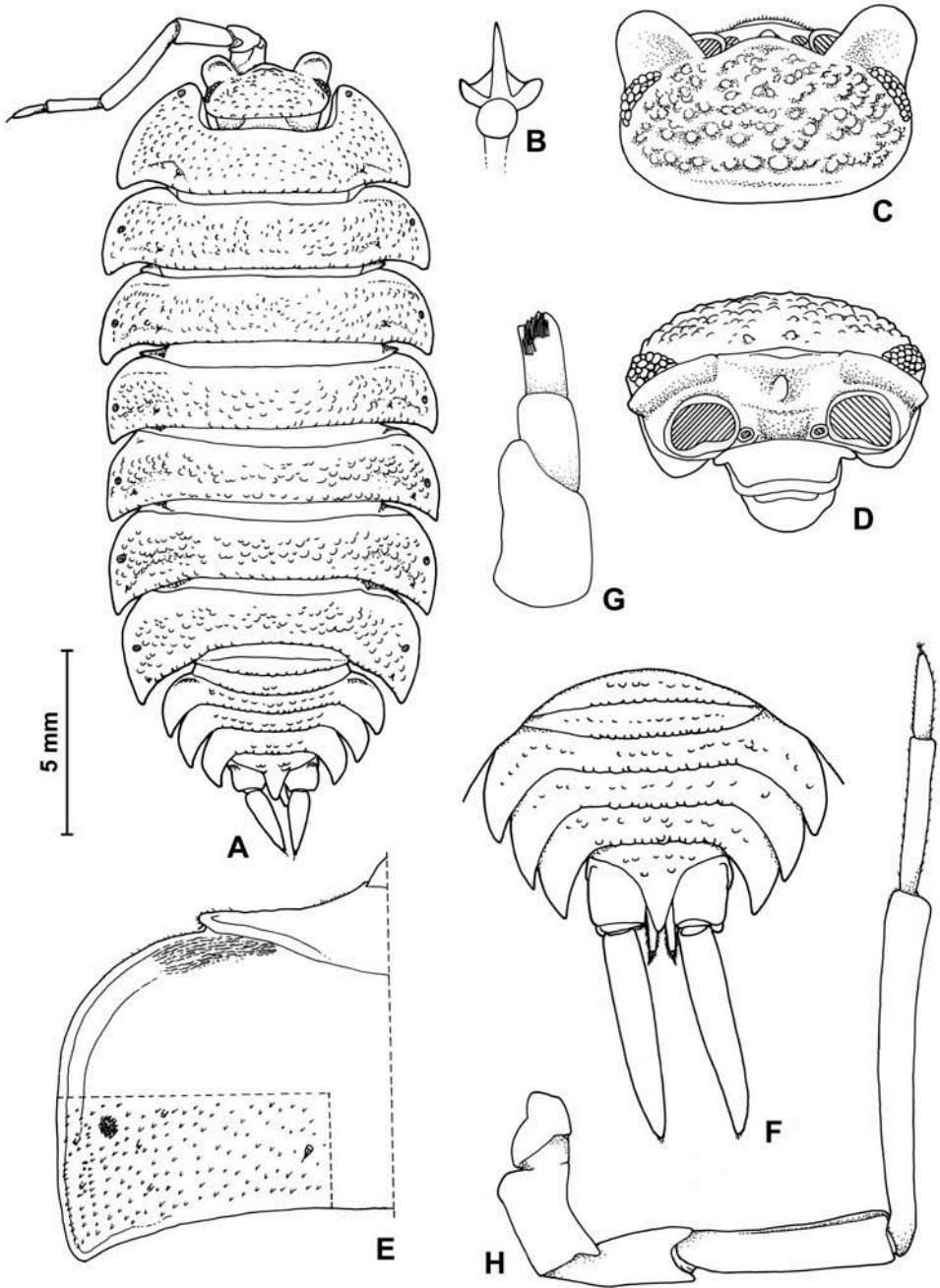


Figure 28. *Porcellio flavocinctus* from St. 10, ♀: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) cephalon, dorsal view; (D) cephalon, frontal view; (E) peronite 4, left side. ♂: (F) pleon, telson and uropods; (G) antennule; (H) antenna.

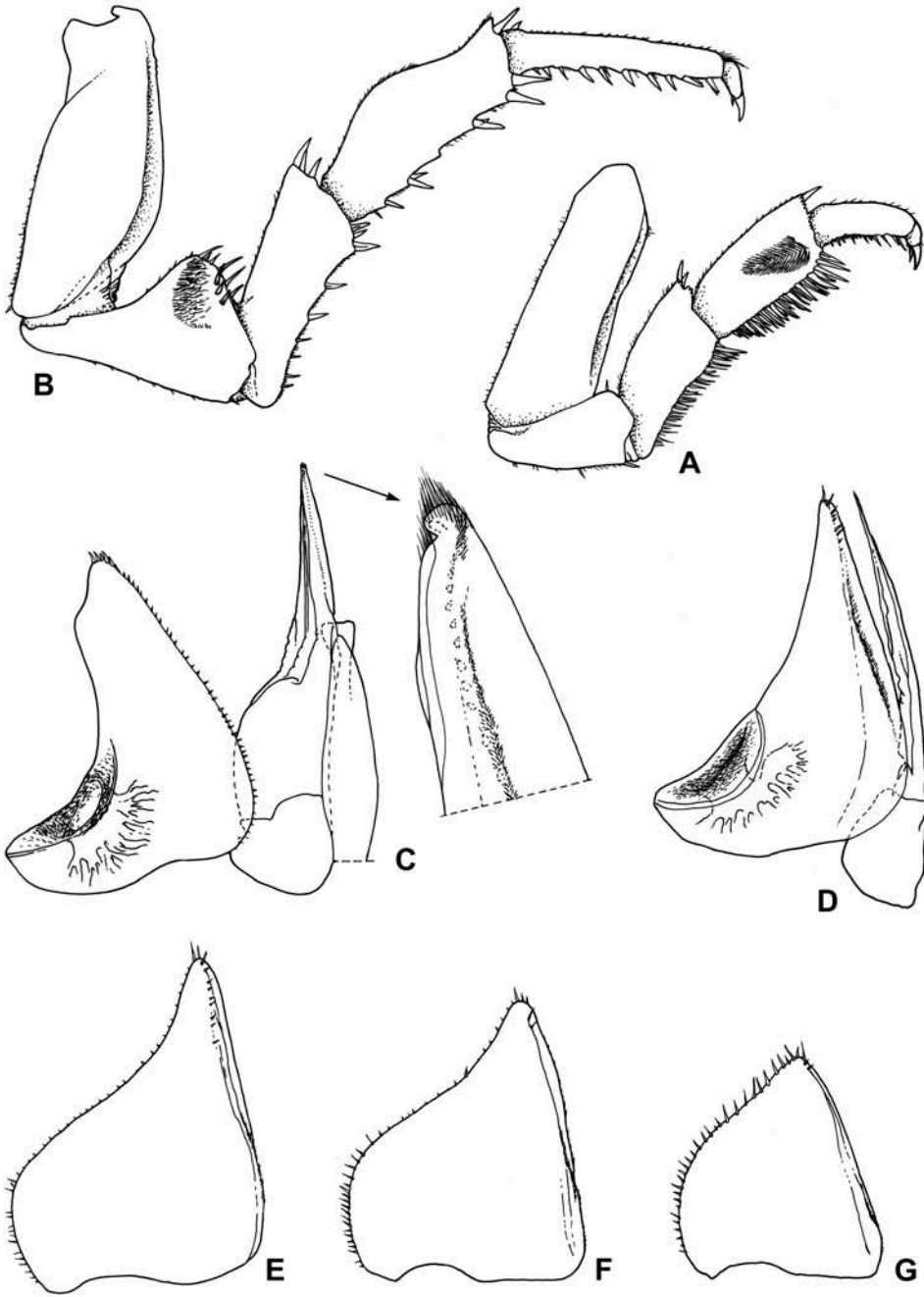


Figure 29. *Porcellio flavocinctus* from St. 10, ♂: (A) pereopod 1; (B) pereopod 7; (C) genital papilla and pleopod 1; (D) pleopod 2; (E) pleopod 3 exopod; (F) pleopod 4 exopod; (G) pleopod 5 exopod.

Material examined

3 ♂♂, 6 ♀♀, St. 10, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9524).

Remarks

These specimens are identified as *P. flavocinctus* after comparison with the redescription of this species provided by Arcangeli (1936, p. 190, Figures 1–7). The main characters of the specimens from the Oued Laou valley are here illustrated (Figures 28 and 29) and they fit well those of *P. flavocinctus* provided by Arcangeli. The record of Budde-Lund (1885) from El Araïsch (= Larache) in northern Morocco was considered doubtful by Arcangeli (1936). Our record from the Oued Laou valley together with those by Vandel (1958a) from the Rif confirms that this species is also present in this part of north-western Africa.

Previous Rif records

Melilla; Mt Gurugu and Ixmoart, near Melilla; Sidi Yacoub el Basi, near Peñón de Velez, Tétouan; Benitez, near Ceuta (Vandel 1958a).

Distribution

Southern Spain, southern Portugal and northern Morocco.

***Porcellio laevis* (Latreille, 1804)**

Porcellio laevis; Verhoeff, 1938, p. 67; Vandel, 1958a, p. 129; Achouri et al., 2008c, pp. 76–78; Achouri et al., 2008a, p. 129

Porcellio (Mesoporcellio) laevis; Arcangeli, 1932, p. 225; Paulian de Félice, 1939, p. 210

Material examined

1 ♂, 1 ♀, St. 3, under stones, leg. S. Taiti and C. Rossano, 1 October 2005 (MZUF 9525); 1 ♂, St. 4, dune under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9526); 2 ♂♂, 1 ♀, St. 5, beach under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9527); 1 ♂, 2 ♀♀, St. 6, near well and wheat field, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9528).

Previous Rif records

Granja de la Muluya; Benitez, near Ceuta (Vandel 1958a); Oued Laou region (Achouri et al. 2008a, 2008c).

Distribution

Europe and northern Africa, introduced to many parts of the world.

Remarks

For diagnostic characters of *P. laevis* see Vandel (1962, p. 684, Figures 331, 332).

***Porcellio riffensis* Caruso and Di Maio, 1990**

Porcellio hoffmannseggii nemethi; Vandel, 1958a, p. 129

Porcellio riffensis Caruso and Di Maio, 1990, p. 204, Figures 6–10; Schmalfluss, 2003, p. 234

Material examined

1 ♂, 4 ♀♀, 3 juvs, St. 7, leg. S. Taiti and C. Rossano, 29 September 2005 (MZUF 9529); 1 ♂, 2 ♀♀, St. 10, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9530); 6 ♂♂, 2 ♀♀, St. 12, leg. C. Rossano, 26 April 2004 (MZUF 9531); 1 ♂, 7 ♀♀, St. 14, *Phillyrea* wood, leg. S. Taiti and C. Rossano, 27 September 2005 (MZUF 9532); 6 ♂♂, 7 ♀♀, St. 16, along road margin under stones, leg. S. Taiti, 28 April 2004 (MZUF 9533); 1 ♀, St. 18, cork-oak wood, leg. S. Taiti, 29 April 2004 (MZUF 9534); 9 ♂♂, 12 ♀♀, St. 19, leg. S. Taiti, 29 April 2004 (MZUF 9535).

Previous Rif records

Einzoren, south of Villa Sanjurjo; Issaguen (Vandel 1958a; Caruso and Di Maio 1990); Bab Taza; Cedreta, 17 km from Ketama; Bab Berred (Caruso and Di Maio 1990).

Distribution

Northern Morocco.

Remarks

For diagnostic characters of *P. riffensis* see Caruso and Di Maio (1990, p. 204, Figures 6–10).

***Porcellio echinatus* Lucas, 1849**

Porcellio (Euporcellio) echinatus; Paulian de Félice, 1939, p. 198

Porcellio echinatus; Dollfus, 1896, p. 532; Vandel, 1958a, p. 129; Achouri et al., 2008c, pp. 76–78

Material examined

2 ♂♂, 2 ♀♀, St. 6, near well and wheat field, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9536); 3 ♂♂, 3 ♀♀, St. 7, leg. S. Taiti, 29 April 2004 (MZUF 9537); 1 ♂, 1 ♀, same locality, leg. S. Taiti and C. Rossano, 29 September 2005 (MZUF 9538); 2 ♀♀, St. 9, under stones in meadow, leg. S. Taiti, 28 April 2004 (MZUF

9539); 1 ♀, St. 10, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9540); 1 ♂, 4 ♀♀, St. 14, *Phillyrea* wood, leg. S. Taiti, 27 April 2004 (MZUF 9541); 1 ♂, 2 ♀♀, same locality, leg. S. Taiti and C. Rossano, 27 September 2005 (MZUF 9542); 1 ♂, 3 ♀♀, St. 19, leg. S. Taiti, 29 April 2004 (MZUF 9543); 2 ♂♂, 3 ♀♀, St. 20, under stones along path to waterfall, leg. S. Taiti and C. Rossano, 2 May 2004 (MZUF 9544); 1 ♂, 2 ♀♀, St. 26, cork-oak wood, leg. S. Taiti, 30 April 2004 (MZUF 9545).

Previous Rif records

Taxdirt, west of Melilla (Vandel 1958a); Oued Laou region (Achouri et al. 2008c).

Distribution

Southern Portugal, southern Spain, northern Morocco, and north-western Algeria.

Remarks

For diagnostic characters of *P. echinatus* see Vandel (1946, p. 304, Figures 125–129).

***Porcellio humberti* Paulian de Félice, 1939
(Figures 30 and 31)**

Porcellio Humberti Paulian de Félice, 1939, p. 210, Figures 70–74

Porcellio humberti; Vandel, 1958a, p. 129; Vandel, 1958c, p. 445, Figures 1–3

Material examined

1 ♀, St. 4, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9546); 1 ♀, St. 7, leg. S. Taiti, 29 April 2004 (MZUF 9547); 5 ♀♀, 1 juv., same locality, leg. S. Taiti and C. Rossano, 29 September 2005 (MZUF 9548); 1 ♂, 3 ♀♀, St. 12, leg. C. Rossano, 26 April 2004 (MZUF 9549); 2 ♀♀, 3 juvs, St. 14, *Phillyrea* wood, leg. S. Taiti and C. Rossano, 27 September 2005 (MZUF 9550); 5 ♂♂, 6 ♀♀, St. 15, sieved ground near stream, leg. S. Taiti, 27 April 2004 (MZUF 9551); 2 ♀♀, St. 16, along road margin under stones, leg. S. Taiti, 28 April 2004 (MZUF 9552); 1 ♀, St. 18, cork-oak wood, leg. S. Taiti, 29 April 2004 (MZUF 9553); 5 ♂♂, 11 ♀♀, St. 19, leg. S. Taiti, 29 April 2004 (MZUF 9554); 1 ♀, St. 20, under stones along path to waterfall, leg. S. Taiti and C. Rossano, 2 May 2004 (MZUF 9555); 4 ♂♂, 6 ♀♀, St. 21, leg. S. Taiti and C. Rossano, 30 September 2005 (MZUF 9556); 2 ♀♀, St. 24, cork-oak wood, leg. S. Taiti, 29 April 2004 (MZUF 9557); 1 ♂, 2 ♀♀, St. 25, under stones in meadow, leg. S. Taiti, 30 April 2004 (MZUF 9558); 3 ♂♂, 7 ♀♀, St. 26, cork-oak wood, leg. S. Taiti, 30 April 2004 (MZUF 9559).

Previous Rif records

Mt Gurugu, near Melilla; Tétouan; Benitez, near Ceuta (Vandel 1958a, 1958c).

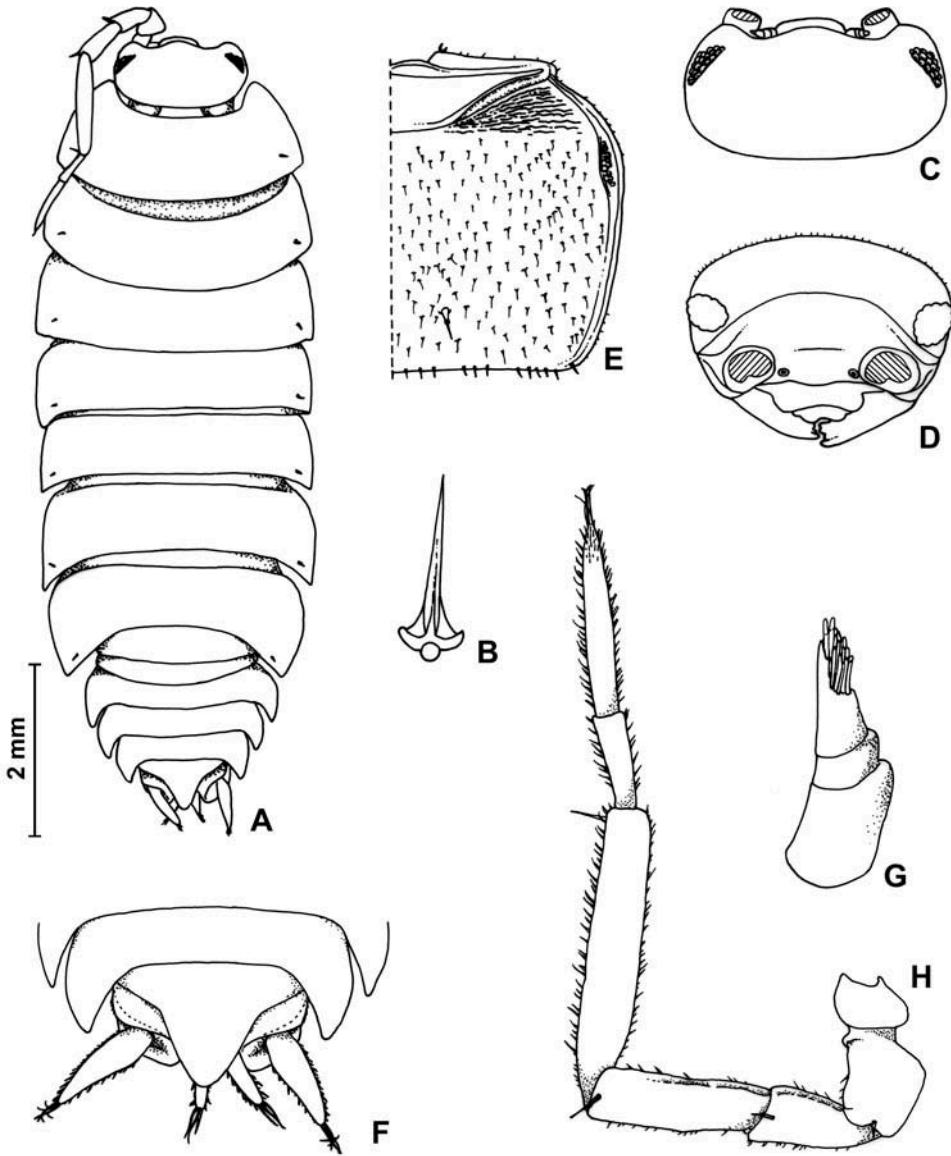


Figure 30. *Porcellio humberti* from St. 19, ♂: (A) adult specimen, dorsal view; (B) dorsal scale-seta; (C) cephalon, dorsal view; (D) cephalon, frontal view; (E) pereonite 4, right side; (F) pleonites 4, 5, telson and uropods; (G) antennule; (H) antenna.

Distribution

Southern Spain and Morocco.

Remarks

Porcellio humberti was described by Paulian de Féllice (1939) on specimens from Jebel Ayachi, in the High Atlas Range. Vandel (1958c) redescribed and partially illustrated

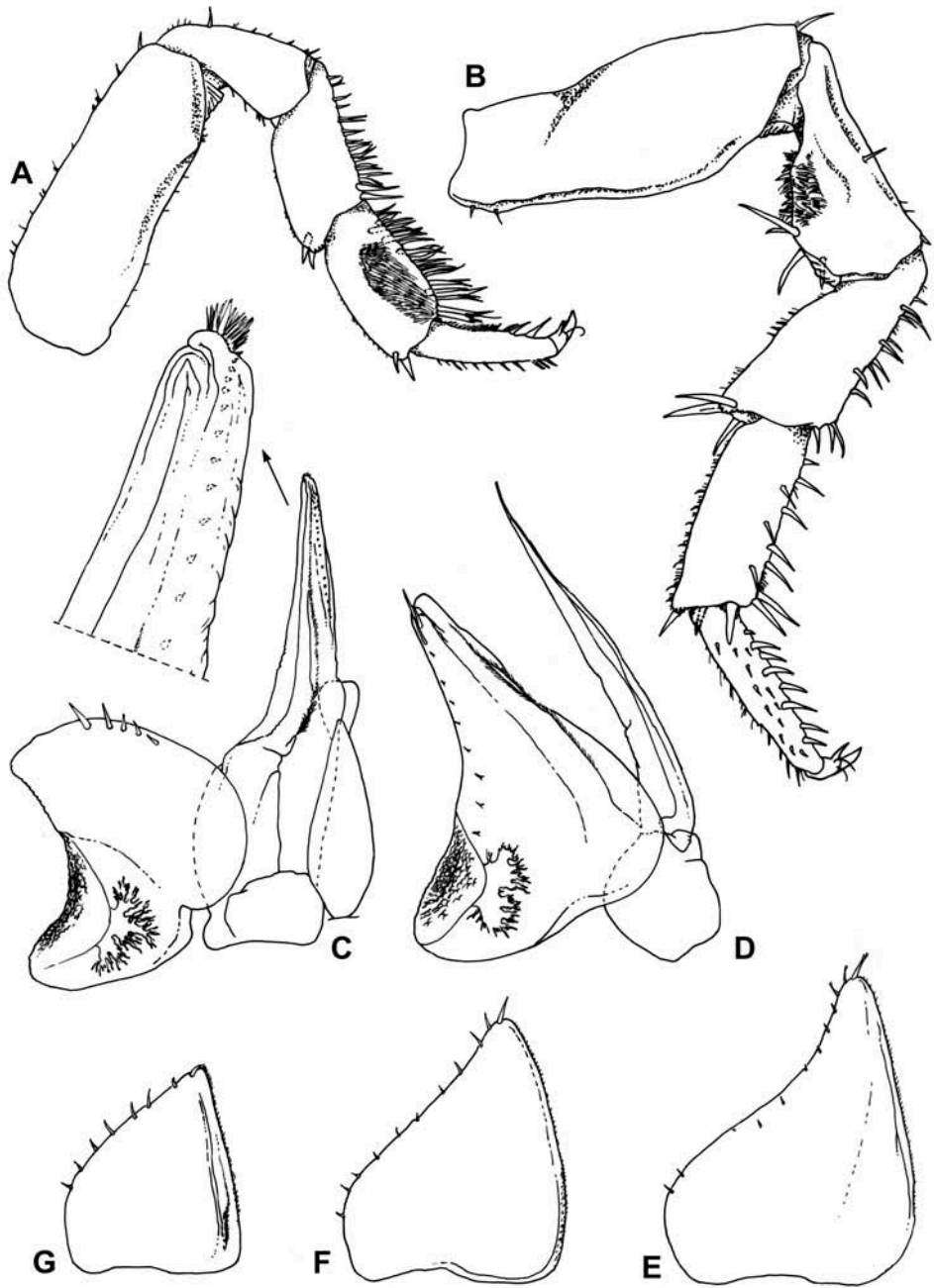


Figure 31. *Porcellio humberti* from St. 19, ♂: (A) pereopod 1; (B) pereopod 7; (C) genital papilla and pleopod 1; (D) pleopod 2; (E) pleopod 3 exopod; (F) pleopod 4 exopod; (G) pleopod 5 exopod.

the species, and added several localities in Morocco and southern Spain. A full set of figures of this species that integrate Vandel's redescription is here provided on specimens from St. 19.

Family **ARMADILLIDIIDAE** (Brandt, 1833)

Genus *Eluma* Budde-Lund, 1885

Eluma caelata (Miers, 1877)

(Figures 32 and 33)

Material examined

1 ♂, 1 ♀, St. 7, leg. S. Taiti, 29 April 2004 (MZUF 9560); 2 ♂♂, St. 8, leg. S. Taiti and C. Rossano, 28 April 2004 (MZUF 9561); 1 ♀, same locality and collectors, 28 September 2005 (MZUF 9562); 3 ♀♀, St. 10, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9563); 1 ♂, 1 ♀, St. 11, leg. S. Taiti, 27 April 2004 (MZUF 9564); 4 ♂♂, 29 ♀♀, St. 18, cork-oak wood, leg. S. Taiti, 29 April 2004 (MZUF 9565); 7 ♂♂, 2 ♀♀, St. 20, under stones along path to waterfall, leg. S. Taiti and C. Rossano, 2 May 2004 (MZUF 9566); 1 ♀, St. 22, leg. S. Taiti and C. Rossano, 30.IX.2005 (MZUF 9567).

Distribution

Southern British Isles, western France, Portugal, Spain, north-western Africa, Canary Islands, Madeira, and Azores. Introduced to Tasmania and French Guiana (Schmalfuss 2003). New record for the Rif region.

Remarks

The synonymy of *Eluma purpurascens* Budde-Lund, 1885 with *Armadillidium caelatum* Miers, 1877 was definitely established by Schmalfuss (2003) after examination of the type material of the latter species. The main characters of this species are illustrated here (Figures 32 and 33) on specimens from St. 18 (Fahsa) for comparison with the new species *Eluma praticola* described below.

Eluma praticola sp. nov.

(Figures 34–36)

Material examined

Holotype: ♂, St. 25, under stones in meadow, leg. S. Taiti, 30 April 2004 (MZUF 9568). Paratypes: 9 ♂♂, 19 ♀♀, same data as holotype (MZUF 9568).

Description

Maximum length: ♂, 5.5 mm; ovigerous ♀, 7 mm. Body very convex, able to roll up into a ball, euspheric type (Figure 34A). Colour brown with paler epimera of pereonites 2–7. Dorsal surface without ornamentation and with numerous round

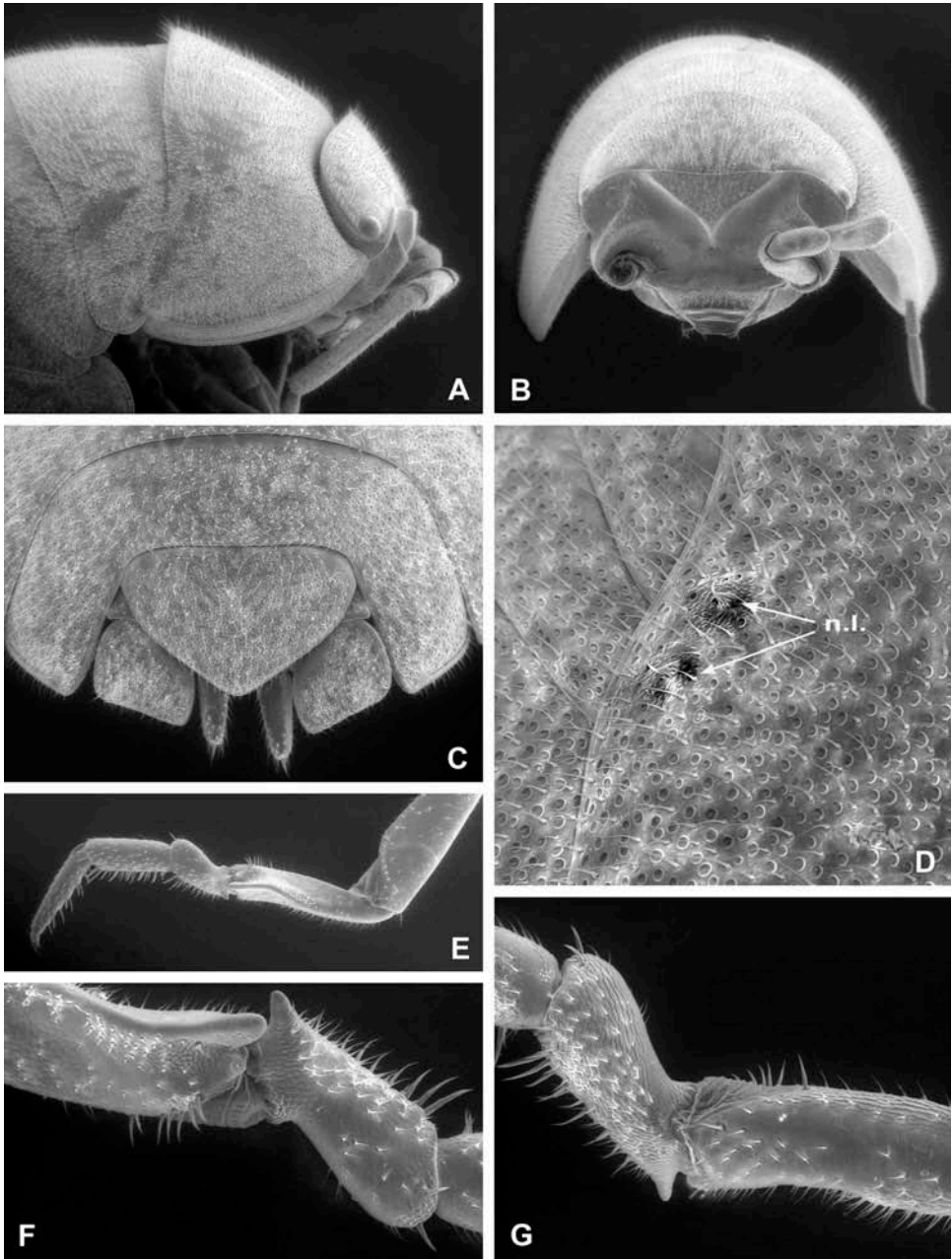


Figure 32. *Eluma caelata* from St. 18, ♀: (A) cephalon and pereonites 1, 2, lateral view; (B) cephalon and pereonite 1, frontal view; (C) pleonite 5, telson and uropods; (D) pereonite 7 with noduli laterales. ♂: (E) pereopod 7, caudal surface; (F) pereopod 7 ischium and merus, caudal surface; (G) pereopod 7 ischium and merus, rostral surface.

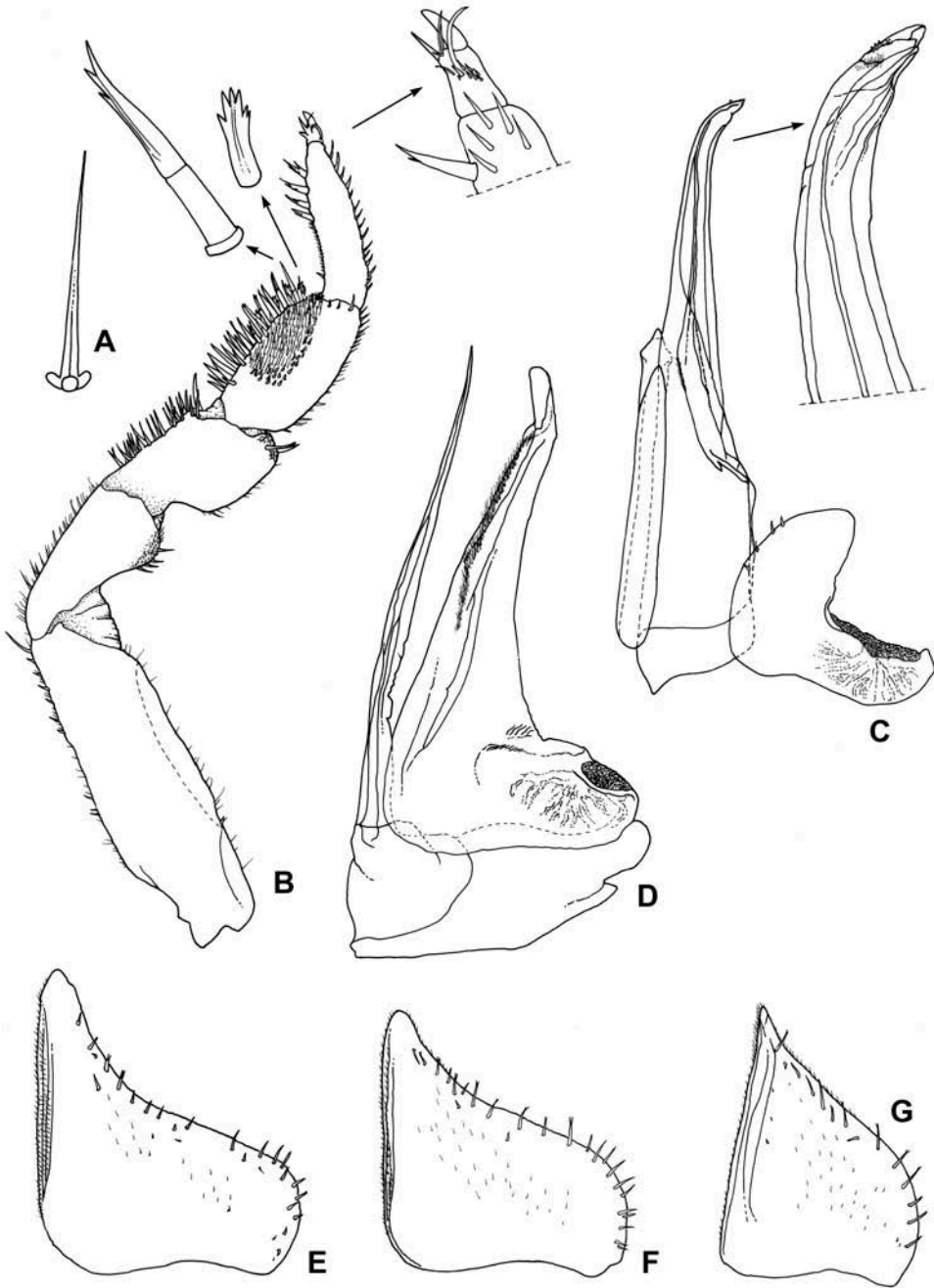


Figure 33. *Eluma caelata* from St. 18, ♂: (A) dorsal scale-seta; (B) pereopod 1; (C) genital papilla and pleopod 1; (D) pleopod 2; (E) pleopod 3 exopod; (F) pleopod 4 exopod; (G) pleopod 5 exopod.

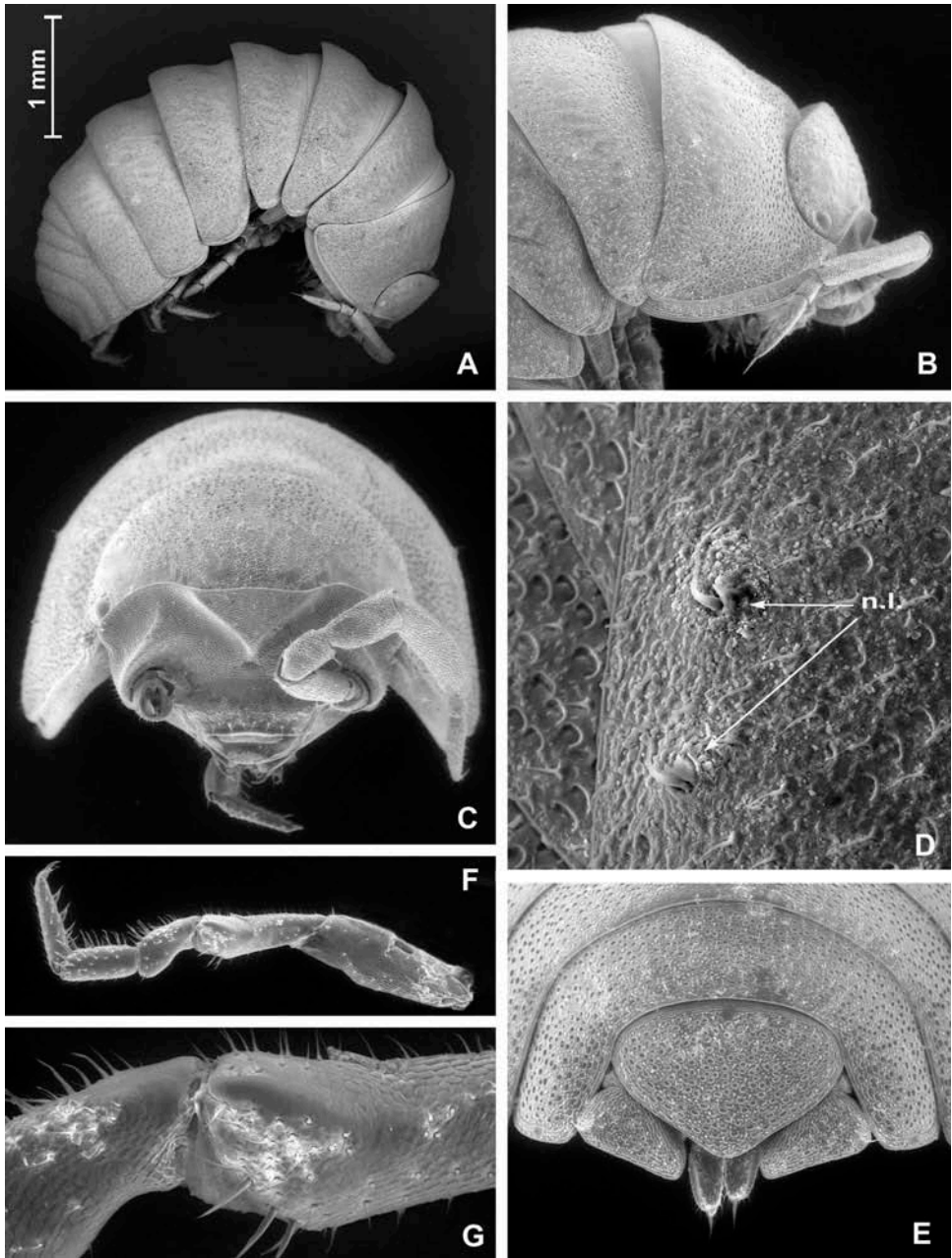


Figure 34. *Eluma praticola* sp. nov. from St. 25, paratype ♀: (A) adult specimen, lateral view; (B) cephalon and pereonites 1, 2, lateral view; (C) cephalon and pereonite 1, frontal view; (D) pereonite 7 with noduli laterales; (E) pleonite 5, telson and uropods. Paratype ♂: (F) pereopod 7, caudal surface; (G) pereopod 7 ischium and merus, caudal surface.

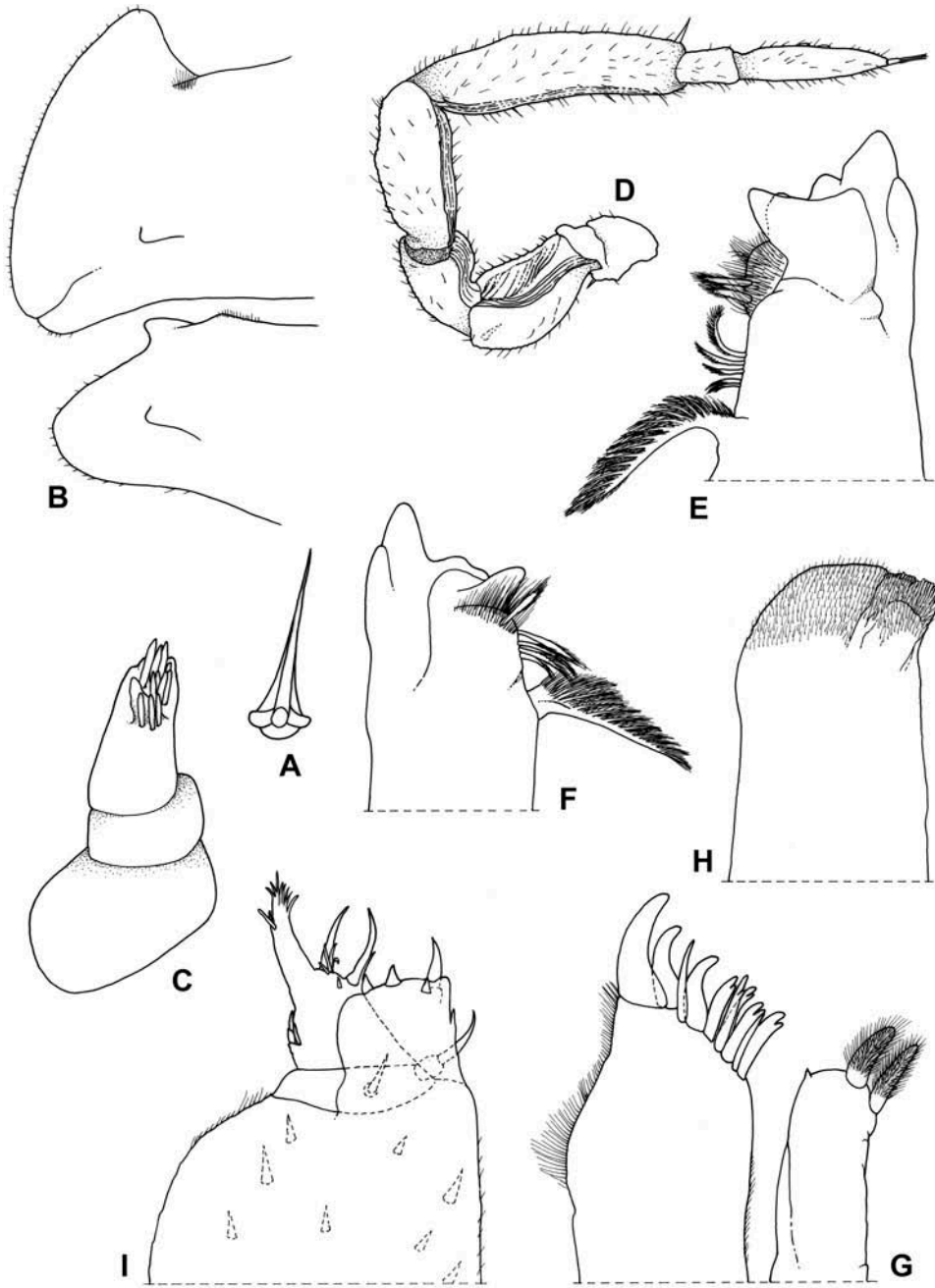


Figure 35. *Eluma praticola* sp. nov. from St. 25, paratype ♂: (A) dorsal scale-seta; (B) right side of pleonites 1 and 2, ventral view; (C) antennule; (D) antenna. Paratype ♀: (E) left mandible; (F) right mandible; (G) maxillule; (H) maxilla; (I) maxilliped.

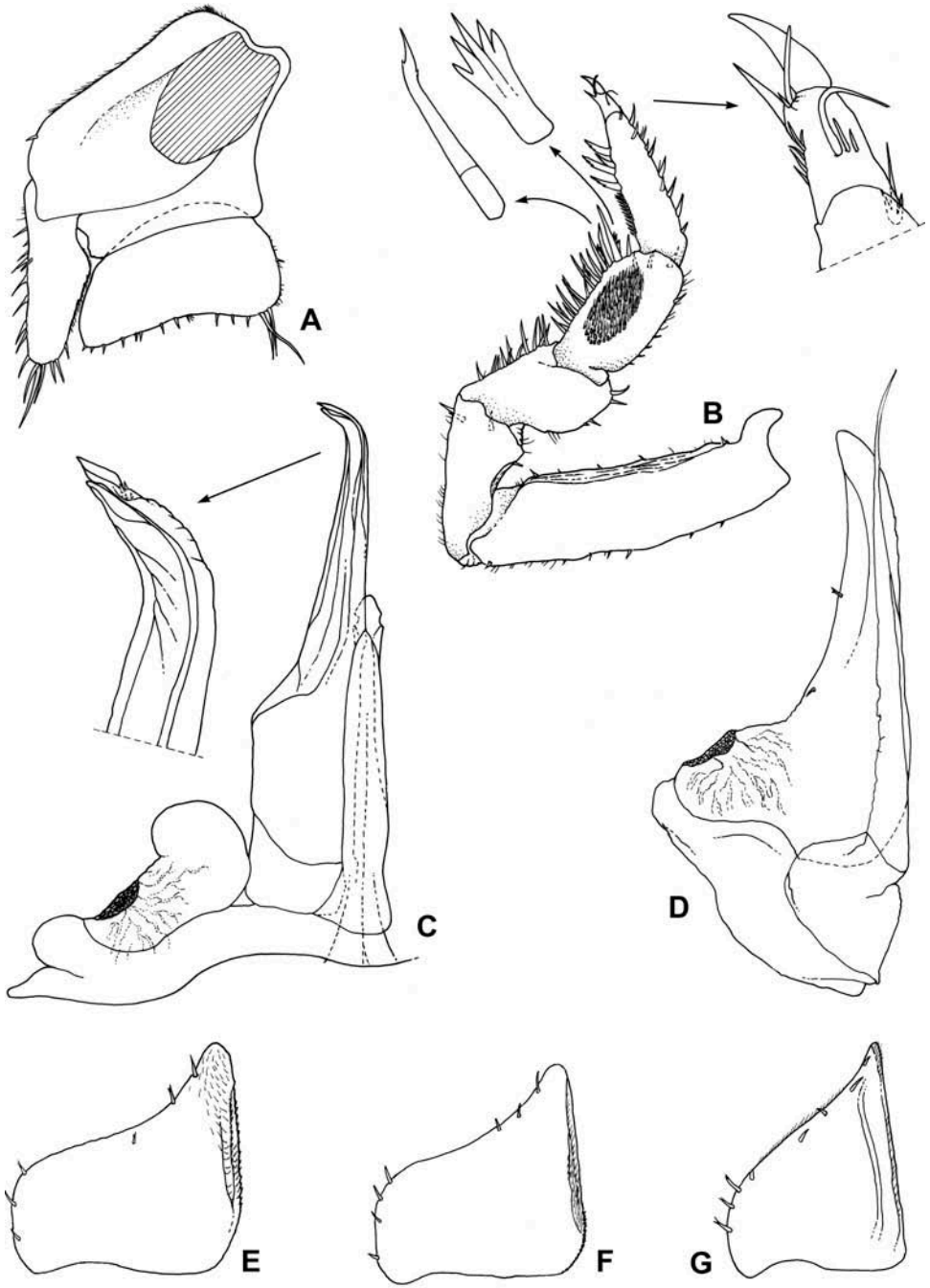


Figure 36. *Ehuma praticola* sp. nov. from St. 25, paratype ♂: (A) uropod; (B) pereopod 1; (C) genital papilla and pleopod 1; (D) pleopod 2; (E) pleopod 3 exopod; (F) pleopod 4 exopod; (G) pleopod 5 exopod.

pits and tiny pointed scale-setae (Figure 35A); one line of noduli laterales per side far from the lateral margin of pereonites 1–6, two noduli laterales per side on pereonite 7 (Figure 34D); no visible gland pores. Cephalon (Figure 34B, C) with a wide triangular scutellum distinctly separated from and not bent over vertex; no postscutellar line; antennary lobes quadrangular, directed frontwards; eye consisting of a single large ocellus. Pereonite 1 (Figures 34B, 35B) with a flattened lateral margin and a schisma on posterior corners; inner lobe of schisma rounded, more protruding backwards than the outer one; a small triangular lobe on ventral surface; posterior margin slightly sinuous at sides. Pereonite 2 (Figure 35B) with rounded epimera, a small triangular ventral lobe and straight posterior margin. Pereonite 3 with rounded epimera and straight posterior margin; pereonites 4–7 with quadrangular epimera and straight posterior margins. Pleonites 3–5 with rectangular epimera, slightly divergent. Telson (Figure 34E) triangular, almost 1.5 as wide as long, with straight sides and broadly rounded apex. Antennule (Figure 35C) of three articles, second article much shorter than first and third, third article with a tuft of superimposed aesthetascs subapically. Antenna (Figure 35D) short and stout with flagellum slightly shorter than fifth article of peduncle, second flagellar article almost three times longer than first and bearing two rows of aesthetascs. Mandibles (Figure 35E, F) with semidichotomized molar penicil and four free penicils; right mandible with one penicil and left mandible with two penicils on the hairy lobe. Maxillule (Figure 35G) outer lobe with 4 + 6 (5 cleft) teeth; inner lobe with two subequal penicils and a small triangular distal point. Maxilla (Figure 35H) apically setose, with quadrangular inner lobe, much smaller than rounded outer lobe. Maxilliped (Figure 35I) with quadrangular endite bearing three short triangular setae on distal margin and a longer subapical seta near the inner corner; basal article of palp with two long setae. Uropod (Figures 34E, 36A) flattened; exopod about twice as wide as long, with concave distal margin; endopod distinctly more protruding backwards compared with exopod.

Male: Pereopod 1 (Figure 36B) with a line of pointed setae on sternal margin of carpus and, to a lesser extent, merus. Pereopod 7 (Figure 34F, G) ischium distally with a ridge on caudal surface, sternal margin slightly concave with numerous long setae; merus with no ridges or lobes, sternal margin slightly convex with some long setae. Pleopod 1 (Figure 36C) exopod with a short, rounded medial lobe; endopod with distal part pointed and bent outwards. Pleopod 2 (Figure 36D) exopod triangular and slightly shorter than endopod. Pleopod 3–5 exopods as in Figure 36E–G.

Etymology

From the Latin *pratium* = meadow + stem of *colere* = to live. The name refers to the habitat where the specimens have been collected.

Remarks

Up to date the genus *Eluma* included only two species, the widespread *E. caelata* and *E. tuberculata* Cruz, 1991 from Fatima, Portugal. The new species is similar to *E. caelata* from which it differs in smaller size (maximum length in ovigerous females 7 mm vs 16 mm), the dorsal surface with shorter and less numerous scale-setae

(compare Figure 34A–E and Figure 32A–D), shorter uropodal exopod (compare Figures 34E and Figure 32C), male pereopod 7 without a basal triangular lobe on merus and less sharp ridge on the caudal surface of the ischium (compare Figure 34F, G and Figure 32E–G), and pleopod 1 exopod with a shorter and round medial lobe (compare Figure 36C and Figure 33C).

Eluma praticola is readily distinguishable from *E. tuberculata* in the dorsal surface without ornamentation and lateral margin of pereonite 1 not grooved. No comparison is possible with the male characters since *E. tuberculata* was described on female specimens (Cruz 1991).

Genus *Armadillidium* Brandt, 1833

Armadillidium album Dollfus, 1887

Armadillidium album; Colombini et al., 2008, p. 86

Material examined

2 ♂♂, 1 ♀, St. 4, under logs, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9569).

Previous Rif records

Oued Laou (Colombini et al. 2008).

Distribution

Atlantic coast of Europe, western and central Mediterranean as far East as Greece.

Remarks

For diagnostic characters of *A. album* see Vandel (1962, p. 841, Figure 403) and Schmalzfuss (2008, p. 154, Figures 1–12).

Armadillidium granulatum Brandt, 1833

Armadillidium granulatum; Dollfus, 1896, p. 528; Paulian de Félice, 1939, p. 212; Vandel, 1958a, p. 130; Achouri et al., 2008c, pp. 76–78; Achouri et al., 2008a, p. 129

Material examined

Many ♂♂ and ♀♀, St. 2, under stones at base of cliff, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9570).

Previous Rif records

Melilla; Taxdirt and Ixmoart, near Melilla; Sidi Yacoub el Basi, near Peñón de Velez; Tétouan; Benitez, near Ceuta (Vandel 1958a); Oued Laou region (Achouri et al. 2008a, 2008c).

Distribution

Littoral species distributed along the coasts of the Mediterranean, Atlantic coasts of Morocco, Portugal, France, Madeira and the Azores.

Remarks

For diagnostic characters of *A. granulatum* see Vandel (1962, p. 796, Figure 383).

Armadillidium vulgare (Latreille, 1804)

Armadillidium vulgare; Dollfus, 1896, p. 530; Dollfus, 1898, p. 134; Verhoeff, 1938, p. 67; Paulian de Félice, 1939, p. 212; Vandel, 1958a, p. 130; Achouri et al., 2008c, pp. 76–78; Colombini et al., 2008, p. 86
Armadillidium cinereum; Arcangeli, 1932, p. 225

Material examined

1 ♀, St. 3, under stones, leg. C. Rossano, 28 April 2004 (MZUF 9571); 3 ♀♀, St. 4, dune under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9572); 1 ♂, 3 ♀♀, St. 5, beach under stones, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9573); 3 ♂♂, same locality, leg. S. Taiti and C. Rossano, 1 October 2005 (MZUF 9574); 1 ♂, 9 ♀♀, St. 6, near well and wheat field, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9575); 1 ♂, 1 ♀, St. 7, leg. S. Taiti and C. Rossano, 29 September 2005 (MZUF 9576); 1 ♀, St. 14, *Phillyrea* wood, leg. S. Taiti, 27 April 2004 (MZUF 9577); 5 ♂♂, 8 ♀♀, St. 15, sieved ground near stream, leg. S. Taiti, 27 April 2004 (MZUF 9578); 1 ♀, St. 23, under stones, leg. S. Taiti, 30 April 2004 (MZUF 9579).

Previous Rif records

Benitez, near Ceuta (Vandel 1958a); Oued Laou region (Achouri et al. 2008c); Oued Laou (Colombini et al. 2008).

Distribution

Cosmopolitan species of Mediterranean origin.

Remarks

For diagnostic characters of *A. vulgare* see Vandel (1962, p. 826, Figures 397, 398) and Gruner (1966, p. 320, Figures 251, 252).

Family ARMADILLIDAE Brandt
 Genus *Armadillo* Latreille, 1802
Armadillo officinalis Duméril, 1816

Armadillo officinalis; Dollfus, 1896, p. 527; Paulian de Félice, 1939, p. 212; Vandel, 1958a, p. 130; Achouri et al., 2008c, pp. 76–78

Material examined

6 ♂♂, 5 ♀♀, St. 2, under stones at base of cliff, leg. S. Taiti and C. Rossano, 1 May 2004 (MZUF 9580); 1 ♀, St. 7, leg. S. Taiti, 29 April 2004 (MZUF 9581); 6 ♂♂, 5 ♀♀, same locality, leg. S. Taiti and C. Rossano, 29 September 2005 (MZUF 9582); 5 ♂♂, 11 ♀♀, 2 juvs, St. 10, leg. S. Taiti and C. Rossano, 26 April 2004 (MZUF 9583); 1 ♂, 5 ♀♀, St. 11, leg. S. Taiti, 27 April 2004 (MZUF 9584); 1 ♂, 4 ♀♀, St. 12, leg. C. Rossano, 26 April 2004; (MZUF 9585) 1 ♂, 3 ♀♀, St. 14, *Phillyrea* wood, leg. S. Taiti, 27 April 2004 (MZUF 9586); 3 ♂♂, 3 ♀♀, 1 juv., same locality, leg. S. Taiti and C. Rossano, 27 September 2005 (MZUF 9587); 9 ♂♂, 5 ♀♀, 6 juvs, St. 15, sieved ground near stream, leg. S. Taiti, 27 April 2004 (MZUF 9588); 6 ♂♂, 9 ♀♀, St. 16, along road margin under stones, leg. S. Taiti, 28 April 2004 (MZUF 9589); 2 ♂♂, 9 ♀♀, St. 19, leg. S. Taiti, 29 April 2004 (MZUF 9590); 4 ♀♀, St. 20, under stones along path to waterfall, leg. S. Taiti and C. Rossano, 2 May 2004 (MZUF 9591); 2 ♂♂, 2 ♀♀, St. 21, leg. S. Taiti and C. Rossano, 30 September 2005 (MZUF 9592); 1 ♀, St. 23, under stones, leg. S. Taiti, 30 April 2004 (MZUF 9593).

Previous Rif records

Ixmoart and Mt Gurugu, near Melilla; Isla de Alhucemas; Tétouan; Benitez, near Ceuta (Vandel 1958a); Oued Laou region (Achouri et al. 2008c).

Distribution

Mediterranean basin, Morocco and Portugal.

Remarks

For diagnostic characters of *A. officinalis* see Vandel (1962, p. 855, Figures 408, 409).

Discussion

In the present study 34 species of terrestrial isopods are recorded from the Oued Laou basin and summarized in Figure 37. Two genera (*Paractenoscia* and *Soteriscus*) and seven species (*Trichoniscus microphthalmus*, *Paractenoscia cavernicola*, *Bathytropa rifensis*, *Soteriscus gibbosus*, *S. laouensis*, *Porcellio pseudornatus* and *Eluma praticola*) are described as new. Nine species (*Ligia italica*, *Graeconiscus thermophilus*, *Ctenoscia minima*, *Stenoniscus carinatus*, *Platyarthrus caudatus*, *P. parisii*, *Lucasius pallidus*, *Porcellionides sexfasciatus lusitanus* and *Eluma caelata*) represent new records for the Rif region.

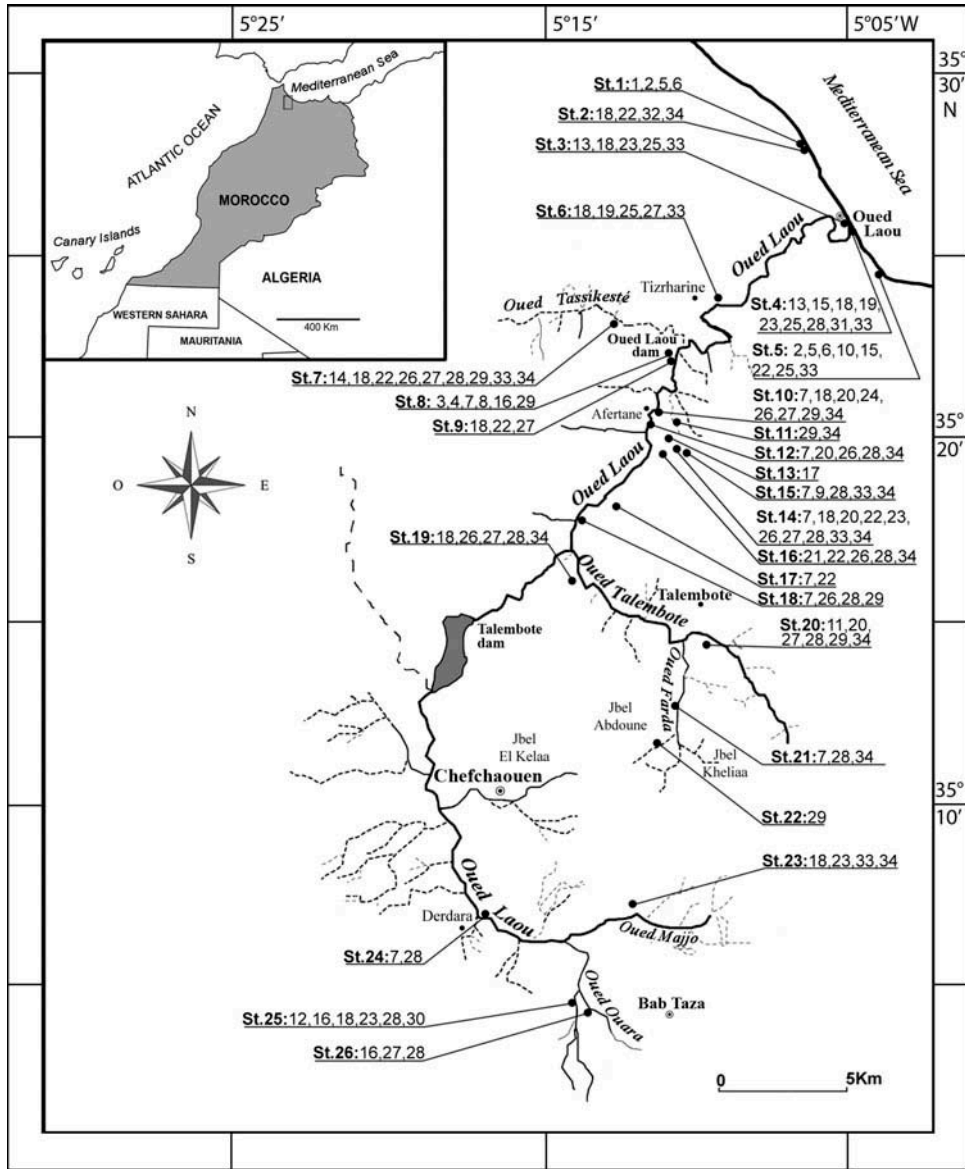


Figure 37. Map of Oued Laou basin with distribution records of Oniscidean species. The stations (St.) refer to those listed in Table 1. 1 = *Ligia italica*; 2 = *Tylos europaeus*; 3 = *Trichoniscus microphthalmus* sp. nov.; 4 = *Graeconiscus thermophilus*; 5 = *Halophiloscia couchii*; 6 = *Stenophiloscia glarearum*; 7 = *Ctenoscia minima*; 8 = *Paractenoscia cavernicola* sp. nov.; 9 = *Bathytropa rifensis* sp. nov.; 10 = *Stenoniscus carinatus*; 11 = *Platyarthrus caudatus*; 12 = *Platyarthrus parisii*; 13 = *Leptotrichus panzerii*; 14 = *Agabiformius lentus*; 15 = *Agabiformius obtusus*; 16 = *Lucasius pallidus*; 17 = *Porcellionides pruinosis*; 18 = *Porcellionides sexfasciatus lusitanus*; 19 = *Porcellionides* sp.; 20 = *Soteriscus gibbosus* sp. nov.; 21 = *Soteriscus laouensis* sp. nov.; 22 = *Porcellio pseudornatus* sp. nov.; 23 = *Porcellio hoffmannseggii hoffmannseggii*; 24 = *Porcellio flavocinctus*; 25 = *Porcellio laevis*; 26 = *Porcellio riffensis*; 27 = *Porcellio echinatus*; 28 = *Porcellio humberti*; 29 = *Eluma caelata*; 30 = *Eluma praticola* sp. nov.; 31 = *Armadillidium album*; 32 = *Armadillidium granulatum*; 33 = *Armadillidium vulgare*; 34 = *Armadillo officinalis*.

Vandel (1958a) recorded 17 species from the Rif area, many of which have also been encountered in the Oued Laou basin. Six of these species (*Lucasius myrmecophilus*, *Soteriscus gaditanus*, *Porcellio ornatus*, *P. wagneri*, *Armadillidium djebalensis* Vandel, 1958b and *A. pardoi* Vandel, 1956a) are not present in the collection examined by us, but we must point out the taxonomic uncertainties concerning *L. myrmecophilus* (see remarks under *L. pallidus*) and the possible misidentification of *P. ornatus* which probably has to refer to *P. pseudornatus* sp. nov.

In a more recent publication on the diversity of terrestrial isopods from the same area considered in this study, Achouri et al. (2008c) listed 19 species, six of which identified only at genus level (*Porcellio* sp. 1, *Porcellio* sp. 2, *Porcellionides* sp., *Acaeroplastes* sp. *Philoscia* sp. and *Chaetophiloscia* sp.). The material studied by those authors should be re-examined to complete the identifications and confirm the presence of the genera *Acaeroplastes* Verhoeff, 1918, *Philoscia* Latreille, 1804 and *Chaetophiloscia* Verhoeff, 1908 in the Rif area. Only three species (*Lucasius myrmecophilus*, *Soteriscus gaditanus* and *Porcellio lamellatus* Budde-Lund, 1885) recorded by the authors for the Oued Laou region were not encountered by us.

According to their present distributions, the 39 species identified with certainty from the Rif region belong to the following biogeographical categories:

1. Widespread species (4)

Agabiformius lentus, *Porcellionides pruinosus*, *Porcellio laevis* and *Armadillidium vulgare*: these species, all of Mediterranean origin, have been introduced into many parts of the world and can be considered as cosmopolitan.

2. Mediterranean-Atlantic species (8)

Ligia italica, *Tylos europaeus*, *Halophiloscia couchii*, *Stenophiloscia glarearum*, *Leptotrichus panzerii*, *Porcellio lamellatus*, *Armadillidium album* and *A. granulatum*

3. Mediterranean species (4)

Graeconiscus thermophilus, *Leptotrichus panzerii*, *Agabiformius obtusus* and *Armadillo officinalis*

4. West-Mediterranean-Atlantic species (6)

Stenoniscus carinatus, *Ctenoscia minima*, *Porcellionides sexfasciatus lusitanus*, *Lucasius pallidus*, *Platyarthrus parisii* and *Eluma caelata*

5. West-Mediterranean species (1)

Platyarthrus caudatus

6. Rif-Betic species (6)

Soteriscus gaditanus, *Porcellio hoffmannseggii hoffmannseggii*, *P. flavocinctus*, *P. echinatus*, *P. wagneri* and *P. humberti*

7. Rif endemics (10)

Trichoniscus microphthalmus sp. nov., *Paractenoscia cavernicola* sp. nov., *Bathytropa rifensis* sp. nov., *Soteriscus gibbosus* sp. nov., *S. laouensis* sp. nov., *Porcellio pseudornatus* sp. nov., *P. riffensis*, *Eluma praticola* sp. nov., *Armadillidium djebalensis* and *A. pardoi*.

About 59% of the species have wide distributions (Groups 1–5), all of Mediterranean origin. Seven of these species (*Ligia italica*, *Tylos europaeus*, *Halophiloscia couchii*, *Stenophiloscia glarearum*, *Stenoniscus carinatus*, *Porcellio lamellatus* and *Armadillidium album*) are halophilic and widely distributed along the sandy and rocky shores of the Mediterranean Sea and some also on the Atlantic coasts of Africa and Europe.

The number of species with more limited distributions and more significant from a zoogeographical point of view is quite high (Groups 6 and 7, 16 spp., 41%). Most of these species are also distributed in the southern part of the Iberian Peninsula (Group 6) or are endemic to the Rif but showing affinities with Iberian species: *Soteriscus gibbosus*, *S. laouensis* which are morphologically close to *S. gaditanus*; *Porcellio pseudornatus* and *P. riffensis*, belonging to the Rif-Betic group of *Porcellio*; *Eluma praticola* belonging to an Atlantic genus; and *Armadillidium djebalensis* and *A. pardoi*, belonging to the *serratum* group of *Armadillidium*. All these examples seem to show a common origin of the fauna of the Rif with that of the Betic cordillera, which were in connection until the middle Miocene (Rosenbaum et al. 2002).

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