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Chevreuxiopsis franki gen. n., sp. n. (Crustacea, Amphipoda, Thoriellidae) from the deep sea southwest of Tasmania

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Abstract

A new amphipod species and genus, *Chevreuxiopsis franki*, found in a pelagic sediment trap southwest of Tasmania is described. The new species can be recognized by its unique antenna 2, which consists of a narrow peduncle, and a 4-articulate flagellum, which has a massively developed, article 1, large, posteriorly drawn out articles 2 and 3, and an elongate lanceolate 4th article. The pereopod 1 basis surrounds large maxillipedal plates. Pereopod 3 to 6 are equipped with subchelate propodus dactylus arrangements. The bases of pereopods 5–7 are narrow.

Introduction

An unusual amphipod was found in a pelagic sediment trap in the Indian sector of the Southern Ocean, southwest of Tasmania, Australia. Careful examination allowed us to identify it as a member of the family Thoriellidae Lowry & Stoddart, 2011. The Thoriellidae consists of four genera: *Chevreuxiella* Stephensen, 1915, *Danaella* Stephensen, 1925, *Parachevreuxiella* Andres, 1987, and *Thoriella* Stephensen, 1915. The morphological diversity in this family is very high. The two *Danaella* species, *Danaella mimonectes* Stephensen, 1925 and *Danaella obensis* (Birstein & Vinogradov, 1962) (initially described as *Chevreuxiella obensis*) have inflated bodies that are more reminescent of hyperiid amphipods than of other Aristioidea Lowry & Stoddart, 1997. In contrast to *Danaella,* the genus *Thoriella*, represented by the slender *Thoriella islandica* Stephensen, 1915, has rather small coxal plates. *Chevreuxiella* and *Parachevreuxiella* are very similar, only differing by the length of uropods 1 and 2, their shape and the presence/absence of an inner ramus on both appendages. As the new species does not fit in any of the known thoriellid genera we are erecting the new genus *Chevreuxiopsis* herein.

Material and methods

The material was collected by a McLane 21-cup sediment trap at 1,000 m depth in the subantarctic Southern Ocean, southwest of Tasmania. The conical sediment trap has a surface of 0.5 m² and is filled with unfiltered water from the region (49°S, 153°E at 1,200 m), which was treated with sodium chloride (5 g/L) to increase the solution density,

sodium tetracarborate (1 g/L) as a pH buffer, and mercuric chloride (3 g/L) for preservation (Roberts et al. 2008). The sample was filtered through a 1 mm screen and the specimen was found in the fraction > 1 mm, which contains plankton and micronekton organisms (Roberts et al. 2008).

For taxonomic study, we transferred the material in a graded series of ethanol-glycerol mixes into pure glycerol and then mounted the specimen or dissected parts on slides for the preparation of the drawings. Pencil drawings of the habitus were made with on a Leica M 205c dissecting microscope and details of the appendages and mouthparts on a Leica DMLB compound microscope. Both microscopes were equipped with a camera lucida. The line drawings were made following the technique described in Coleman (2003, 2009). Measurements were made along the dorsal outline of the animals, from the rostrum to the end of the urosome.

The material is held in the collections of the Leibniz Institute for Evolution and Biodiversity Science, Museum für Naturkunde Berlin (ZMB).

Systematics

Thoriellidae Lowry & Stoddart, 2011

Species list:

Chevreuxiella metopoides Stephensen, 1915
Chevreuxiopsis franki gen. n., sp. n.
Danaella mimonectes Stephensen, 1925
Danaella obensis (Birstein & Vinogradov, 1962)
Parachevreuxiella justi Lowry & Stoddart, 2011
Parachevreuxiella lobata Andres, 1987
Thoriella islandica Stephensen, 1915

Key to the species of the Thoriellidae

1	Coxae small and separate from each other, in uropods 1 and 2 both rami subequal in length	*Thoriella islandica*
–	Coxae large and overlapping each other, uropods 1 and 2 inner ramus short, vestigial or absent	2
2	Pereonites 3–6 grossly swollen	3
–	Pereonites 3–6 ordinary	4
3	Posterior margin of urosome straight	*Danaella mimonectes*
–	Posterior margin of urosome incised	*Danaella obensis*
4	Antenna 2 with flagellum consisting of subequal articles	5
–	Antenna 2 flagellum consisting of 4 massive articles, article 1 expanded, articles 2 and 3 drawn out posteriorly, article 4 lanceolate	*Chevreuxiopsis franki* gen. n. sp. n.
5	Uropods 1 and 2 with spine-like inner rami	*Chevreuxiella metopoides*
–	Uropods 1 and 2 without inner rami	6
6	Uropods 1 and 2 rami much longer than peduncle	*Parachevreuxiella lobata*
–	Uropods 1 and 2 rami subequal or shorter than peduncle	*Parachevreuxiella justi*

Chevreuxiopsis gen. n.

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Diagnosis. *Body* slender, pereon not inflated. *Antenna 1* slender, with normal flagellum. *Antenna 2* flagellum 4-articulate, much wider than peduncle, massively developed; article 1 enlarged, weakly drawn out posteriorly; articles 2 and 3 strongly drawn out posteriorly; article 4 lanceolate. *Maxilla 1* inner plate with 2 terminal plumose setae; outer plate with 6+1 apical spine-like setae; palp 2-articulate; article 2 inflated, lanceolate. *Maxilla 2* ordinary. *Pereopod 1* basis ovoid, expanded, with anteromarginal nose-like process; dactylus knob-like. *Pereopods 3–6* propodus subchelate; dactylus falcate (probably prehensile). *Pereopod 3* coxa slightly longer than that of peropod 2. *Pereopod 4* coxa enlarged, posteromarginally straight. *Pereopods 5–7* basis slender. *Urosome* segments 2 and 3 fused; uropods 2 pairs, each with lanceolate outer ramus and spine-like inner ramus. *Telson* absent.

Type species. *Chevreuxiopsis franki* sp. n., monotypic.

Chevreuxiopsis franki sp. n.

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Figures 1–5

Material examined. Holotype: female (the specimen appears to have unsetose oostegites), 12 mm.

Type locality. The specimen was collected with a McLane 21-cup sediment trap at 1,000 m depth between the 11 and 26 August 1998 at the Southern Ocean Time Series site (SOTS, 46°45.52′S, 142°5.38′E), southwest of Tasmania, Australia (ZMB Crust 31700).

Etymology. The species is named for Frank Halfter, the father of the first author.

Diagnosis. As for generic diagnosis.

Description (based on holotype, 12 mm).

Body (Fig. 1c). Head deeper than long, shorter than pereonite 1. Pereonite 2 slightly longer than 1. Pereonites

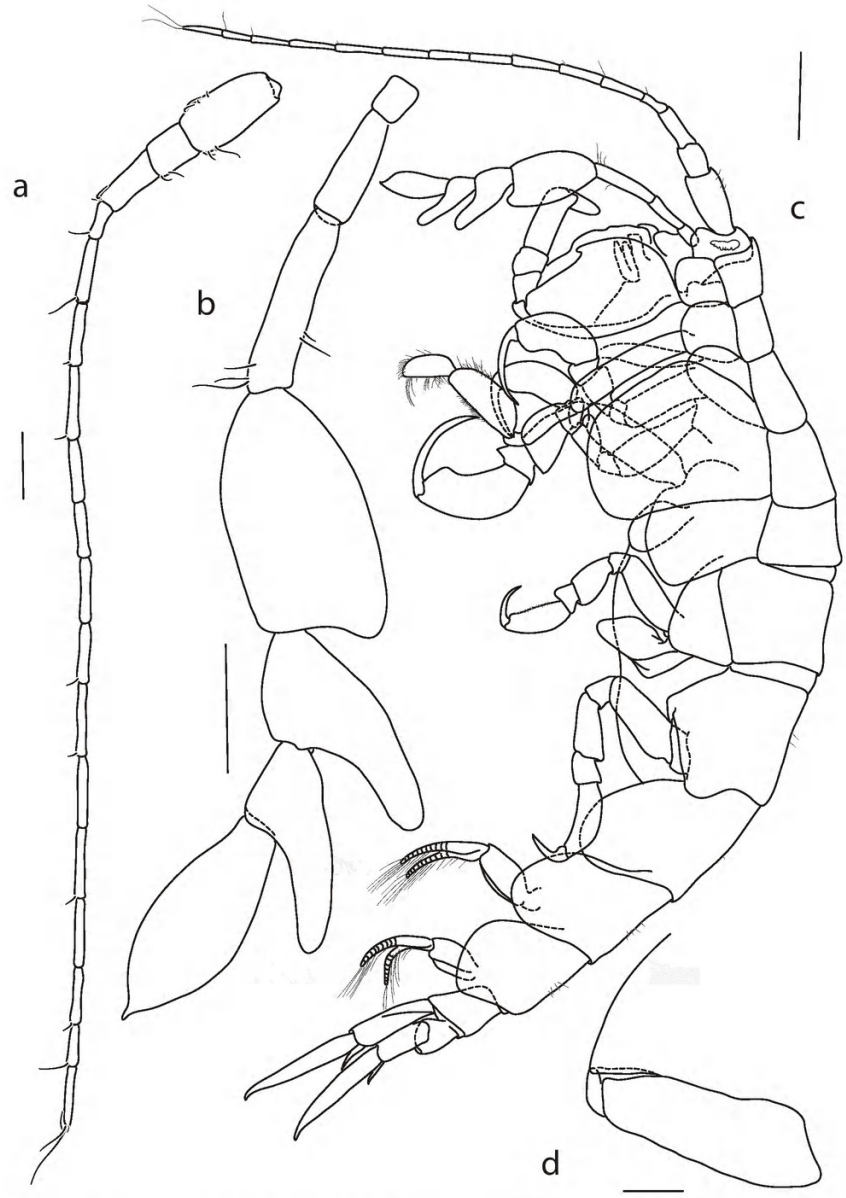

Figure 1. *Chevreuxiopsis franki* gen. n., sp. n., holotype 12 mm. **a** Antenna 1 **b** Antenna 2, peduncular articles 1–2 missing **c** Habitus **d** Labrum and mandible, lateral view. Scale bars: 500 µm (a, b); 1 mm (c); 100 m (d).

3 and 4 subequal in length. Pereonite 5 as long as pereonite 2. Pleonites subequal in length, posteroventrally rounded. Urosomite 1 longer than the fused urosomites 2 and 3. Telson absent.

Head (Fig. 1c) with anterior rounded lobe between insertion of antenna 1 and 2. Eyes present, dark pigments visible in alcohol; weakly reniform, extended dorsoventrally. *Antenna 1* (Fig. 1a, c) about 2× as long as antenna 2; peduncular article ratios 1 : 0.4 : 0.6, width successively smaller; 15 flagellum articles, slender, with very few slender setae. *Antenna 2* (Figs 1b, 6) peduncle articles slender, with 2 minute basal articles (which were damaged during dissection), article 3 short; article 4 about 2× as long as article 3; article 5 as long as article 1–4 combined; flagellum article 1 distally expanded, about 3× as wide as basal articles, posterodistally lobate; article 2 and 3 proximally as wide as peduncular article 3 and posterodistally drawn out into long narrow lobes; article 4 lanceolate, distally pointed and inside with a dense mass of tissue. *Mouthparts* (Figs 1c, 2f) extended ventrally, all covered by large outer plates of maxilliped, which leave an anteriorly and ventrally slit-like opening and additionally surrounded posteriorly by wide bases of pereopods 1. Mandibles to maxilla 2 directed anteriorly; ventrally of these mouthparts is a dense tissue mass (dashed in Fig. 2f, 3a), that might represent the inner maxillipedal plates. Both *mandibles* slender without molar, setal rows or palp (Fig. 2a, b). *Labrum* without pronounced epistome, rounded from lateral view (Fig. 1d). *Lower lip* (Fig. 2e) with rather long rounded apices with few setae in the hypopharyngeal gap and with slender mandibular lobes. *Maxilla 1* (Fig. 2c, d) inner plate with 2 plumose apical

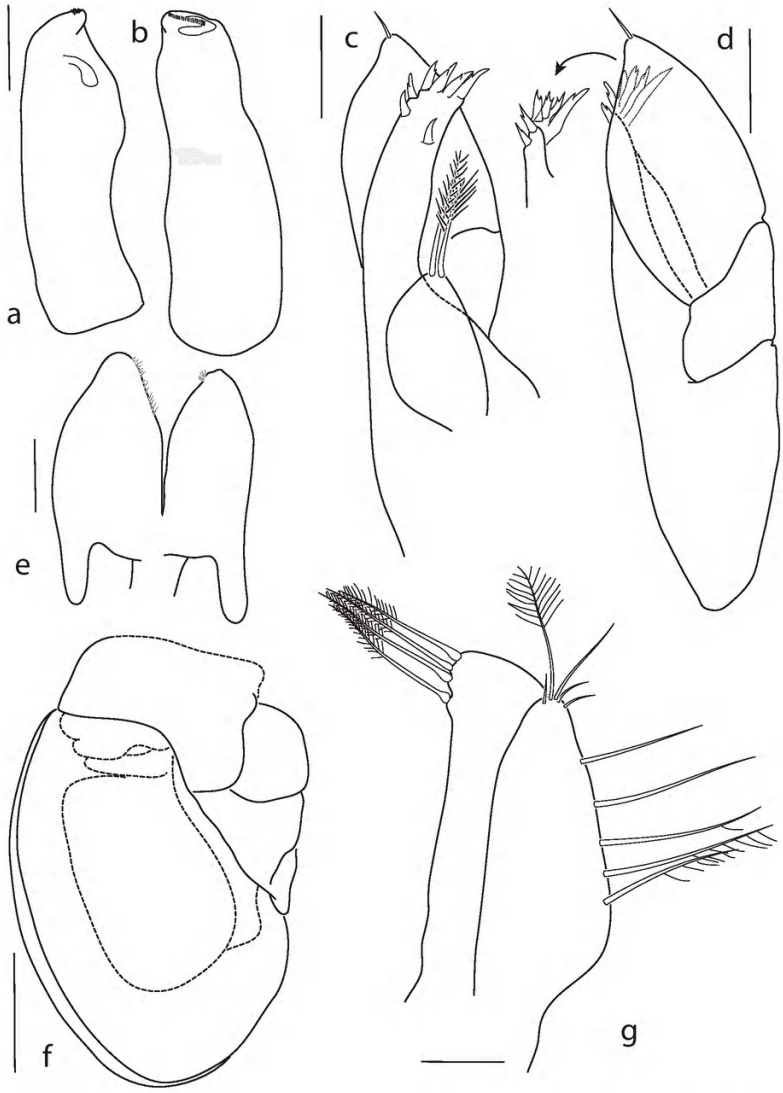

Figure 2. *Chevreuxiopsis franki* gen. n., sp. n., holotype 12 mm. **a** Right mandible **b** Left mandible **c, d** Maxilla 1 **e** Lower lip **f** Mouthparts, left aspect **g** Maxilla 2. Scale bars: 100 µm (a–e); 500 µm (f).

setae; outer plate with 6 plus 1 apical robust setae; palp 2-articulate, line between both articles barely visible, distal article lanceolate, with 1 short seta on tapering tip. *Maxilla 2* (Fig. 2g) inner plate with some medial setae; outer plate with 4 distolateral plumose setae.

Pereon. *Pereopod 1* (Fig. 3b) dark purple/black pigmented in ethanol; coxa subquadrate; basis anteromarginally expanded with short nose-shaped protrusion; ischium and merus subequal; carpus weakly expanded distally 2.2× as long as wide; propodus slightly tapering distally with distal knob-like dactylus. *Pereopod 2* (Fig. 3d, e) basis elongate and slender; ischium 2.7× as long as wide; merus short, distally pointed; carpus longer than propodus with cushions of slender, hair-like setae on anterior and posterior margins; propodus anteromarginally rounded with similar setation as carpus; dactylus subapically, accompanied with long several long setulated setae and with few setae on the inner curvature. *Pereopod 3* (Fig. 3c) coxa subrectangular, slightly directed anteriorly; basis as long as coxa; ischium 0.6× the width of basis; merus relatively short, distally expanded; carpus wider than long, distally expanded; carpus curved posteriorly, distally oblique; dactylus with proximal rounded joint, weakly curved, slender; propodus and dactylus form subchelate complex. *Pereopod 4* (Fig. 4a) coxa largest, about 4× as long as coxa 1, surpassing basis, ischium and part of merus, anteriorly convex, posteriorly straight; basis to dactylus subequal to pereopod 3, except for the slightly longer carpus. *Pereopod 5* (Fig. 4b) coxa bilobed; basis to merus subequal to pereopod 4; carpus shorter than wide, with anterior process; propodus curved anteriorly with oblique distal margin; carpus and long, slender, weakly curved dactylus form a very large subchela.

Pereopod 6 (Fig. 5a, d) coxa wide, weakly bilobate, posterior lobe slightly longer than anterior one; basis about half as long as coxa width; ischium longer than wide; merus expanded posterodistally; carpus short, distally expanded, with some small teeth anteromarginally; propodus, relatively slender, convex posteromarginally, anteromarginally straight, with marginal small teeth, especially on the medial face; dactylus falcate.

Pereopod 7 (Fig. 4c) coxa shorter than wide, subrectangular; basis posteroproximally weakly expanded,

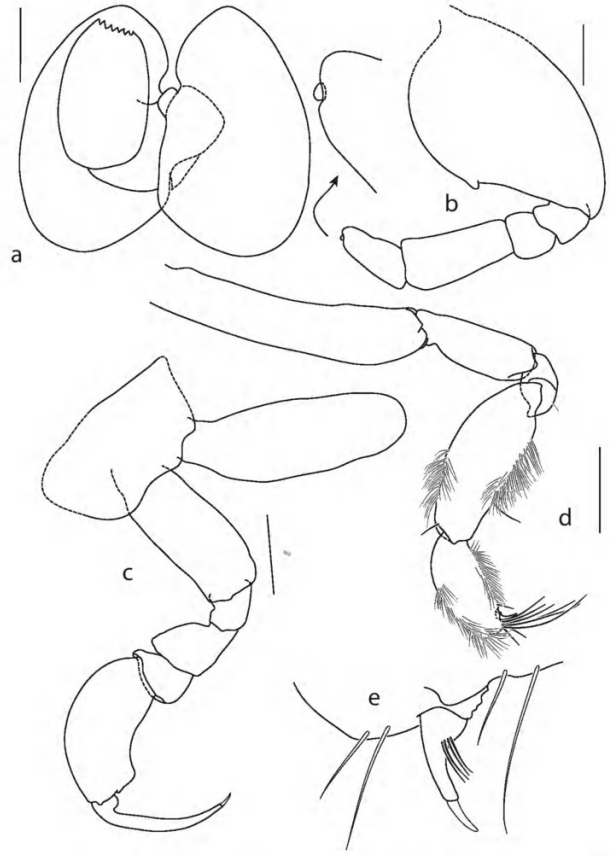

Figure 3. *Chevreuxiopsis franki* gen. n., sp. n., holotype 12 mm. **a** Maxilliped, opened up **b** Pereopod 1, basis to dactylus; detail shows knob-like dactylus **c** Pereopod 3 **d** Pereopod 2, without coxa **e** Dactylus of pereopod 2. Scale bar: 500 µm (a–d).

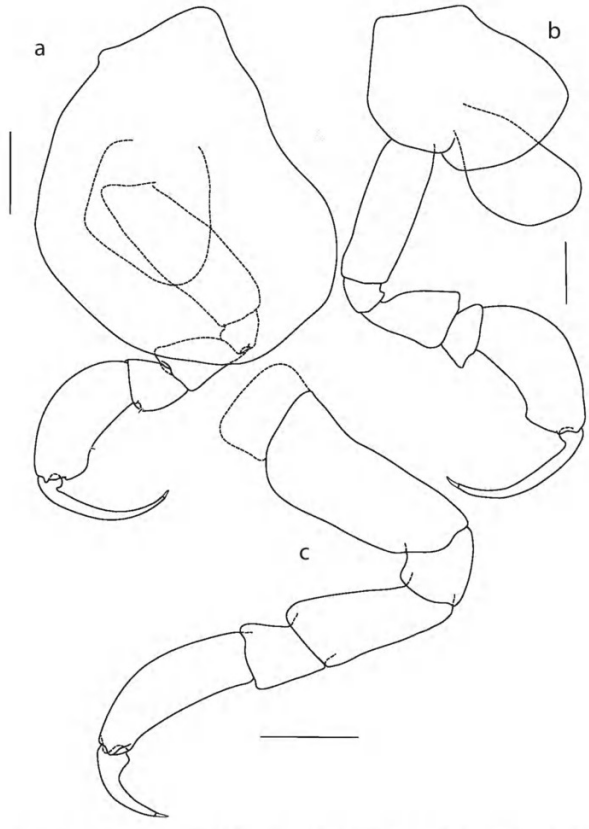

Figure 4. *Chevreuxiopsis franki* gen. n., sp. n., holotype 12 mm. **a** Pereopod 4 **b** Pereopod 5 **c** Pereopod 7, medial aspect. Scale bar: 500 µm (a–c).

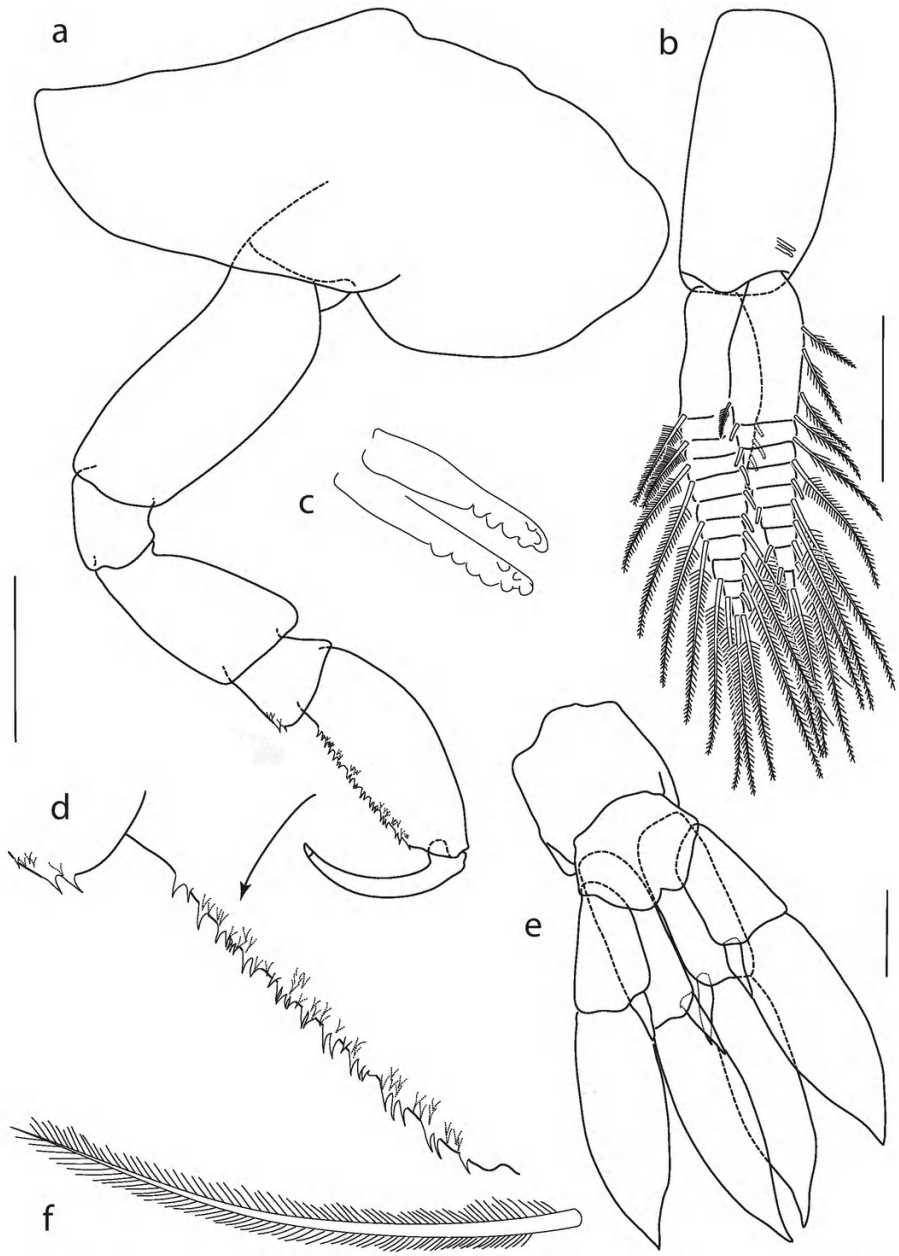

Figure 5. *Chevreuxiopsis franki* gen. n., sp. n., holotype 12 mm. **a** Pereopod 6 **b** Pleopod 1; **c** Coupling hooks of pleopod **d** Anterior margin of propodus **e** Urosome, dorsal view **f** Setulated seta of pleopod. Scale bar: 500 µm (a, b, e).

somewhat tapering distally; ischium subquadrate; merus weakly expanded posterodistally; carpus subquadrate; propodus convex posteromarginally, straight anteromarginally; dactylus much shorter than preceding appendages.

Pleon. *Pleopod 1* (Fig. 5b, c) peduncle 2× as long as wide; coupling hooks (Fig. 5c) long with rows of protrusions ventrally; both rami slightly longer than peduncle, inner ramus somewhat shorter than outer ramus; swimming setae moderately long with dense setulation (Fig. 5f).

Urosome. First urosomite longer than the fused second and third segment; urosomite 2 expanded midlaterally and weakly incised posteromarginally forming 2 short rounded lobes; peduncle of uropod 1 2.5× as long as wide; outer ramus lanceolate; inner ramus spine-like, 25% of outer ramus length; uropod 2 peduncle shorter than that of uropod 1 and weakly expanded distally; outer ramus slightly wider compared to that of uropod 1; inner ramus 23% of outer ramus. Telson absent.

Distribution. The species is so far only known from the type locality.

Discussion

We classified the new species in a new genus, *Chevreuxiopsis*. This genus is related to *Chevreuxiella* (represented by *C. metopoides*, the only species) and both genera share

Figure 6. *Chevreuxiopsis franki* gen. n., sp. n., holotype 12 mm. Photo of head, antennae, maxillipeds and anterior pereopods. Note the dark purple/black colour of the 1st pereopods. Scale bar: 500 µm.

the following: pereon not inflated (cf. *Danaella*); coxa 4 enlarged; similarities in the mouthparts: rather underived maxilla 1 and 2 and the morphology of the maxilliped; urosome and both uropods are very similar in the lanceolate shape of the rami and the dimensions of the inner rami.

However, there are also strong differences between the new species and *C. metopoides*. *Chevreuxiopsis franki* gen. n. sp. n. has a differently shaped, slender antenna 1 (vs expanded and elongate first flagellar article. This is perhaps a sexually dimorphic character, as *C. metopoides* was described on a male specimen) and especially antenna 2 flagellum, which has an enlarged article 1, large, posteriorly drawn out articles 2 and 3 and a lanceolate article 4 (vs normally shaped and multiarticulate); maxilla 1 with inflated palp article 2 (vs normal), inner plate with 2 plumose setae (vs 4 setae); basis of pereopod 1 ovoid expanded with anteromarginal nose-like process (vs weakly expanded and without nose-like process); coxa 3 slightly longer than coxa 2 (vs much longer and wider); coxa 4 posteromarginally straight (vs posteroventally lobate); basis of pereopods 5–7 slender (vs expanded); pereopod 3–6 probably prehensile due to their subchelate arrangement of propodus and falcate dactylus (vs simple).

The maxilliped is of a unique shape in thoriellids. Large plates surround the mouthparts and leave a small slit anteriorly and ventrally. However, due to its derived morphology it is very difficult to homologize the parts. For example, Stephensen (1915: 41, fig. 24) labelled the massive maxillipedal plates, that surround the mouthparts, as the first palp articles, but we think they are the outer plates of the maxilliped. These plates are overlapped by the huge bases of the first pereopod, which has dark purple/black pigmentation and may act as a shutter (see below).

Due to the few records in literature, knowledge about the biology of the Thoriellidae is limited (Lowry and Stoddart 2011). Stephensen (1915) suggested a semiparasitic lifestyle for *Chevreuxiella* and *Thoriella*, and Andres (1987) found *Parachevreuxiella lobata* attached to a wound of a bathypelagic fish. However, it is difficult to draw conclusions about the lifestyle of *Chevreuxiopsis franki* sp. n. Due to the relatively good preservation of the body, an active entering of the specimen into the sediment trap is assumed. The long-term deployment of the sediment trap prevents analyses of potential differences in day vs night distribution due to diurnal vertical migration. Hence, no additional information on the vertical distribution of this species can be concluded.

The specimen is of transparent appearance apart from the dark purple gnathopod 1, which covers the maxilliped

(Fig. 6). Herring (1981: 171) already noted a blue-green bioluminescence in the genera *Chevreuxiella* and *Danaella* in the thoriellid family while handling, which "almost extinguished when the maxilliped plate was withdrawn between the two densely pigmented expanded basal articles of the first pair of gnathopods". Also, Parker (1999) studied the luminescence of an unidentified thoriellid juvenile and found the expanded fifth articles of the second antennae to act as reflectors of the luminescent maxilliped. He assumed that rather than having a communication or defensive function, light flashes could be used to catch prey. Similarly, this could be the case in our specimen. Additional to the dark purple/black shutter, we also note enlarged articles of the second antenna, which could function as reflector of the emitted bioluminescence and lead potential prey towards the maxillipeds. However, this has to be further investigated in behavioural studies.

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