

First record and a new species of *Foxiphalus* Barnard, 1979 (Crustacea: Amphipoda: Phoxocephalidae) from the Atlantic Ocean, with two new records of the family from northeastern Brazil

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Abstract. A new species of *Foxiphalus* Barnard, 1979 is described. The material examined was collected as part of the project "Avaliação da biota bentônica e planctônica da Baía Potiguar e Ceará" (BPOT), off northeastern Brazilian continental slope on the state of Rio Grande do Norte at depths ranging from 135 to 283 meters. *Foxiphalus potiguara* sp. nov. is recognized among its congeners by: rostrum slightly exceeding the article 2 of antenna 1; lower lip outer lobes with strong shoulder cusps; maxilliped inner plate with two apical robust setae; gnathopod 2 carpus shortened; pereopod 5 basis tapering distally; and epimeral plate 3 posterior margin weakly crenulated. This is the first record of *Foxiphalus* for the Atlantic Ocean and we provide an amended diagnosis of the genus and an identification key to its world species. In addition, two new records of Phoxocephalidae are reported from northeastern Brazil: *Heterophoxus shoemakeri* Andrade & Senna, 2020 and *Metharpinia dentiurosoma* Alonso de Pina, 2003.

Keywords. Amphipoda; Amphilochidea; Taxonomy; Potiguar Basin; Rio Grande do Norte.

INTRODUCTION

Foxiphalus Barnard, 1979 was erected to place three species previously belonging to *Paraphoxus* G.O. Sars, 1891 (Barnard & Barnard, 1982). In the past, the genus has been placed in different sub-families, now invalid, within Phoxocephalidae G.O. Sars, 1891 such as *Birubiinae* Barnard & Drummond, 1978 and *Metharpiniinae* Jarret & Bousfield, 1994 (Barnard & Karaman, 1991; Jarret & Bousfield, 1994). Members of *Foxiphalus* share some general morphological similarities with *Birubius* Barnard & Drummond, 1976, *Rhepoxynius* Barnard, 1979, *Grandifoxus* Barnard, 1979 and *Eobrolgus* Barnard, 1979. However, it can be distinguished among them by the following characters, respectively: absence of a strong dactylar nail of maxilliped; unconstricted rostrum; one or two setae on article 3 of antenna 2; and setae spread ventrally on article 2 of antenna 1.

Until now, *Foxiphalus* has been only recorded in cold waters from the northern Pacific Ocean, ranging from Alaska, in North America, to Panama, in Central America, mostly on shallow waters, but also in slightly greater depths up to 324 meters (Barnard & Karaman, 1991; Jarret & Bousfield, 1994).

The family Phoxocephalidae has lately been studied in more detail in Brazil, accounting many new species and new records from south-east and southern Brazilian waters (Andrade & Senna, 2019a, b; Andrade & Senna 2020a, b, c, d). Currently there are 28 species of the family recorded from Brazilian waters. Here, we report two new records of phoxocephalids from northeastern Brazil: *Heterophoxus shoemakeri* Andrade & Senna, 2020 and *Metharpinia dentiurosoma* Alonso de Pina, 2003. We also describe a new species of *Foxiphalus*, being the first record of the genus for the Atlantic Ocean, with material from the

Potiguar Basin, northeastern Brazil. In addition, we provide an amended diagnosis of the genus and an identification key to world species of *Foxiphalus*.

MATERIAL AND METHODS

The material was collected off the Potiguar Basin (BPOT), Rio Grande do Norte state, across the shelf break to the upper slope from 135 to 283 meters by Van Veen grabs on the scope of the project “Avaliação da Biota Bentônica e Planctônica da Bacia Potiguar e Ceará” developed by the Brazilian Oil Company “Petróleo Brasileiro S/A (Petrobrás)” onboard the R/V Seward Johnson.

The basin is located at the eastern end of the Brazilian Equatorial Margin (Fig. 9), comprising both emerged and submerged segments. Most of it is distributed in the state of Rio Grande do Norte and partially in the state of Ceará (Mohriak, 2003), covering approximately 38,500 km², distributed between the continental shelf and the continental slope, up to 2,000 meters depth (Bertani et al., 1990).

The type-material is deposited at the Crustacea Collection of the *Museu de Oceanografia Prof. Petrônio Alves Coelho da Universidade Federal de Pernambuco* (MOUFPE), Brazil. For the taxonomic study, appendages and mouthparts were dissected and mounted in glycerin gel slides, drawn under an optical microscope with camera lucida, Leica DM E, and digitally prepared with CorelDRAW 2018. The setal/spine classification used in this work follows Watling (1989). The nomenclature of gnathopod palm is based on Poore & Lowry (1997). Based on literature review and observation of other important characters on the new species, we decided to amend the previous diagnosis from Jarret & Bousfield (1994) and new characters are highlighted in bold. The previous identification key available for *Foxiphalus* from Jarret & Bousfield (1994) was not complete, accounting only regional species. Thus, we present an updated identification key for all world species, as well as using better established and stable characters for an easier distinction of the species within *Foxiphalus*.

RESULTS

Taxonomic analysis

Order Amphipoda Latreille, 1816

Suborder Amphilochidea Boeck, 1871

Family Phoxocephalidae G.O. Sars, 1891

Subfamily Harpiniinae Barnard & Drummond, 1978

Genus *Heterophoxus* Shoemaker, 1925

***Heterophoxus shoemakeri* Andrade & Senna, 2020**

Heterophoxus shoemakeri Andrade & Senna, 2020a: 3, figs. 1-6.

Material examined: 2 ♀♀, in 70% ethanol, BPOT Station MT55 R1, 278 m depth, 2011, state of Rio Grande do Norte,

Brazil, 36°54'24.68"W, 04°34'24.26"S (MOUFPE 15958); 2 ♀♀, in 70% ethanol, BPOT Station MT55 R2, 283 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°54'24.68"W, 04°34'24.26"S (MOUFPE 20007).

Distribution and bathymetric range: The species has previously been found off the coast of the states of Rio de Janeiro, Santa Catarina and Rio Grande do Sul (Andrade & Senna, 2020a) between 25 and 128 m depth. Here we report it for the continental slope of the state of Rio Grande do Norte at 278 and 283 m depth.

Remarks: This species was recently described with material from off the coasts of the Brazilian states of Rio de Janeiro, Santa Catarina and Rio Grande do Sul. The individuals found here agree with its original description although some subtle differences can be noticed such as setation patterns. This is the deepest and northernmost record of the species and its first record to northeastern Brazil.

Subfamily Phoxocephalinae G.O. Sars, 1891 **Genus *Foxiphalus* Barnard, 1979**

Type species: *Foxiphalus obtusidens* (Alderman, 1936)

Diagnosis: After Jarret & Bousfield (1994), amendments in bold. Pigmented eyes very small to medium in female, medium to large in male. Rostrum fully hooded, unconfined. Antenna 1, peduncle article 2 shorter than 1. Antenna 2, peduncle article 1 and 2 variously ensiform, article 3 with one lateral seta, article 4 facial robust setae in three distinct rows, anterior margin with few setae only, or also with robust seta, article 5 with one or two clusters of facial setae and one or two distal calceoli on the anterior margin in male; flagellum medium in the male and elongated with alternately calceolate articles in the male. Mandible incisors broad with at least two teeth, left *lacinia mobilis* with at least two teeth, right *lacinia mobilis* simple, bifid or absent, molar with five to 10 robust setae, accessory setal row medium to strong; palp slender, article 2 weakly setose, article 3 apex oblique and truncate, bearing cluster of setae. Upper lip epistome occasionally with sharp anterior process. Lower lip broad, with distinct shoulder cusps. Maxilla 1 inner plate with up to five apical setae, outer plate with one apical robust seta enlarged. Maxilla 2 outer plate usually broader than inner. Maxilliped inner plate with one or two apical robust setae; outer plate slender, short, not reaching half of palp article 2, dactylus slender. Gnathopods 1-2 dissimilar, propodus longer than respective carpus; palms acute. Gnathopod 2 carpus posterior margin short. Pereopods 3-4 carpus posterior margin with distal long robust seta, propodus with robust setae distally. Pereopod 5 basis broad, propodus longer than carpus, posterior margin setose, dactylus slender. Pereopod 6 basis broad, merus usually narrow and without facial rows of robust setae. Pereopod 7 copulatory spines in males slender, subequal, straight or slightly curved, prox-

imally serrated, distally setulose or smooth. Uropod 1 peduncle with displaced robust seta present, rami with few dorsal robust setae, bearing apical nail. Uropod 2 peduncle with dorsal row of robust setae, outer ramus with few dorsal robust setae, inner ramus with robust seta or naked. Uropod 3 inner ramus of variable length in females, subequal and setose with plumose setae in males. Telson lobes with at least one apical robust seta on each side and single plumose seta.

Genus composition: The genus is composed of 11 species + 1 new species: *Foxiphalus aleuti* Barnard & Barnard, 1982; *F. apache* Barnard & Barnard, 1982; *F. cognatus* (Barnard, 1960); *F. falciformis* Jarret & Bousfield, 1994; *F. fucaximeus* Jarret & Bousfield, 1994; *F. golfensis* Barnard & Barnard, 1982; *F. obtusidens* (Alderman, 1936); *F. potiguara* **sp. nov.**; *F. secasius* Barnard & Barnard, 1982; *F. similis* (Barnard, 1960); *F. slatteryi* Jarret & Bousfield, 1994; and *F. xiximeus* Barnard & Barnard, 1982.

***Foxiphalus potiguara* sp. nov.**
(Figs. 1-8)

Material examined: Holotype, 1 ♀, 8.3 mm, dissected and illustrated, BPOT Station MT54 R3, 168 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°44'43.15"W, 04°37'17.08"S (MOUFPE 15999). Allotype, 1 ♂, 8.6 mm, dissected and illustrated, BPOT Station MT54 R3, 168 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°44'43.15"W, 04°37'17.08"S (MOUFPE 20003). Paratypes: 1 ♀, 7.0 mm, dissected and illustrated, BPOT Station MT54 R2, 173 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°44'43.15"W, 04°37'17.08"S (MOUFPE 15962); 1 ♀, 3.8 mm, dissected and illustrated, BPOT Station MT53 R2, 156 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°34'28.76"W, 04°41'30.23"S (MOUFPE 20004); 1 ♀, 6.7 mm, in 70% ethanol, BPOT Station MT54 R1, 186 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°44'43.15"W, 04°37'17.08"S (MOUFPE 20005); 1 ♀, 6.3 mm, in 70% ethanol, BPOT Station MT54 R3, 168 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°44'43.15"W, 04°37'17.08"S (MOUFPE 20006).

Diagnosis: Eyes medium to large. Rostrum broad, unconstricted, slightly exceeding the article 2 of antenna 1. Antenna 2 article 4 with three facial rows of robust setae. Upper lip epistome rounded. Lower lip outer lobes with strong and acute shoulder cusps. Right mandible incisor with three teeth, *lacinia mobilis* bifid. Left mandible incisor with 3 teeth, *lacinia mobilis* with 4 teeth. Maxilliped inner plate with two apical robust setae; apex of palp article 3 slightly protuberant. Gnathopods 1-2 dissimilar; propodus with one robust seta with accessory seta near palmar corner; palm acute; dactylus with nail. Gnathopod 1 carpus and propodus about twice longer than wide. Gnathopod 2 carpus shortened, slightly longer than wide; propodus ovate. Pereopods 3-4 carpus posterior margin with distal long robust seta almost reaching the apex of propodus. Pereopod 4 coxa weakly excavat-

ed posterodorsally. Pereopod 5 basis tapering distally; merus, carpus, and propodus slender. Pereopod 6 basis broad. Pereopod 7 basis produced posteroventrally, posterior margin serrated. Epimeral plates 1-2 with few plumose setae and rounded corners. Epimeral plate 3 posterior margin weakly crenulated, bearing slender setae. Uropods 1-2 rami with few robust setae, embedded apical nails present. Uropod 1 peduncle with displaced robust seta present. Uropod 3 outer ramus article 2 bearing two plumose setae apically. Telson deeply cleft, each lobe with two dorsolateral plumose setae and one robust and one plumose seta apically.

Description of female: Based on female holotype, 8.3 mm (MOUFPE 15999).

Habitus as in Fig. 1A. **Head** (Fig. 2A, B) with medium and ovate eyes, rostrum broad and unconstricted, slightly exceeding the article 2 of antenna 1. **Antenna 1** (Fig. 2C) peduncle article 1 about 1.4× longer than wide, dorsal margin with a proximal set of setules, dorsal apex with three setae, ventral margin with seven plumose setae, being one more robust and displaced; article 2 about 0.4× the length of article 1, dorsal apex with two setae, ventral margin with eight pectinate setae medially, facial margin with four setae; article 3 short, ventral margin with 2 setae, facial margin with four plumose setae distally; primary flagellum 11-articulate; accessory flagellum 10-articulate. **Antenna 2** (Fig. 2D) articles 1-2 weakly ensiform, article 3 bearing one facial pectinate seta, article 4 facial robust setae formula: 4-4-3, dorsal margin with one robust setae and 2 pectinate medially, ventral margin with 3 plumose setae proximally, many pectinate setae and distally with two smooth robust setae, being one shorter and displaced, article 5 facial margin with a row 5 robust setae, dorsal apex with 3 plumose setae, ventral margin weakly setose with pectinate and plumose setae, bearing a distal row of four robust setae, extending to facial margin; flagellum 13-articulate.

Upper lip (Fig. 2E) with two sets of setules on the lower apex, epistome rounded. **Lower lip** (Fig. 2F) inner lobes naked, outer lobes with strong and acute shoulder cusps.

Mandibles (Fig. 3A-B) incisor with three teeth, *lacinia mobilis* bifid (right) and with four teeth (left), accessory setal row with eight robust multicuspidate setae and short plumose setae between them, molar as a hump with a triturative surface, with five robust setae, bearing a brush of setules, palpal hump small; palp 3-articulate, article 1 short, article 2 lateral margin with a brush of setules proximally and three setae medially, medial margin with four setae, article 3 with two setae, apex oblique, with 10 pectinate setae. **Maxilla 1** (Fig. 2G) inner plate with five apical plumose setae, lateral margin setulose; outer plate with 11 robust setae, being four serrate, six bifid and one more robust and smooth; palp 2-articulate, article 2 with four pectinate setae, medial margin with row of setules and two setae, apex with one robust seta. **Maxilla 2** (Fig. 2H) inner plate subequal to outer, with 11 plumose setae, lateral margin setulose; outer plate lateral margin with row of setules and four short apicolateral plumose setae, apex with eight bipectinate setae.

Maxilliped (Fig. 2I) inner plate with seven plumose setae and 2 apical robust setae; outer plate with medial margin with a row of nine papposerrate setae extending to apex, lateral margin with seven pappose setae extending to apex; palp article 2 with one apicolateral seta, medial margin weakly setose, article 3 lateral margin with one pectinate seta medially and three distally, medial and facial margins weakly setose, article 4 elongated, with accessory seta, nail present.

Gnathopod 1 (Fig. 4A) coxa subrectangular, ventral margin convex, with nine pectinate setae; basis weakly setose; ischium short and subrectangular, posterodistal

corner with three pectinate setae; merus subtriangular, posterior margin with four distal pectinate setae, facial margin with two setae; carpus about 2× longer than wide, anterior margin with one distal seta, posterior margin weakly setose, with pectinate setae; propodus about 1.9× longer than wide and 1.2× longer than carpus, weakly setose, posterior margin with one robust seta with accessory seta near palmar corner; palm acute, covered with short setae, palmar hump medium; dactylus reaching the palmar corner, nail present. **Gnathopod 2** (Fig. 4B) coxa subrectangular, ventral margin with 10 pectinate setae, basis weakly setose; ischium short and

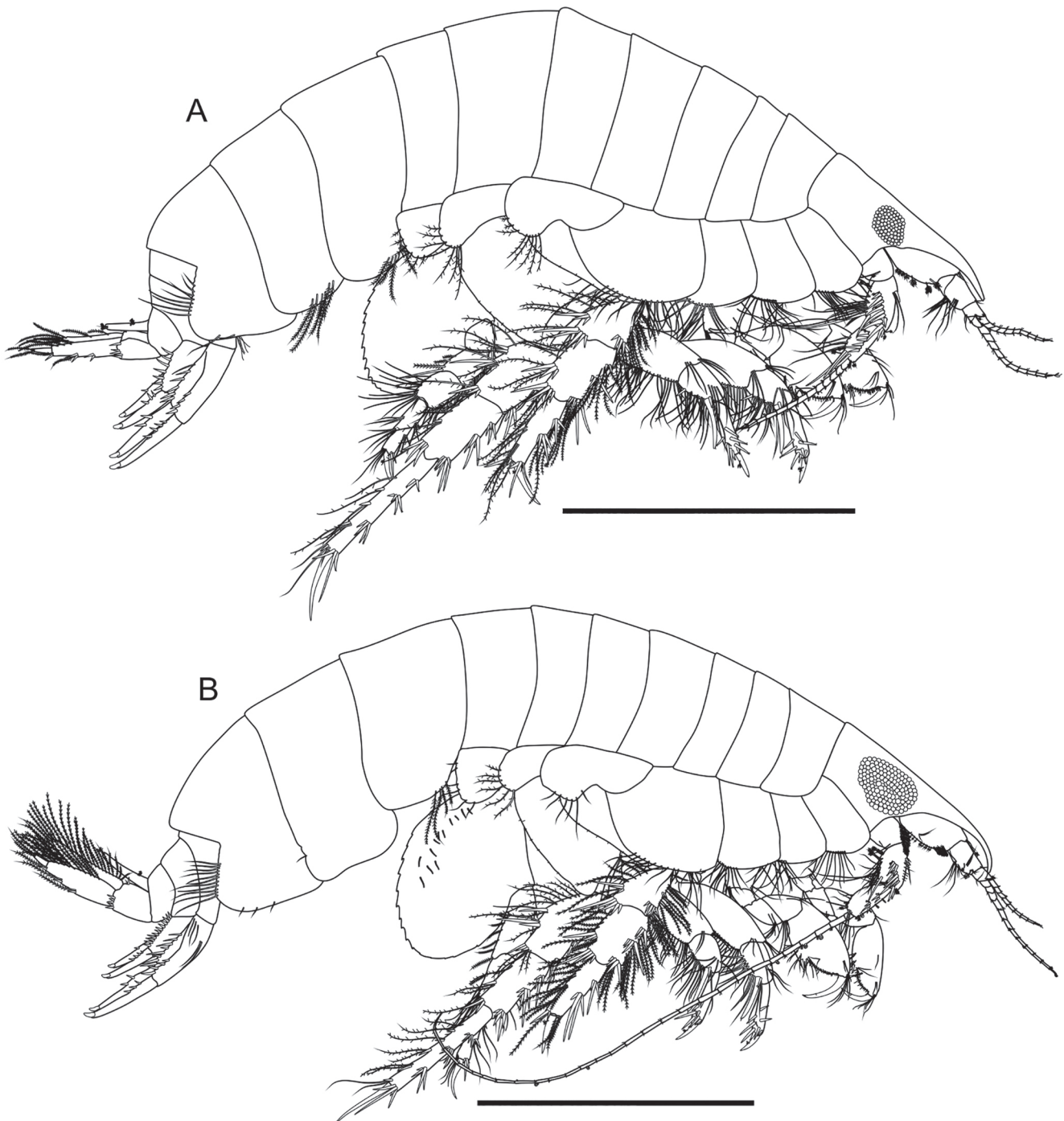


Figure 1. *Foxiphalus potiguara* sp. nov., female holotype, 8.3 mm (MOUFPE 15999). (A) habitus, lateral view. Male allotype, 8.6 mm (MOUFPE 20003). (B) habitus, lateral view. Scale bars: 2 mm.

subquadrate, posterodistal corner with three setae; merus posterior margin six setae, facial margin with two setae; carpus short, anterior margin with one distal seta; propodus ovate, weakly setose, about 1.5× longer than wide, posterior margin with one robust seta with accessory seta near palmar corner, palmar hump large; dactylus reaching the palmar corner, nail present. **Pereopod 3** (Fig. 4C) coxa subrectangular, ventral margin with nine pectinate setae; basis weakly setose, posterodistal corner with five pectinate setae; ischium short and subrectangular, posterodistal corner with five setae; merus about 2.6× longer than wide, anterior and facial margins with three distal pectinate setae each, posterior margin moderately; carpus facial margin with a row of four pectinate

setae, posterior margin moderately setose, distally with a short displaced robust seta with accessory seta, distal long robust seta almost reaching the apex of propodus; propodus with eight robust setae with accessory setae and one short seta; dactylus about 55% the length of propodus, bearing one short plumose seta medially, nail present. **Pereopod 4** (Fig. 4D) coxa posterior margin expanded, posterodorsal margin weakly excavated, ventral margin with 11 pectinate setae; remaining segments very similar to pereopod 3, differing only by some setae patterns. **Pereopod 5** (Fig. 5A) coxa bilobated, posterior lobe with eight posteroventral pappose setae; basis about 1.8× longer than wide, anterior margin with nine setae, anterodistal corner with five setae; ischium short

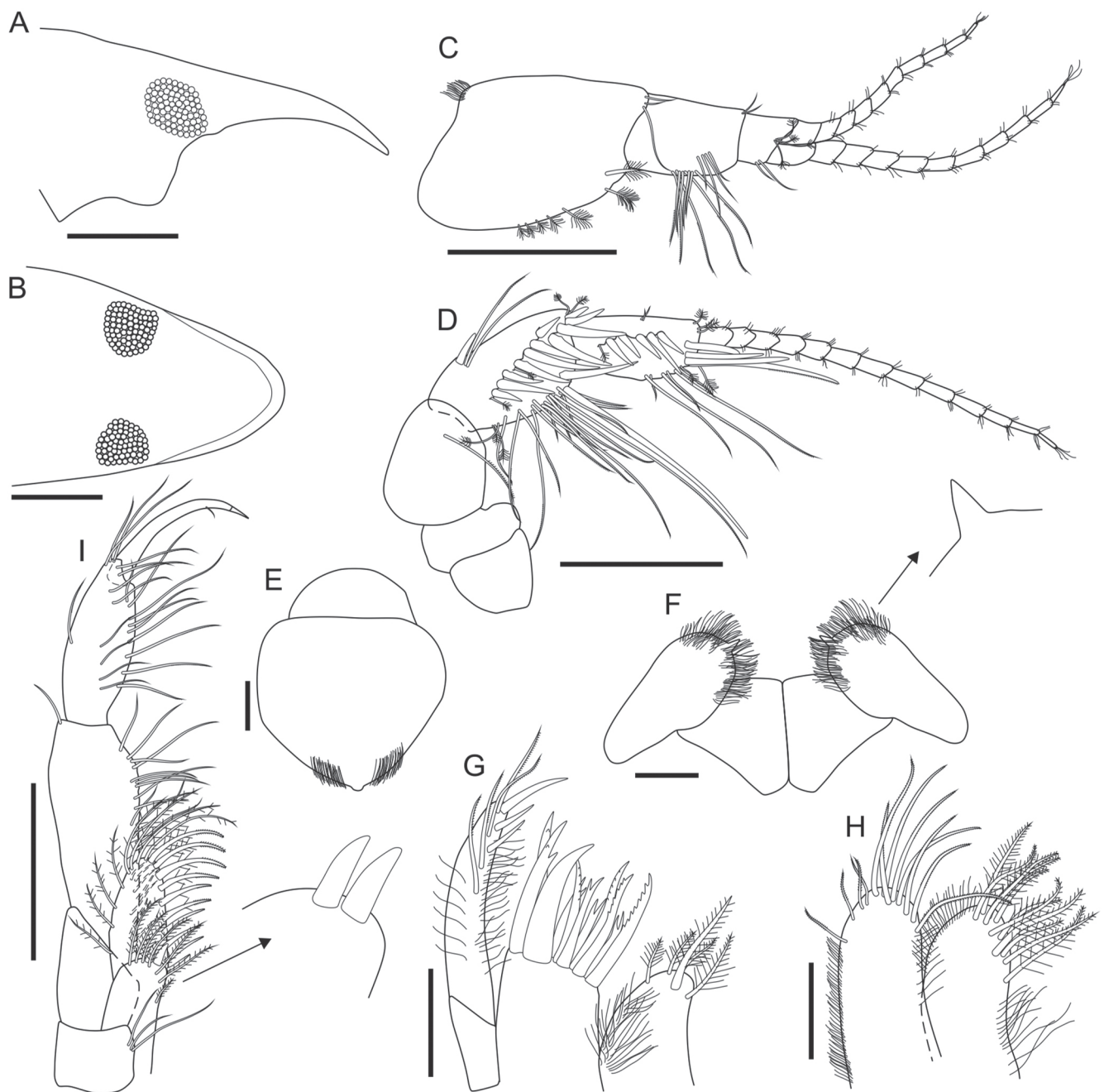


Figure 2. *Foxiphalus potiguara* sp. nov., female holotype, 8.3 mm (MOUFPE 15999). (A) head, lateral view; (B) head, dorsal view; (C) right antenna 1, lateral view; (D) right antenna 2, lateral view; (E) upper lip, dorsal view; (F) lower lip, ventral view; (G) right maxilla 1, dorsal view; (H) right maxilla 2, dorsal view; (I) right maxilliped, dorsal view. Scale bars: A-D = 0.5 mm; E-H = 0.1 mm; I = 0.3 mm.

and subrectangular, anterodistal corner with a row of five pectinate setae extending to facial margin; merus robust setae formula: 1-2-3-5-5, anterior margin with plumose setae, posterior margin with few pappose setae; carpus robust setae formula: 2-4-3-5-4, anterior and posterior margins with plumose and pappose setae respectively; propodus robust setae formula: 3-4-2-2; dactylus about 65% the length of propodus, bearing one proximal short plumose seta. **Pereopod 6** (Fig. 5B) coxa posteroventral margin with seven pappose setae; basis broad, about 1.2x longer than wide, anterior margin with three setae proximally, medially with five sets of pectinate setae, anterodistal corner with six pectinate setae; ischium short and subtriangular, anterodistal corner with five setae; merus anterior margin weakly setose, with 5 sets of robust setae: 1-2-3-2-3, posterior margin with pappose setae and three sets of robust setae: 2-3-3; carpus anterior

margin with three sets of robust setae: 4-5-7, posterior margin with few pappose setae, one robust seta medially and four distally; propodus anterior margin with four sets of robust setae: 2-4-4-3, posterior margin with few pappose setae and four robust setae; dactylus about 50% the length of propodus. **Pereopod 7** (Fig. 5C) coxa subrectangular, posterior margin with six pappose setae; basis slightly longer than wide, produced posteroventrally, posterior margin serrated, anterior margin with five setae proximally and three short robust setae medially, anterodistal corner with one robust seta; ischium subquadrate, anterodistal corner with three setae; merus anterior margin moderately setose, posterior margin with three plumose and one smooth setae; carpus anterior margin with few slender and robust setae, posterior margin with pectinate setae; propodus anterior and posterior margins with three sets of setae each; dactylus about 60%



Figure 3. *Foxiphalus potiguara* sp. nov., female holotype, 8.3 mm (MOUFPE 15999). (A) left mandible, mesial view; (B) right mandible, mesial view. Scale bars: 0.2 mm.

the length of propodus, bearing one proximal short plumose seta.

Epimeral plate 1 (Fig. 6A) anterior margin with two plumose setae, anteroventral corner with a row of three plumose setae extending to facial margin. **Epimeral plate 2** (Fig. 6B) anterior margin with two plumose setae, facial margin with a row of six plumose setae. **Epimeral plate 3** (Fig. 6C) anterior margin with two plumose setae, ventral margin with two setae, posterior margin weakly crenulated, with eight setae. **Urosomite 1** (Fig. 1A) bearing a ventral tuft of setae. **Uropod 1** (Fig. 6D) peduncle longer than rami, about 2.8× longer than wide, dorso-medial margin with one slender and five robust setae, dorsolateral margin with four robust setae, displaced robust setae present; both rami bearing one embedded apical nail; outer ramus slightly longer than inner, dorsal margin with four robust setae; inner ramus dorsal margin

with two robust setae. **Uropod 2** (Fig. 6E) peduncle longer than rami, about 2.1× longer than wide, dorsomedial corner with one robust seta, dorsolateral margin with seven robust setae; both rami bearing one embedded apical nail; outer ramus slightly longer than inner, dorsal margin with three robust setae; inner ramus dorsal margin with one robust seta. **Uropod 3** (Fig. 6F) peduncle about 1.5× longer than wide, dorsomedial margin with one robust and one short seta, dorsolateral margin with one distal robust seta, ventral margin with a distal row of four robust setae; outer ramus 1.4× longer than inner, article 1, ventrally with three sets of two robust and one plumose seta, dorsal margin with three plumose setae, article 2 about 0.3× the length of article 1, bearing two apical plumose setae, inner ramus about 0.6× the length of outer, with few plumose setae, being two placed apically. **Telson** (Fig. 6I) about 85% cleft, each lobe with two

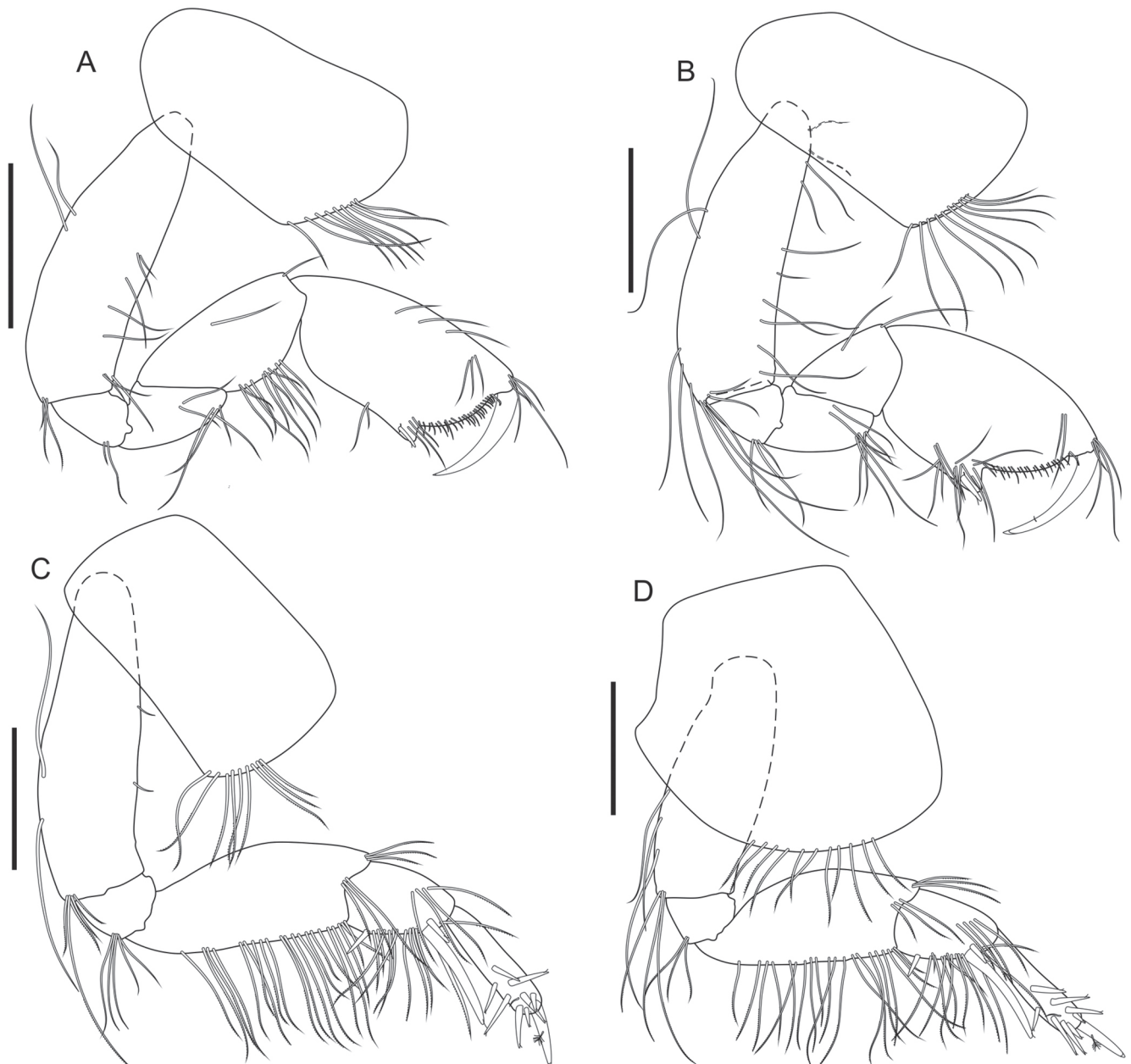


Figure 4. *Foxiphalus potiguara* sp. nov., female holotype, 8.3 mm (MOUFPE 15999). (A) right gnathopod 1, lateral view; (B) right gnathopod 2, lateral view; (C) right pereopod 3, lateral view; (D) right pereopod 4, lateral view. Scale bars: 0.5 mm.

dorsolateral plumose setae plus a short, one robust and one plumose seta apically.

Description of male: Based on male allotype, 8.6 mm (MOUFPE 20003).

Head (Fig. 7A-B) with large and ovate eyes, rostrum broad and unstricted, slightly exceeding the article 2 of antenna 1. **Antenna 1** (Fig. 7C) peduncle article 1 dorsal apex with one plumose and two smooth setae, ventral margin with 13 plumose setae and a distal row of setules; article 2 dorsal apex with two setae, ventral margin with eight pectinate setae, facial margin with two plumose and five pectinate setae, article 3 ventral margin with two setae, facial margin with four setae, being two plumose; primary flagellum 12-articulate; accessory flagellum 9-articulate. **Antenna 2** (Fig. 7D) peduncle ar-

ticle 3 bearing one long and one short facial seta, dorsal margin with a row of setules; article 4 facial robust setae formula: 3-4-3, dorsal margin with one robust, one long and eight smooth setae medially, proximally and distally with sets of setules, ventral margin with five plumose setae proximally and pectinate setae medially, distally with one displaced robust long seta; article 5 facial robust setae formula: 3-2, dorsal margin with four brushes of setules and one distal calceolous, ventral margin with few slender and plumose setae, facial margin with two distal robust setae; flagellum 28-articulate, with five calceoli.

Gnathopod 1 (Fig. 7E) coxa weakly expanded distally, ventral margin convex, with 11 setae; basis weakly setose, ischium short and subrectangular; merus posterior and facial margins with three and one pectinate setae respectively; carpus anterior margin with one distal seta,

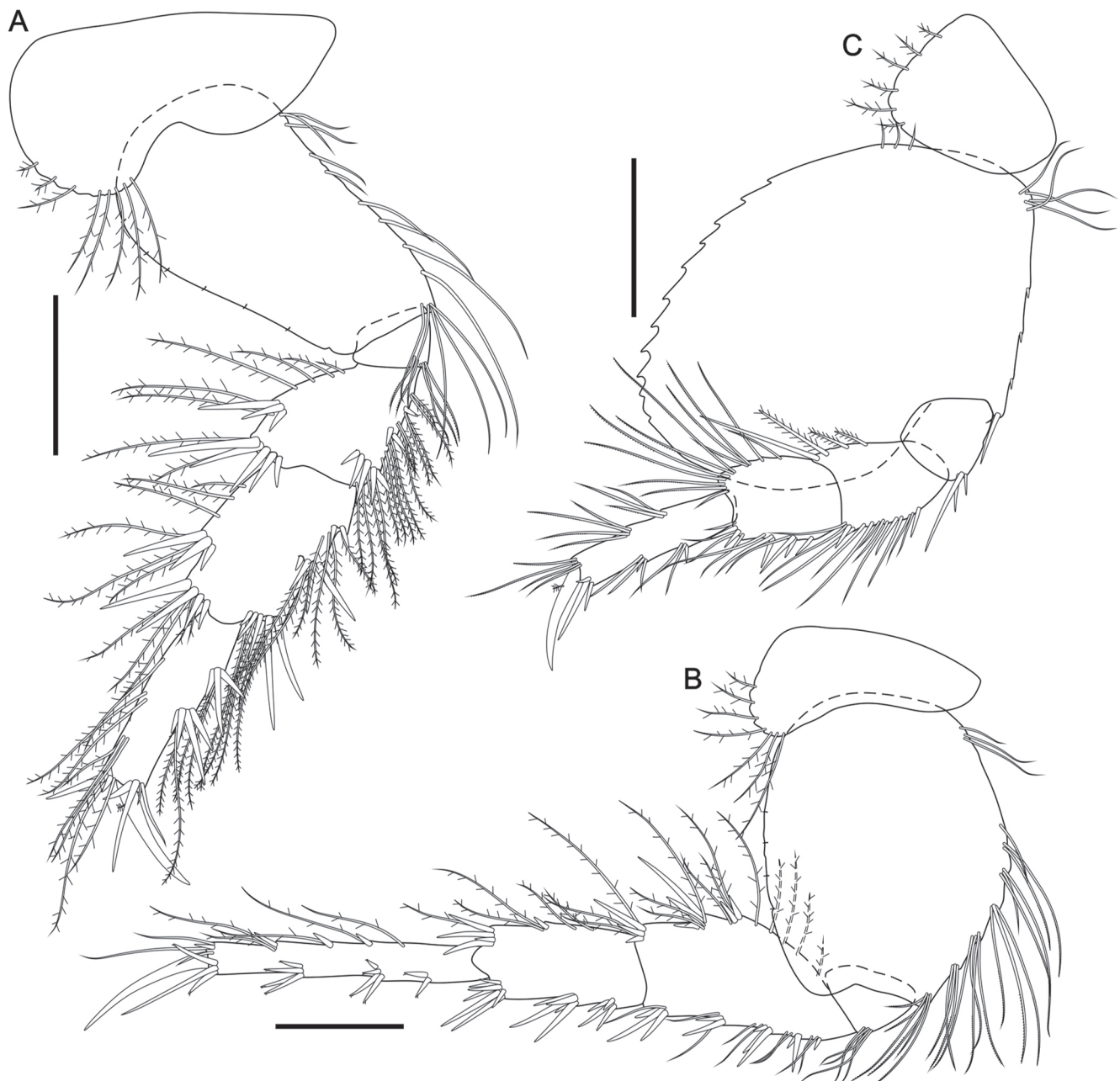


Figure 5. *Foxiphalus potiguara* sp. nov., female holotype, 8.3 mm (MOUFPE 15999). (A) right pereopod 5, lateral view; (B) right pereopod 6, lateral view; (C) right pereopod 7, lateral view. Scale bars: 0.5 mm.

posterior margin with nine pectinate setae; propodus about 2.5× longer than wide and 1.3× longer than carpus, weakly setose, posterior margin with one robust seta with accessory seta near palmar corner; palm acute, covered with short setae, palmar hump medium; dactylus reaching the palmar corner, nail present. **Gnathopod 2** (Fig. 8A) coxa subrectangular, ventral margin with nine setae; other segments weakly setose and very similar to gnathopod 1; propodus ovate, weakly setose, about 1.8× longer than wide, posterior margin with one robust seta with accessory seta near palmar corner, palmar hump large; dactylus exceeding the palmar corner, nail present. **Pereopod 7** (Fig. 8B) coxa subtriangular, posterior margin with six setae; basis 1.3× longer than wide, posterior margin weakly serrated, facial margin with few short se-

tae; carpus copulatory spines subequal, proximally serrated, strongly tapering distally.

Epimeral plate 1 (Fig. 8C) anteroventral corner with a row of four plumose setae, increasing in length, ventral margin almost straight, posterior margin convex.

Epimeral plate 2 (Fig. 8D) anterior margin with seven setae, anteroventral corner weakly expanded, ventral margin with a shallow concavity, posterior margin with two notches, one of them bearing one seta.

Epimeral plate 3 (Fig. 8E) anterior margin with seven short setae, ventral margin with three setae, posterior margin with 11 pectinate setae. **Uropod 3** (Fig. 8F) peduncle ventral margin with five distal robust setae, dorsal margin with one short and one robust seta; outer ramus slightly longer than inner, article 1 ventral margin with three sets of one ro-

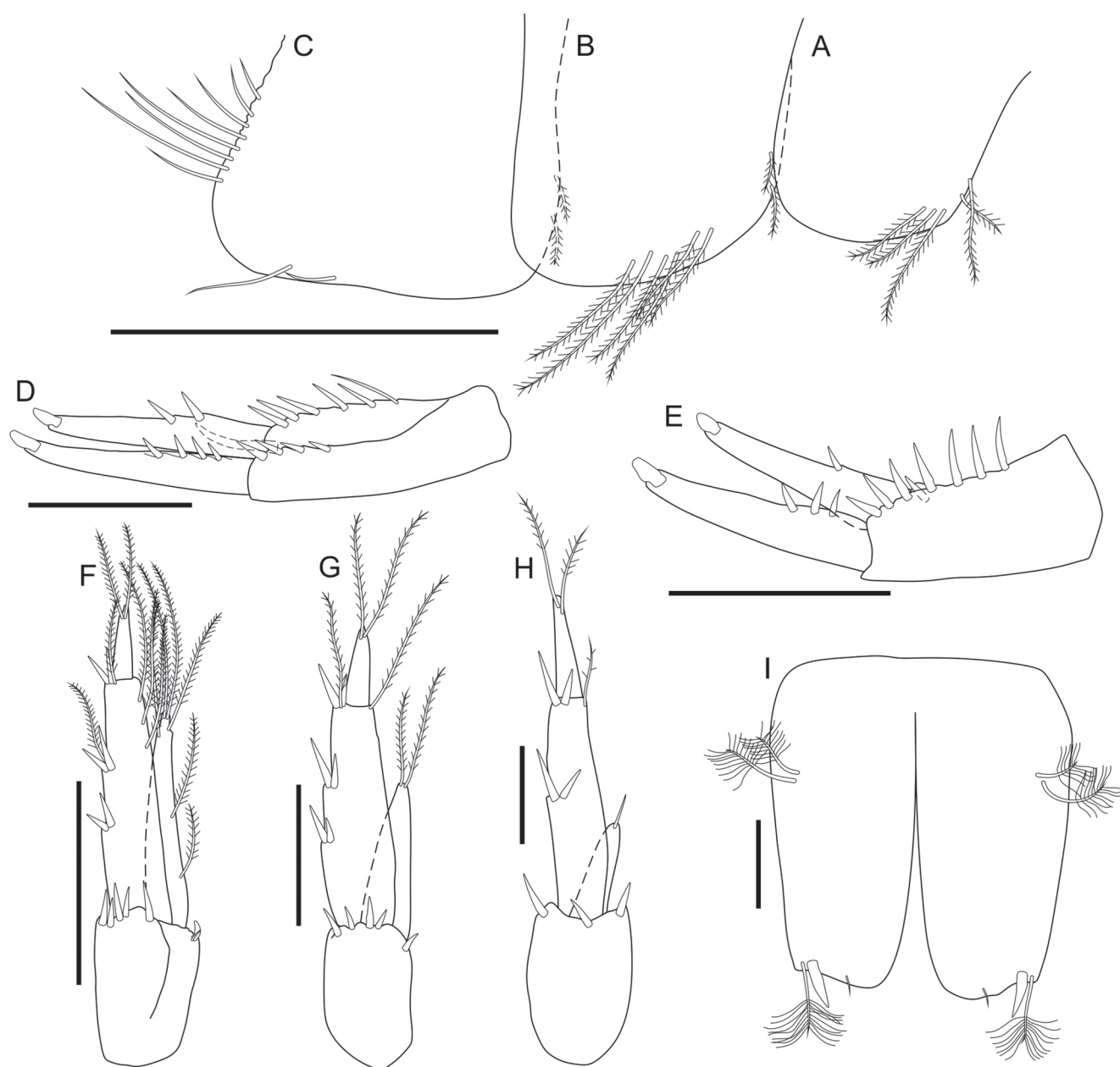


Figure 6. *Foxiphalus potiguara* sp. nov., female holotype, 8.3 mm (MOUFPE 15999). (A) epimeral plate 1, lateral view; (B) epimeral plate 2, lateral view; (C) epimeral plate 3, lateral view; (D) right uropod 1, lateral view; (E) right uropod 2, lateral view; (F) right uropod 3, lateral view; (I) telson, dorsal view. Female paratype, 7 mm (MOUFPE 15962). (G) right uropod 3, lateral view. Female paratype, 3.8 mm (MOUFPE 20004). (H) right uropod 3, lateral view. Scale bars: A-C = 1 mm; D-F = 0.5 mm; G = 0.3 mm; H-I = 0.1 mm.

bust and one long plumose seta, dorsally covered with plumose setae, article 2 about 0.2× the length of article 1, bearing two apical plumose setae, inner ramus strongly setose with plumose setae, with two apical plumose setae.

Etymology: The specific epithet is given after the Potiguar Basin, type-locality of the new species. This name is derived from an indigenous Tupi word “poti’war” or “potiguar” that means “the one who eats shrimp”. The epithet is used as a noun in apposition.

Type locality: Continental slope of Rio Grande do Norte state, Brazil (36°44'43.15"W, 04°37'17.08"S).

Distribution and bathymetric range: The species is found off the coast of the state of Rio Grande do Norte, from 156 to 186 m depth (Fig. 9).

Remarks: Among the species of the genus, *Foxiphalus potiguara* **sp. nov.** is most morphologically similar to *F. similis* due to characters such as: lower lip outer lobes with strong shoulder cusps; mandible right and left incisors with three teeth, molar with five robust setae; maxilliped palp with slender nail; pereopod 5 merus and carpus narrow; uropod 1 peduncle with strong displaced robust setae; telson without dorsolateral robust setae. However, the new species can be distinguished by *F. similis* by the following (characters of *F. similis* in parenthesis): maxilla 1 inner plate with five apical setae (three to four apical setae); mandible molar as a hump with a tritulative surface (as a hump, non-tritulative); maxilliped inner plate with two apical robust setae (one apical robust seta); pereopod 5 basis narrow, tapering distally (broad, not tapering); male copulatory spine without distal setules (distally setulose); urosomite 1 of female with ventral tuft of

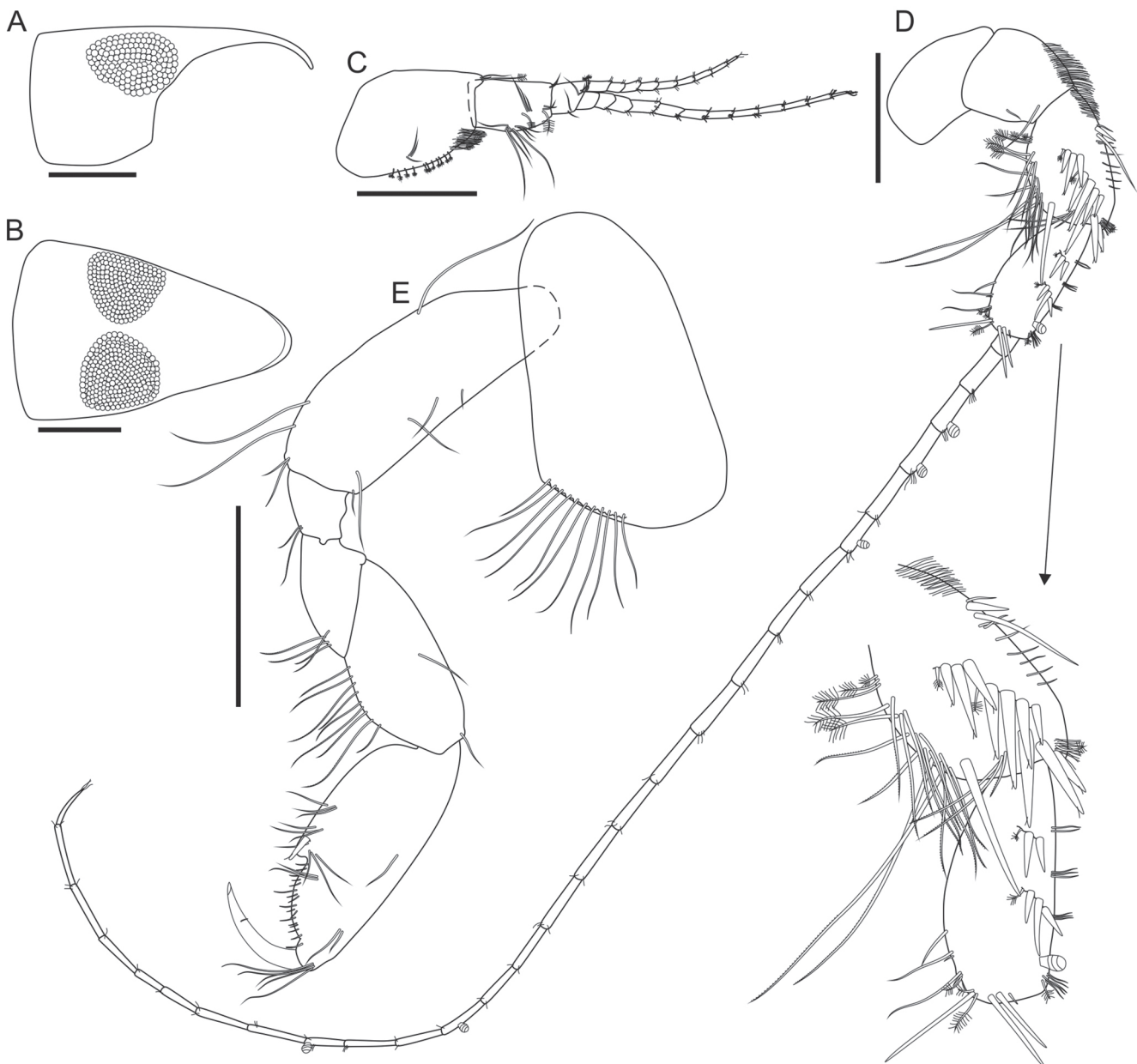


Figure 7. *Foxiphalus potiguara* **sp. nov.**, male allotype, 8.6 mm (MOUFPE 20003). (A) head, lateral view; (B) head, dorsal view; (C) right antenna 1, lateral view; (D) right antenna 2, dorsal view; (E) right gnathopod 1, dorsal view. Scale bars: 0.5 mm.

setae (without); telson with each lobe bearing one apical robust seta (two robust setae).

Furthermore, *F. potiguara* **sp. nov.**, presents the longer rostrum within the genus, slightly exceeding the apex of the second article of antenna 1, whereas the other species have it only reaching the apex of this article. In addition, *F. potiguara* **sp. nov.** has the largest discrepancy between gnathopods 1-2 among its congeners, being the second gnathopod stronger than the first. The new species also shares with only another species (*F. aleuti*) the presence of two apical robust setae on the inner plate of maxilliped. Thus *F. potiguara* **sp. nov.** can be distinguished by the latter by presenting: mandibular molar with less robust setae; gnathopods 1-2 with more

shortened carpus and stronger propodus; pereopod 3 carpus posterior margin with longer distal long robust seta; uropod 3 outer ramus articles 1 and 2 longer in relation to the peduncle; telson lobes presenting only one apical robust seta.

It is important to highlight that during the analysis of the material, subtle and expected differences were found among the female individuals. However, it was possible to notice an interesting contrast between the inner and outer rami of the third uropod in relation to each individual's length, and consequently reflecting maturity stage. The smallest individual (female paratype MOUFPE 20004) presents a less setose uropod 3 (Fig. 6H), very short inner ramus on uropod 3 with one apical slender seta, about

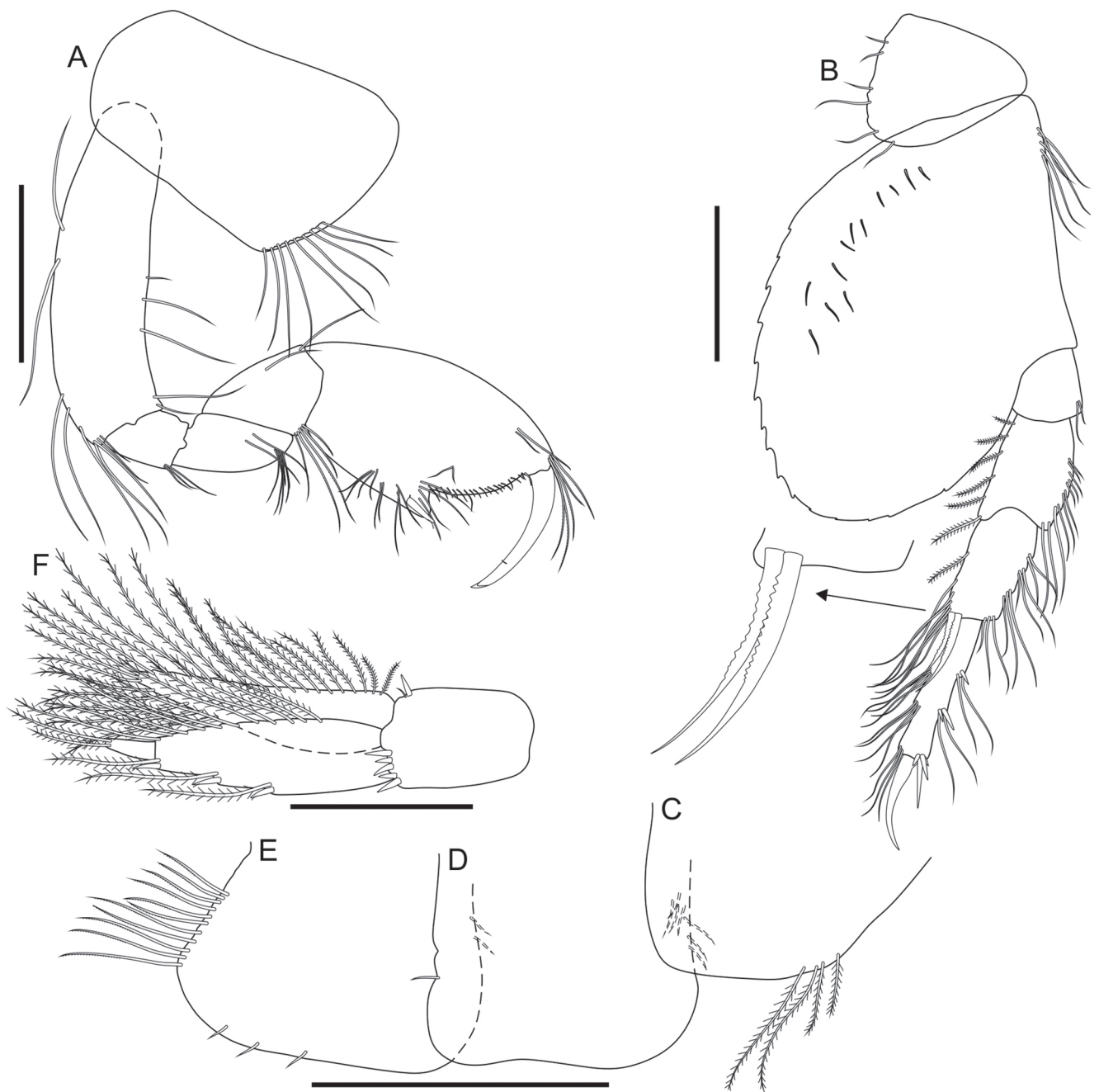


Figure 8. *Foxiphalus potiguara* **sp. nov.**, male allotype, 8.6 mm (MOUFPE 20003). (A) right gnathopod 2, lateral view; (B) right pereopod 7, lateral view; (C) epimeral plate 1, lateral view; (D) epimeral plate 2, lateral view; (E) epimeral plate 3, lateral view; (F) right uropod 3, lateral view. Scale bars: A-B and F = 0.5 mm; C-E = 1.0 mm.

0.3× the length of outer, and article 2 of outer ramus about 0.4× the length of article 1. A medium-sized individual (female paratype MOUFPE 15962) presents uropod 3 (Fig. 6G) more setose than the smaller one, with inner ramus about 0.4× the length of outer, bearing two apical plumose setae and article 2 of outer ramus about 0.3× the length of article 1. Whereas the bigger individual (female holotype MOUFPE 15999) presents a fully developed inner ramus on uropod 3 (Fig. 6F), reaching 0.6× the length of outer, bearing two apical plumose setae and article 2 of outer ramus about 0.3× the length of article 1.

Key to world species of *Foxiphalus*

1. Maxilliped inner plate with two apical robust seta 2
- Maxilliped inner plate with one apical robust setae 3
2. Telson lobes with one apical robust seta *Foxiphalus potiguara* sp. nov.
- Telson lobes with two apical robust setae
..... *F. aleuti* Barnard & Barnard, 1982
3. Right mandible lacinia mobilis simple or absent 4
- Right mandible lacinia mobilis bifid 8
4. Epimeral plate 3 posteroventral corner rounded 5
- Epimeral plate 3 posteroventral corner produced 6
5. Rostrum reaching to the apex of article 2 of antenna
..... *F. slatteryi* Jarret & Bousfield, 1994
- Rostrum reaching to the middle of article 2 of antenna 1
..... *F. cognatus* (Barnard, 1960)
6. Epimeral plate 3 posteroventral corner bluntly produced
..... *F. fucaximeus* Jarret & Bousfield, 1994
- Epimeral plate 3 posteroventral corner sharply produced 7
7. Upper lip epistome rounded-falcate, without cusp
..... *F. xiximeus* Barnard & Barnard, 1982
- Upper lip epistome acute and strongly produced ... *F. similis* (Barnard, 1960)
8. Left mandible lacinia mobilis falciform
..... *F. falciformis* Jarret & Bousfield, 1994
- Left mandible lacinia mobilis regularly bifid 9
9. Uropod 1 peduncle with distal displaced robust seta 10
- Uropod 1 peduncle without distal displaced robust seta 11
10. Uropod 1 peduncle with a weak displaced robust seta
..... *F. apache* Barnard & Barnard, 1982
- Uropod 1 peduncle with an enlarged displaced robust seta
..... *F. obtusidens* (Alderman, 1936)
11. Epimeral plates 2 and 3 posterior margin weakly concave
..... *F. golfensis* Barnard & Barnard, 1982
- Epimeral plates 2 and 3 posterior margin straight
..... *F. secasius* Barnard & Barnard, 1982

Genus *Metharpinia* Schellenberg, 1931

Metharpinia dentiurosoma Alonso de Pina, 2003

Metharpinia dentiurosoma Alonso de Pina, 2003: 2523, figs. 1-7. López-Gappa et al., 2006: 16, 52. Alonso & Chiesa, 2014: 206, 207, 209, fig. 3C, E-I. Andrade et al., 2015: 39. Andrade & Senna, 2020a: 2, figs. 1-6.

Material examined: 1 ♀, in 70% ethanol, BPOT Station MT52 R2, 145 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°25'8.77"W, 04°44'59.22"S (MOUFPE 15998); 1 ♀,

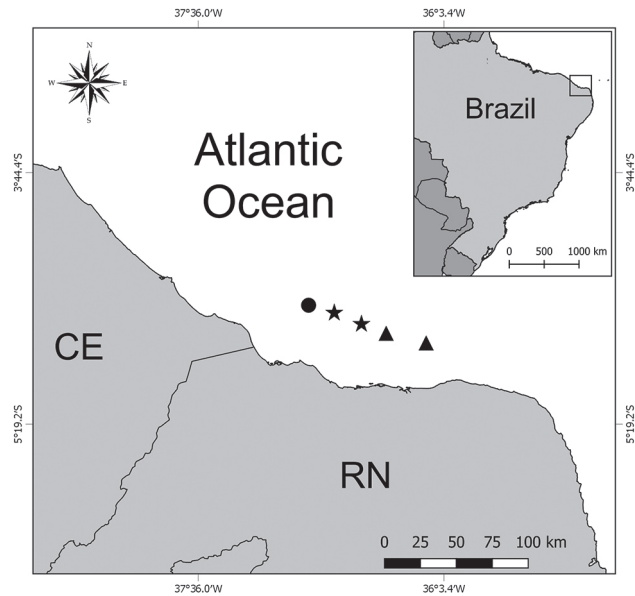


Figure 9. Distribution of *Foxiphalus potiguara* sp. nov., *Heterophoxus shoemakeri* Andrade & Senna, 2020 and *Metharpinia dentiurosoma* Alonso de Pina, 2003 in the present study. Circle: record for *H. shoemakeri*; Star = records for *F. potiguara* sp. nov. and *M. dentiurosoma*; Triangle = records for *M. dentiurosoma*.

in 70% ethanol, BPOT Station MT54 R3, 168 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°44'43.15"W, 04°37'17.08"S (MOUFPE 15947); 1 ♀, in 70% ethanol, BPOT Station MT51 R3, 147 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°10'03.52"W, 04°48'37.71"S (MOUFPE 20008); 1 ♀, in 70% ethanol, BPOT Station MT54 R2, 173 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°44'43.15"W, 04°37'17.08"S (MOUFPE 20009); 2 ♀♀, in 70% ethanol, BPOT Station MT54 R2, 173 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°44'43.15"W, 04°37'17.08"S (MOUFPE 20010); 1 ♀, in 70% ethanol, BPOT Station MT53 R1, 135 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°34'28.76"W, 04°41'30.23"S (MOUFPE 20011); 4 ♀♀, in ethanol 70%, BPOT Station MT52 R1, 151 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°25'8.77"W, 04°44'59.22"S (MOUFPE 20012); 1 ♀, in 70% ethanol, BPOT Station MT53 R2, 156 m depth, 2011, state of Rio Grande do Norte, Brazil, 36°34'28.76"W, 04°41'30.23"S (MOUFPE 20013).

Distribution and bathymetric range: This species was previously described with type-material from the coast of Buenos Aires, Argentina, at depths between 14 and 21 meters. Later, the species was found on samples off the coast of the Brazilian states of Rio de Janeiro, São Paulo and Santa Catarina ranging from 28 to 72 m depth. Here we report it for the continental slope of the state of Rio Grande do Norte at depths ranging from 135 to 173 meters.

Remarks: This species was recently redescribed with material from the coasts of the Brazilian states of Rio de Janeiro, São Paulo and Santa Catarina. The individuals found here agree with its original description although expected differences are observed such as setation due to maturity stages. This is the deepest and northernmost record of the species and its first record to northeastern Brazil.

CONCLUSION

So far, the genus *Foxiphalus* had only been recorded mostly for shallow cold waters and deep sea in the Pacific Ocean, and despite the new finding reported here is in a warm tropical zone, the new species was found only in the continental slope. Thus, considering the past and new records of *Foxiphalus*, we can hypothesize that the genus has a wide bathymetric range, but more adapted to cold waters, even in the southern hemisphere.

The species *H. shoemakeri* and *M. dentiurosoma* have been previously recorded from southwestern Atlantic and in this study, we extend their distribution approximately 2.040 km towards north, and increase their depth range to 283 and 173 meters, respectively (Fig. 9). Accounting the latest findings regarding the phoxocephalids reported from Brazil it is expected that both species might also be found along the whole Brazilian coast.

The diversity of Phoxocephalidae in northeastern Brazilian waters is poorly known and the new species described here points out this evidence. We consider that new samplings and further taxonomical efforts combined with molecular studies must be applied as appropriate tools in order to fill these gaps in the marine Brazilian biodiversity.

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CONFLICTS OF INTEREST: Authors declare there are no conflicts of interest.

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