

A New Species of Amphipod *Pariphinotus* Kunkel, 1910 (Amphipoda: Phliantidae) from the Southwestern Atlantic

André R. Senna^{1,*} , Urssula N. Guedes² , Luiz F. Andrade³ , and Guilherme H. Pereira-Filho⁴ 

¹Universidade do Estado do Rio de Janeiro (UERJ), Faculdade de Formação de Professores (FFP), Departamento de Ciências (DCIEN). Rua Dr. Francisco Portela, 1470, Patronato, São Gonçalo, RJ, CEP 24435-005, Brasil.

*Correspondence: E-mail: senna.carcinologia@gmail.com (Senna)

²Universidade Federal Rural do Rio de Janeiro, Programa de Pós-graduação em Biologia Animal. Decanato de Pesquisa e Pós-Graduação, UFRRJ, Rod. BR 465, Km 7, Seropédica, RJ, CEP 23890-000, Brasil. E-mail: urssula.guedes@gmail.com (Guedes)

³Museu de Oceanografia da Universidade Federal de Pernambuco (UFPE), Laboratório de Carcinologia. Av. Arquitetura, s/n, Cidade Universitária, Recife, PE, CEP 50740-550, Brasil. E-mail: lzflp.andrade@hotmail.com (Andrade)

⁴Universidade Federal de São Paulo, Instituto do Mar, Laboratório de Ecologia e Conservação Marinha. Rua Doutor Carvalho de Mendonça, 144, Encruzilhada, Santos, SP, CEP 11070-100, Brasil. E-mail: pereira.filho@unifesp.br (Pereira-Filho)

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The genus *Pariphinotus* Kunkel, 1910 comprises a total of six species around the world, with circumtropical and subtropical distribution, commonly occurring in shallow waters, in soft bottoms and algae, including a previous record of *P. seclusus* (Shoemaker, 1933) from Brazil. Material examined was collected by SCUBA diving, from rhodolith beds, 12 meters deep, at the Fernando de Noronha Archipelago, off the northeastern Brazilian coast. The new Brazilian species described here can be diagnosed by a unique combination of character states present in other species of the genus. However, it has two exclusive characteristics, distinguishing it from the group: medial apex of pleopod 3 peduncle with two small hook setae, and uropod 1 peduncle not exceeding the apex of telson.

Key words: Crustacea, Taxonomy, Identification key, Fernando de Noronha Archipelago, Brazil.

BACKGROUND

Amphipods are characterized by having antennal glands but absent in the maxilla; epipods absent in the maxilliped; thoracopodal epipodal gills; oostegite in pereopod 1 absent; pleopods with ringed rami and without sexual dimorphism; three pairs of uropods, uropod 3 often with two rami; telson not fused to pleonite; ventral embryonic flexion; lateral coxal plates; and dorsal cecum (Poore 2005). Among them, species of the family Phliantidae Stebbing, 1899 are dorsoventrally flattened due to their laterally splayed coxal plates and appendages (Coleman and Lowry 2012). They are marine, epigeal, widespread in both hemispheres, and presents mandible molar non-tritulative or with tiny

tritulating patch, palp absent, maxilla 1 basal endite apically setose, palp absent, and coxa 4 with well-developed posteroventral lobe (Lowry and Myers 2013).

Phliantidae comprises seven genera and 32 species worldwide (Horton et al. 2021): *Gabophtias* J.L. Barnard, 1972 (three species); *Iphinotus* Stebbing, 1899 (two species); *Iphiplateia* Stebbing, 1899 (five species); *Pariphinotus* Kunkel, 1910 (six species); *Pereionotus* Spence Bate & Westwood, 1861 (11 species); *Phlias* Guérin, 1836 (one species); and *Quasimodia* J.L. Barnard, 1969 (four species). Species in this family have unusual characters for Amphipoda, such as a dorsoventrally depressed body with dorsal keels, somewhat like isopods (Coleman 2009). Hitherto, there is only one species of Phliantidae from the Southwestern

Atlantic, *Pariphinotus seclusus* (Shoemaker, 1933), recorded by Wakabara and Leite (1977) from the coast of Bahia and Espírito Santo states. However, the specimens described by the authors have remarkable differences from the original description of the species, known from Tortugas, Florida. For comparison purposes, we will refer to this record as *P. seclusus* (*sensu* Wakabara and Leite 1977). Unfortunately, this material is currently lost (Serejo and Siqueira 2018).

The genus *Pariphinotus* was erected by Kunkel (1910), with a description of a species from Bermuda Islands, and re-diagnosed by Lazo-Wasem et al. (1989), presenting conical mandibular molar with a large apical stout seta, lower lip with inner lobes, maxilla 1 lacking palp, maxilliped palp 4-articulate, gnathopods 1–2 simple, pleopod 3 with inner ramus one-half length of outer ramus, and uropod 3 lacking rami. So far, it comprises a total of 6 species around the world, with circumtropical and subtropical distribution, commonly occurring in shallow waters, associated with soft bottoms and algae.

In this paper we describe a new species of *Pariphinotus* from the Fernando de Noronha Archipelago, off the northeastern coast of Brazil, associated with rhodolith beds. In addition, we present an overview of the genus, including a discussion of the validity of prior record of *P. seclusus* from Brazil. An identification key to world species of *Pariphinotus* is also provided.

MATERIALS AND METHODS

The material examined was collected by SCUBA diving from rhodolith beds in Ressureta Channel, 10–15 m deep, located between the Meio and Rata islands, in the Fernando de Noronha Archipelago, Pernambuco state, Brazil (03°49'2.51"S, 32°23'34.10"W). The Fernando de Noronha Archipelago includes 21 islands located about 350 km from off the Brazilian northeastern coast. The archipelago is under the influence of the west-flowing Equatorial Current, with warm (~26°C) and saline waters (~36/00). Rhodolith beds represent the main habitats of insular shelves of the archipelago 10–100 m depth, with soft bottoms nearshore (Amado-Filho et al. 2012; Veras et al. 2020). Samples were collected using a bag with 0.5 mm mesh, at a depth of 12 meters. The specimens (one male and one female) were stored in vials containing 70% ethanol and are housed in the Crustacea Collections of Universidade do Estado do Rio de Janeiro (UERJ) and Universidade Federal da Bahia (UFBA). Appendages and mouthparts were dissected and mounted on glass slides with glycerin jelly. Drawings were made under optic microscope (Motic BA-310) with camera lucida, and digitally prepared

with CorelDRAW 2018. The setal/spine classification adopted in this paper follows Garm and Watling (2013). Nomenclature of the gnathopod palm is based on Poore and Lowry (1997). A distributional map was prepared with QGIS 3.2.1.

RESULTS

TAXONOMY

Order Amphipoda Latreille, 1816
Suborder Senticaudata Lowry and Myers, 2013
Family Phliantidae Stebbing, 1899
Genus *Pariphinotus* Kunkel, 1910

Diagnosis: See Lazo-Wasem et al. (1989: 4).

Composition of the genus: The genus *Pariphinotus* comprises seven species: *P. amadoi* sp. nov.; *P. escabrosus* (Barnard, 1962); *P. galapagoanus* (Barnard, 1979); *P. lepas* (Hirayama, 1987); *P. seclusus* (Shoemaker, 1933); *P. seticoxa* (Ortiz, 1976); and *P. tuckeri* Kunkel, 1910.

Type-species: *Pariphinotus tuckeri* Kunkel, 1910.

***Pariphinotus amadoi* sp. nov.**

(Figs. 1–4)

urn:lsid:zoobank.org:act:335599A6-A193-4611-8EE7-275CD2D14BEE

Material examined: Holotype: male, 2.5 mm, dissected and drawn, from rhodolith beds, Ressureta Chanel, between Meio and Rata Islands, Fernando de Noronha Archipelago, Pernambuco state, Brazil, 3°49'2.51"S, 32°23'34.10"W, 12 m depth, Pereira-Filho, G.H. col., September 2012 (UERJ 543). Paratype: one female, in ethanol 70%, same sampling data (UFBA 2280).

Etymology: The epithet '*amadoi*' is attributed to this species in honour of Dr. Gilberto M. Amado-Filho (in memoriam), who dedicated part of his career revealing the importance of the Southwestern Atlantic rhodolith beds. At the beginning of 2000's, during a field trip to sample Brazilian kelps, Dr. Amado-Filho was impressed about the extension of the rhodolith beds in which those algae were attached. Thereafter, he devoted his scientific knowledge to reveal the extensiveness and high biodiversity associated with these habitats. He never forgot the importance of sharing his knowledge of rhodoliths with non-scientists and thus left us a legacy to marine biodiversity conservation.

Diagnosis: The new species can be diagnosed by combining the following characters (character in “ ” is an exclusive state within the genus): Rostrum elongate and apically truncate. Antenna 1 peduncle, lobe of

first article shorter than articular body, subtriangular, apically round. Pereopods 3–7 dactylus, apically plumose seta present. Pereopod 6 basis, posterior lobe subquadrate, posteroventral lobe absent. Pereopod 7 basis, posterior lobe subrectangular, with slight distal indentation. “Pleopod 3 medial apex of peduncle with 2 small hook setae. Uropod 1 peduncle not exceeding the distal margin of telson”; rami subapical nail present, outer ramus, outer margin with 1 seta. Uropod 2 rami with row of tubercles present.

Description: Based on holotype (UERJ 543). Body dorsoventrally depressed, dorsal keels present from pereonite 1 to pleonite 1. Head small, rostrum well developed, apically truncate, dorsal margin with proximal concavity. Antenna 1 peduncle, first article about $1.2 \times$ wider than long, medial lobe shorter than articular body, subtriangular, apically round, with three subapical slender setae, second article about as long as wide, medial lobe subtriangular, slender, apically subacute, with two subapical slender setae, third article subrectangular, slightly longer than wide; flagellum 4-articulate, first article about $1.5 \times$ longer than wide, subrectangular, bearing group of seven slender setae medially on lateral margin and a group of four slender setae laterodistally, second article short, about $1.7 \times$ wider than long, bearing five facial slender setae, third article about $2.4 \times$ longer than wide, tapering distally, fourth article minute, with two apical long slender setae; accessory flagellum absent. Antenna 2 slender, peduncle, third article enlarged, about $1.6 \times$ longer than wide, ventral margin with one distal slender seta, fourth article slender, about $3.4 \times$ longer than wide, with two slender setae dorsodistally and three slender setae ventrally, fifth article subrectangular, about $2.6 \times$ longer than wide, with one slender seta dorsodistally and three slender setae ventrally; flagellum 2-articulate, first article short, about twice longer than wide, with two subdistal slender setae, second article minute, with three long apical slender setae. Mandible without palp; molar as a slender projection with one apical slender seta; incisor 4-cuspidate. Maxilla 1 inner plate reduced; outer plate $1.4 \times$ longer than wide, with five apical multi-cuspidate stout setae. Maxilla 2 stout, inner and outer plates almost completely coalescent, inner plate $1.9 \times$ wider than outer plate, bearing three apical plumose stout setae. Maxilliped inner plate slender and subrectangular, bearing four apical stout setae; outer plate distally round, reaching half of palp second article, medial margin setose; palp slender, 4-articulate, first article about twice longer than wide, second article about $1.7 \times$ longer than wide, medial margin bearing four pectinate setae, third article subequal in length to second article, about $1.7 \times$ longer than wide, suboval, bearing nine pectinate setae medially, fourth article

unguiform, about $2.4 \times$ longer than wide, bearing one apical simple seta.

Pereon: Gnathopod 1 simple, coxa about $1.5 \times$ longer than wide, anterior margin concave, anteroventral corner produced and round, ventral margin with submarginal small setae; basis $2.5 \times$ longer than wide, anterior margin with one medial slender seta; ischium subrectangular, about $1.6 \times$ longer than wide, naked; merus subtriangular, about $1.7 \times$ longer than wide, posterior margin convex, bearing two distal slender setae; carpus about $1.4 \times$ longer than wide, distally enlarged, anterodistal corner slightly produced, bearing two pectinate and one simple stout setae, posterior margin with two slender setae; propodus subrectangular, about $2.3 \times$ longer than wide, anterior margin with one medial slender seta, bearing one pectinate stout seta and four simple slender setae distally, posterior margin with two medial slender setae, bearing one stout and four slender setae distally; dactylus robust, about $1.8 \times$ longer than wide, curved, bearing one small anterodistal slender seta, apical nail present. Gnathopod 2 simple, coxa subrectangular, about $1.3 \times$ longer than wide, anterior and ventral margins with submarginal small setae, posterior margin slightly concave; basis stout, about $2.6 \times$ longer than wide, posterior margin with one medial small slender seta; ischium subrectangular, about $1.8 \times$ longer than wide, posterior margin with one distal small slender seta; merus subtriangular, about $1.6 \times$ longer than wide, posterior margin slightly convex, bearing two slender setae; carpus about $1.3 \times$ longer than wide, slightly enlarged distally, anterodistal corner bearing one pectinate stout seta, posterodistal corner with one elongate slender seta; propodus subrectangular, about $2.8 \times$ longer than wide, anterior margin with one proximal and three distal slender setae, posterior margin with one proximal slender seta, bearing one stout and three slender setae distally; dactylus robust, about twice longer than wide, curved, anterior margin bearing one proximal plumose seta, posterior margin with one slender seta, apical nail present, bearing one anterior subapical slender seta. Pereopod 3 coxa about $1.2 \times$ longer than wide, anterior margin with few submarginal slender setae, posterior margin slightly concave; basis about $2.3 \times$ longer than wide, anterior margin with one medial seta, posterior margin with one medial seta, posteroventral corner bearing one slender seta; ischium about $2.1 \times$ longer than wide, posterior margin slightly convex, bearing two small setae; merus about $1.2 \times$ longer than wide, anterodistally lobate, anterior margin bearing one stout seta distally; carpus about $0.8 \times$ the length of merus, about as long as wide, anterior margin slightly produced, bearing one distal stout seta, posterior margin with two slender setae; propodus subrectangular, about $2.8 \times$ longer than wide, anterior margin with two

slender setae, anterodistal corner with three slender setae, posterior margin with 1 medial seta and a distal group of four slender setae and one pectinate stout seta; dactylus about $2.5 \times$ longer than wide, curved, anterior margin with one distal slender seta, apical nail present. Pereopod 4 similar to pereopod 3, coxa slightly longer than wide, anterior and ventral margins with submarginal setae, posterior margin concave; basis $2.1 \times$ longer than wide; merus and carpus, bearing one anterodistal pectinate stout seta each; propodus $2.6 \times$ longer than wide; dactylus, anterior margin bearing one proximal apically plumose and one distal simple seta, posterior margin with one slender seta, apical nail present. Pereopod 5 coxa bilobate, about twice wider than long, anteroventral lobe broadly round, posteroventral lobe reduced, bearing one small slender

seta; basis about $1.2 \times$ wider than long, anterior margin with one slender seta, posterior margin expanded, produced into a broadly rounded lobe, bearing three slender setae; ischium about $1.6 \times$ longer than wide, anterodistal corner with one slender seta; merus about as long as wide, posterodistally lobate, posterior margin with three slender setae; carpus about as long as wide, posterodistal corner weakly expanded; propodus stout, about $2.8 \times$ longer than wide, anterior margin with one medial and a distal pair of slender setae, bearing one stout seta anterodistally, posterior margin with five slender setae, posterodistal corner with one slender seta; dactylus stout, about $2.5 \times$ longer than wide, curved, bearing one anterior, one posterior, and one distal slender setae, anterior margin rough, posterior margin with one proximal apically plumose seta, apical nail

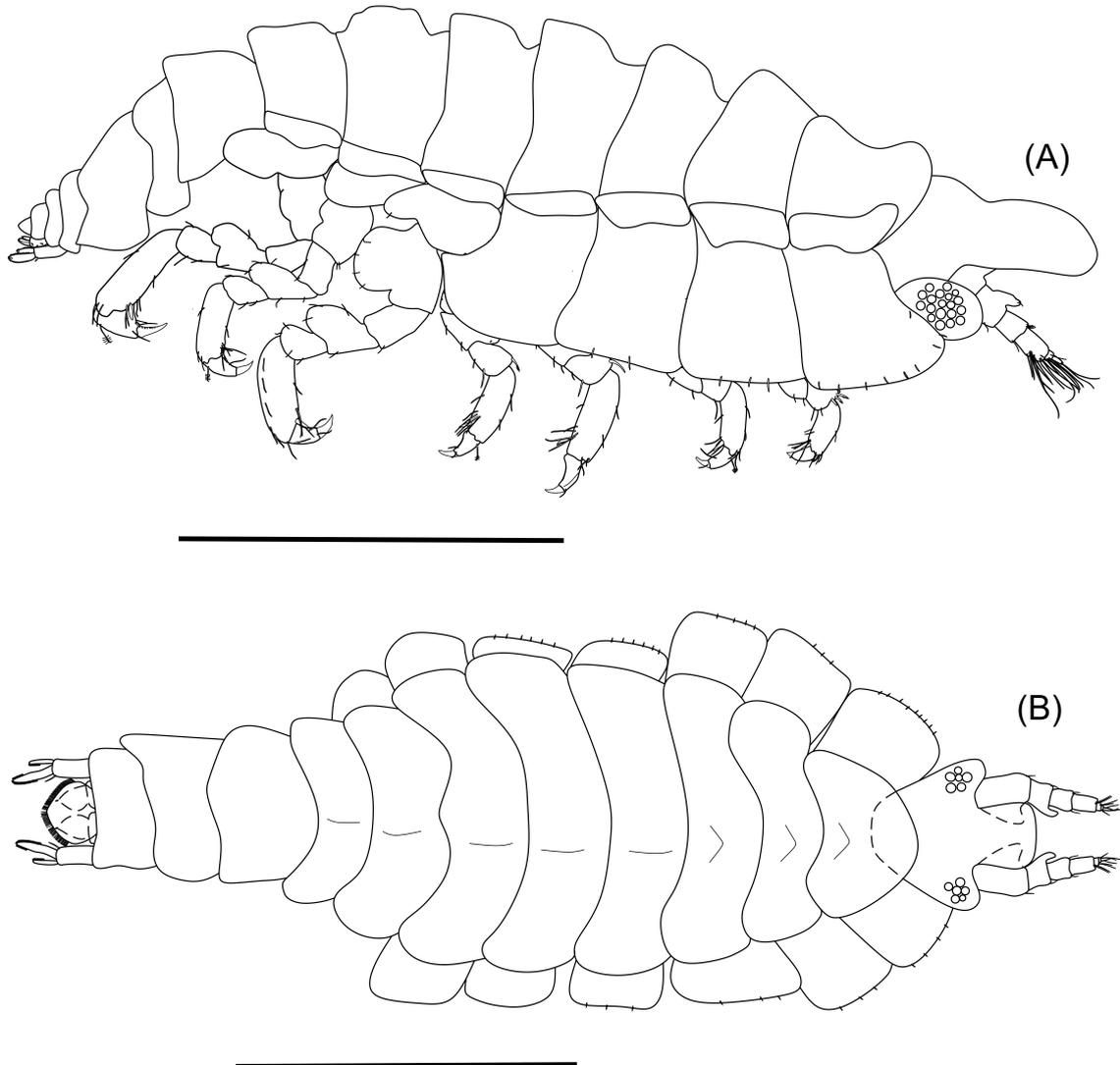


Fig. 1. *Pariphinotus amadoi* sp. nov., Holotype, Fernando de Noronha Archipelago, Brazil (UERJ 543). (A) Habitus, lateral view; (B) Habitus, dorsal view. Scale bars = 0.5 mm.

present. Pereopod 6 basis about $1.3 \times$ longer than wide, posterior margin expanded as a subquadrate proximal lobe, with strong distal indentation, posteroventral lobe absent; ischium about $1.7 \times$ longer than wide, subrectangular, anterior margin with one medial slender seta, anterodistal corner with one slender seta; merus

about $1.9 \times$ longer than wide, posterodistally lobate, anterior margin with two slender setae, posterior margin with one slender seta; carpus about $1.5 \times$ longer than wide, posterodistal corner weakly expanded, anterior margin with two slender setae, posterior margin with one slender seta; propodus about $3.2 \times$ longer than

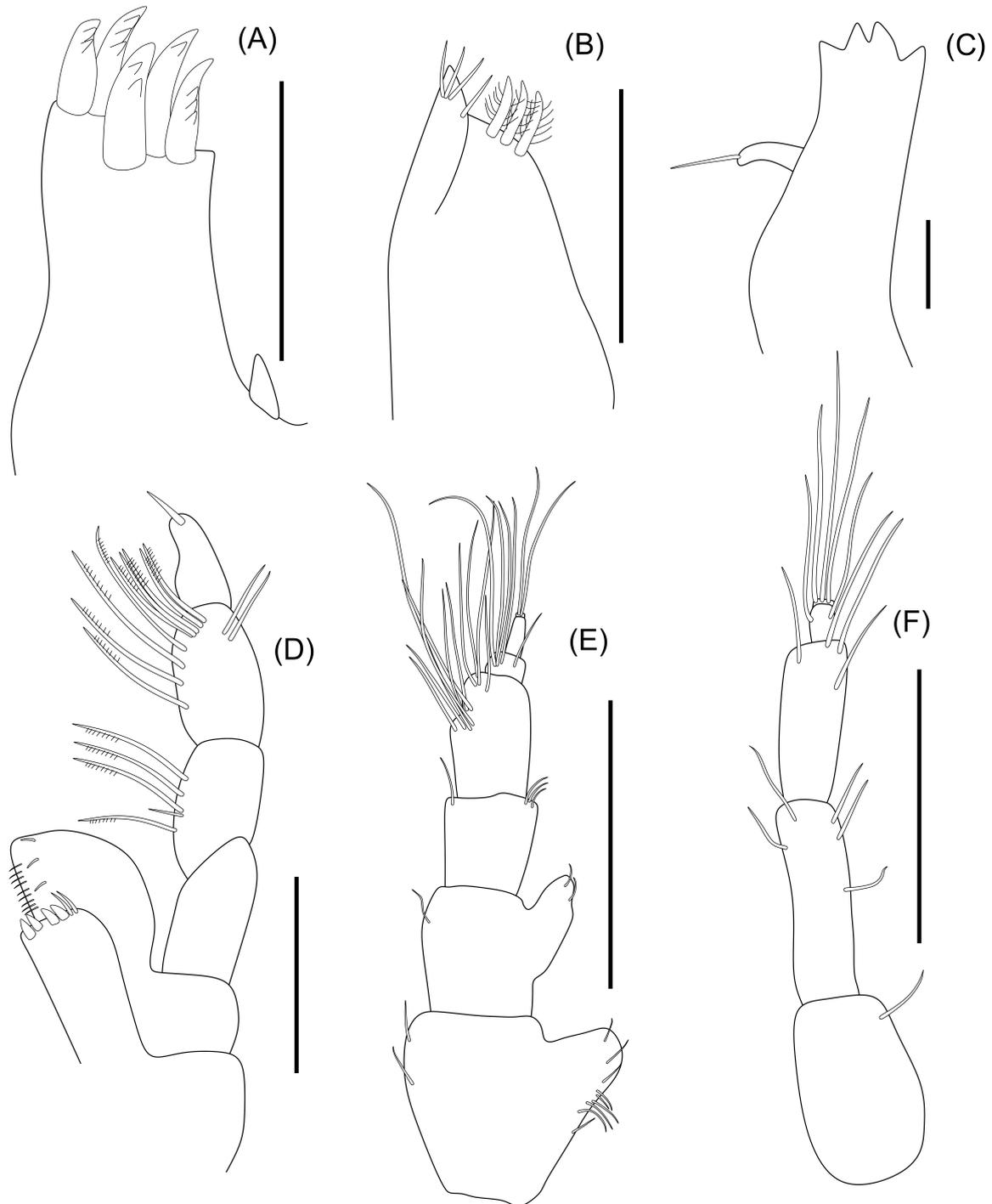


Fig. 2. *Pariphiotus amadoi* sp. nov., Holotype, Fernando de Noronha Archipelago, Brazil (UERJ 543). (A–B) Maxillae 1–2; (C) Mandible; (D) Maxilliped; (E–F) Antennae 1–2. Scale bars = 0.05 mm for A–B; 0.1 mm for the remainders.

wide, anterior margin with six slender setae, bearing 1 stout seta anterodistally, posterior margin with one medial and two distal slender setae; dactylus about $2.7 \times$ longer than wide, curved, bearing one anterior and one posterior slender setae, anterior margin rough, posterior margin with one proximal apically plumose seta, apical nail present. Pereopod 7 basis about $1.7 \times$ longer

than wide, subrectangular, posterior margin weakly expanded, with slight distal indentation, bearing a small medial slender seta, posteroventral lobe absent; ischium about $1.9 \times$ longer than wide, distally enlarged; merus about $1.4 \times$ longer than wide, posterodistally lobate, anterior margin with two slender setae, posterior margin with one slender seta; carpus about $1.4 \times$ longer than

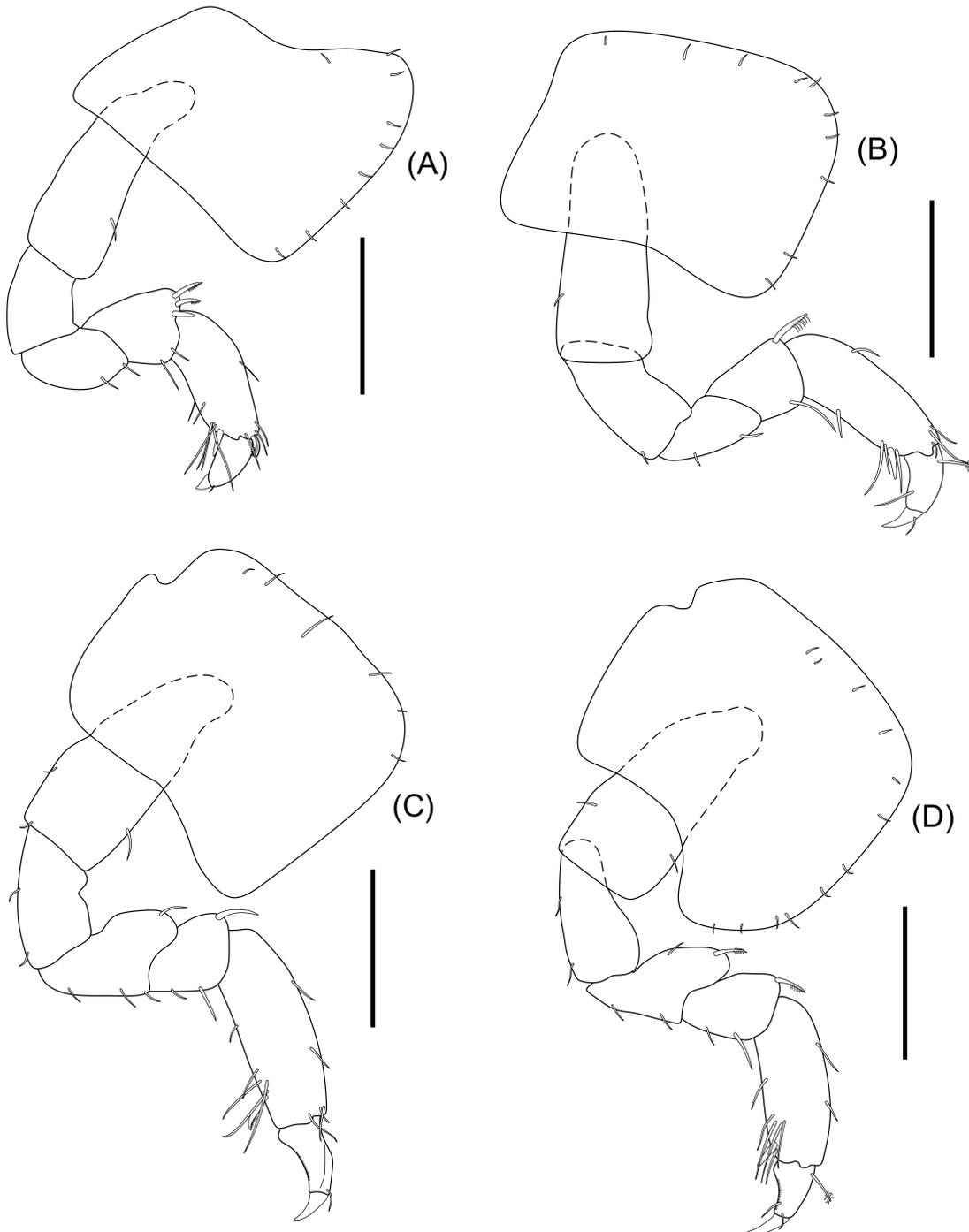


Fig. 3. *Pariphinotus amadoi* sp. nov., Holotype, Fernando de Noronha Archipelago, Brazil (UERJ 543). (A–B) Gnathopods 1–2; (C–D) Pereopods 3–4. Scale bars: 0.2 mm.

wide, suboval, anterior margin with two slender setae, posterior margin with one slender seta; propodus stout, about 3.3 × longer than wide, anterior margin with one medial and four distal slender setae, bearing one stout seta anterodistally, posterior margin with one medial

and two distal slender setae; dactylus about twice longer than wide, curved, with two anterodistal and one laterodistal slender setae, anterior margin distally rough, posterior margin with one proximal apically plumose seta, apical nail present.

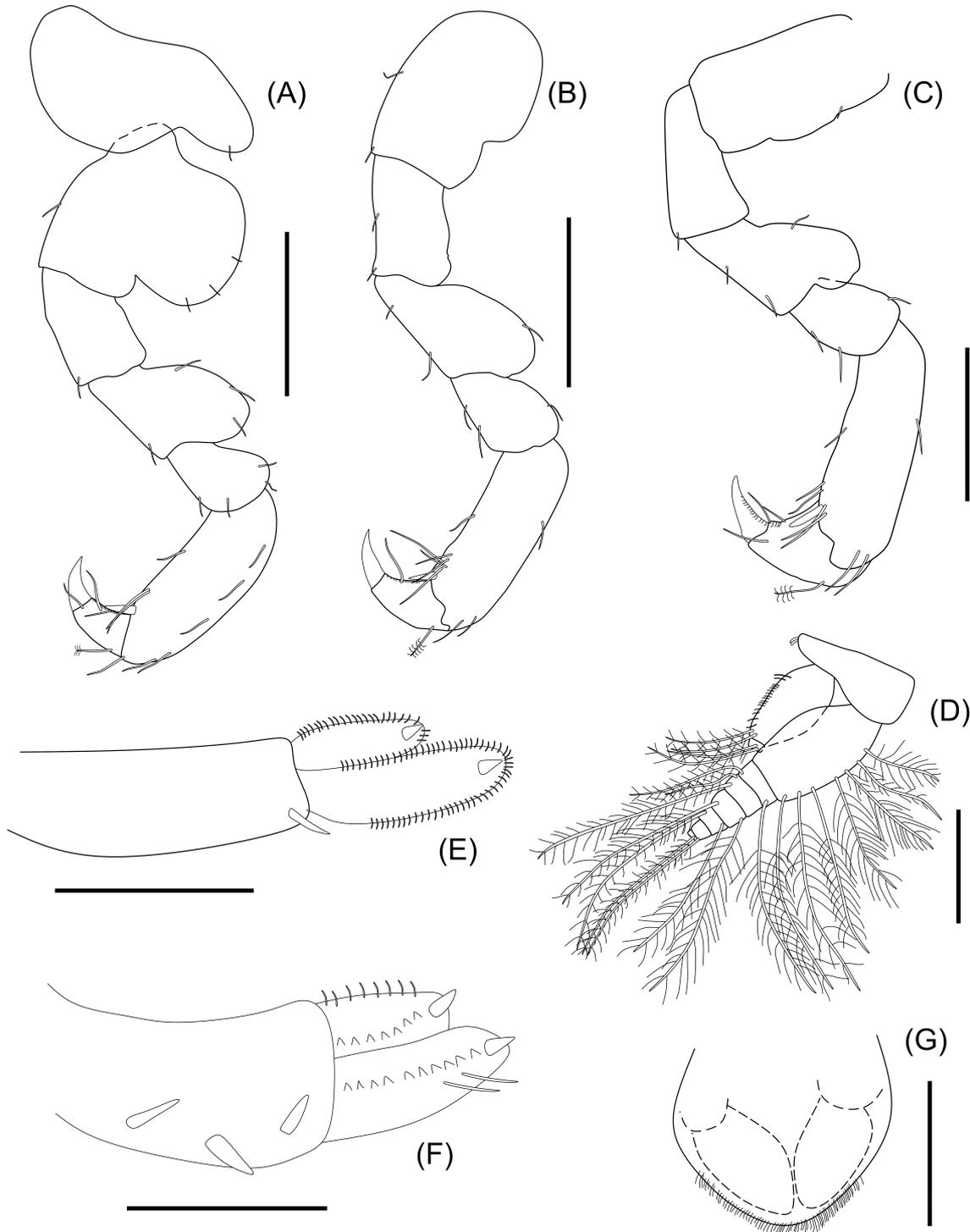


Fig. 4. *Pariphinotus amadoi* sp. nov., Holotype, Fernando de Noronha Archipelago, Brazil (UERJ 543). (A–C) Pereopods 5–7; (D) Pleopod 3; (E–F) Uropods 1–2; (G) Uropod 3 + Telson, dorsal view. Scale bars: 0.2 mm for P5–7; 0.1 mm for the remainders.

Pleon: Pleopod 3 peduncle subtriangular, medial apex bearing two small hook setae; rami well developed; inner ramus about $1.8 \times$ longer than wide, suboval, 2-articulate, inner margin minutely setose, distally and apically with long slender plumose setae; outer ramus about $3 \times$ longer than wide, about $2.2 \times$ longer than inner ramus, 7-articulate, first article about half of entire ramus, tapering distally, outer margin, apex, and distal end of inner margin bearing long slender plumose setae. Uropod 1 biramous, peduncle does not exceed the apex of telson, about $2.9 \times$ longer than wide, laterodistal corner bearing one stout seta; outer ramus about $0.7 \times$ the length of peduncle, about $1.5 \times$ longer than inner ramus, apically round, inner, outer, and apical margins minutely setose, subapical nail present; inner ramus, apically round, inner, outer, and apical margins minutely setose, subapical nail present. Uropod 2 biramous, peduncle stout, about $1.9 \times$ longer than wide, three lateral stout setae; outer ramus about $0.7 \times$ the length of peduncle, about $1.3 \times$ longer than inner ramus, longitudinal row of tubercles present, apical nail present; inner ramus, inner margin minutely setose, longitudinal row of tubercles present, apical nail present. Uropod 3 lacking rami, about $1.7 \times$ longer than wide, lanceolate, apically subacute, naked. Telson entire, round, slightly longer than wide, distal margin minutely setose.

DISCUSSION

The species of the genus *Pariphinotus* can be grouped according to the ratio of length and width of gnathopod 1 carpus. *Pariphinotus amadoi* sp. nov., *P. escabrosus*, *P. galapagoanus*, *P. seclusus* and *P. tuckeri* belong to a group with carpus of gnathopod 1 from 1.3 to $1.7 \times$ longer than wide. *Pariphinotus lepas* has carpus of gnathopod 1 about $3 \times$ longer than wide, while in *P. seticoxa* it is about as long as wide.

Pariphinotus amadoi sp. nov. is similar to *P. escabrosus*, described from Point Conception, California, in the following characters: rostrum long and apically truncate; antenna 1, peduncular first article lobe shorter than articular body, subtriangular, apically round; pereopod 5, basis with posterior lobe round; pereopod 6, basis, posterior margin expanded as a subquadrate proximal lobe, with distal strong indentation; pereopod 7, basis subrectangular, posterior margin weakly expanded, with slight distal indentation; uropod 1, outer ramus with one lateral seta; and telson, apical margin round. However, *P. amadoi* sp. nov. differs from *P. escabrosus* in the following characters (characters in *P. escabrosus* in parentheses): pereopods 3–7, dactylus with apically plumose seta (seta absent);

pereopod 5, basis with posterior margin smooth (thickly serrated); uropod 1, peduncle not surpassing apical margin of telson (surpassing), rami with subapical nail present (absent); and uropod 2, rami with row of tubercles present (absent).

Pariphinotus amadoi sp. nov. is similar to *P. galapagoanus*, known from Isla Santa Cruz, Galapagos Islands, in the following: rostrum elongate an apically truncate; antenna 1, peduncular first article lobe shorter than articular body; maxilla 1, outer plate with five apical multi-cuspidate stout setae; pereopods 3–7, dactylus with apically plumose seta; pereopod 5, basis with posterior lobe round and posterior margin smooth; pereopod 7, basis subrectangular, posterior margin weakly expanded, with slight distal indentation; uropod 1, outer ramus with one lateral seta, rami with subapical nail present; and uropod 2, rami with row of tubercles present. On the other hand, the new species can be differentiated from *P. galapagoanus* by (characters in *P. galapagoanus* in parentheses): pereopods 5–7, articles without facial setae (facially setose); pereopod 6, posterior margin weakly expanded and subquadrate (strongly expanded and round).

Pariphinotus lepas, described from Tomioka Bay, Japan, is the one that most differs from the new species, sharing with it a few characters, such as: maxilla 1, outer plate with five apical multi-cuspidate stout setae; and pereopods 5–7, basis with posterior margin smooth. Additionally, the new species can be easily distinguished from *P. lepas* by the following (characters in *P. lepas* in parentheses): rostrum elongate and apically truncate (short and subtriangular); antenna 1, peduncular first article lobe shorter than articular body, subtriangular (longer than, subquadrate); pereopods 3–7, dactylus with apically plumose seta (without); pereopod 5, basis with posterior lobe round (subquadrate); pereopods 5–7, basis weakly to regularly expanded (strongly expanded); uropod 1, peduncle not surpassing apical margin of telson (surpassing), rami with subapical nail present (absent), outer ramus with one lateral seta (some sparse setae); uropod 2, rami with row of tubercles present (absent); and telson, apical margin round (truncate).

Pariphinotus amadoi sp. nov. is close to *P. seticoxa*, from Hicacos Peninsula, Cuba, in having: rostrum elongate an apically truncate; pereopod 5, basis with posterior lobe round, margin smooth; uropod 1, peduncle not surpassing apical margin of telson, rami with subapical nail present, outer ramus with one lateral seta; uropod 2, rami with row of tubercles present. On the other hand, *P. amadoi* differs from *P. seticoxa* by (characters in *P. seticoxa* in parentheses): pereopods 3–7, dactylus with apically plumose seta; pereopod 6, basis, posterior lobe subquadrate (round); pereopod 7, basis posterior lobe subrectangular (round).

The new species from Fernando de Noronha, *P. amadoi* sp. nov. shares some characters with *P. tuckeri*, from Bermuda, Caribbean: rostrum elongate and apically truncate; antenna 1, peduncular first article lobe shorter than articular body; and pereopod 5, basis with posterior lobe round, margin smooth. However, *P. amadoi* sp. nov. is discerned from *P. tuckeri* by the following (characters in *P. tuckeri* in parentheses): pereopods 3–7, dactylus with apically plumose seta (without); uropod 1, peduncle not surpassing apical margin of telson (surpassing), rami with subapical nail present (absent), outer ramus with one lateral seta (some sparse setae); uropod 2, rami with row of tubercles present (absent).

The new Brazilian species is similar to *P. seclusus*, from Tortugas, Florida, in having: rostrum elongate and apically truncate; antenna 1, peduncular first article lobe shorter than articular body; pereopods 3–7, dactylus with apically plumose seta; pereopod 5, basis with posterior lobe round, margin smooth; pereopod 6, basis, posterior margin expanded as a subquadrate proximal lobe, with distal strong indentation; pereopod 7, basis subrectangular, posterior margin weakly expanded, with slight distal indentation. Nevertheless, *P. amadoi* sp. nov. can be discerned from *P. seclusus* by the following (characters in *P. seclusus* in parentheses): antenna 1, peduncular second article lobe exceeding the distal margin of the article itself (not exceeding); uropod 1, peduncle not surpassing apical margin of telson (surpassing), rami with subapical nail present (absent), outer ramus with one lateral seta (some sparse setae); uropod 2, rami with row of tubercles present (absent).

Until now, only a single species of the genus, *P. seclusus*, is known from Southwestern Atlantic. It was recorded by Wakabara and Leite (1977) from the coast of the Brazilian states of Bahia and Espírito Santo, between 13°00'S and 20°41'S. However, there are morphological discrepancies between the original description of the species and that material described and illustrated by the authors from the Brazilian coast, designated here as *P. seclusus* (*sensu* Wakabara and Leite 1977). The latest differs from *P. seclusus* in the following (characters in *P. seclusus* in parentheses): pereopod 6, basis with posterior lobe round (subrectangular); pereopod 7, basis slight distal indentation absent (present); pereopods 3–7, dactyli without apically plumose seta (seta present); uropod 1 inner ramus with subapical nail (apical nail absent); and uropod 2, rami with row of tubercles present (absent). These discrepancies suggest a misidentified species unknown to science.

As with the Florida species, *P. seclusus* (*sensu* Wakabara and Leite 1977) presents several similarities to the new Brazilian species: rostrum elongate and apically truncate; antenna 1, lobe of first article shorter

than articular body; pereopod 5, basis with posterior lobe round, margin smooth; uropod 2, rami with row of tubercles present; and telson, apical margin round. However, it can be distinguished from *P. amadoi* sp. nov. by the following (characters in *P. seclusus* (*sensu* Wakabara and Leite 1977) in parentheses): pereopods 3–7, dactylus with apically plumose seta (seta absent); pereopod 6, basis with posterior lobe round (subrectangular); pereopod 7, basis slight distal indentation absent (present); uropod 1, rami subapical nail present (absent in outer ramus), and outer ramus, outer margin with one seta (seta absent).

The type locality of each species of *Pariphinotus*, in addition to the occurrence of *P. seclusus* (*sensu* Wakabara and Leite 1977) from Bahia and Espírito Santo, are indicated in figure 5.

Key to world species of *Pariphinotus*

1. Rostrum elongate and apically truncate 2
- Rostrum short and subtriangular *P. lepas* (Hirayama, 1987)
2. Uropod 2 rami with row of tubercles 3
- Uropod 2 rami without row of tubercles 6
3. Pereopod 6 basis posterior lobe rounded 4
- Pereopod 6 basis posterior lobe subquadrate
..... *Pariphinotus amadoi* sp. nov.
4. Pereopod 7 basis posterior lobe subrectangular 5
- Pereopod 7 basis posterior lobe rounded
..... *P. seticoxa* (Ortiz, 1976)
5. Pereopod 7 basis posterior margin with slight distal indentation ..
..... *P. galapagoanus* (J.L. Barnard, 1979)
- Pereopod 7 basis posterior margin without indentation
..... *P. seclusus* (*sensu* Wakabara and Leite 1977)
6. Uropod 1 rami without apical stout seta 7
- Uropod 1 outer ramus with apical stout seta
..... *P. tuckeri* Kunkel, 1910
7. Pereopod 5 basis posterior margin smooth
..... *P. seclusus* (Shoemaker, 1933)
- Pereopod 5 basis posterior margin with notches
..... *P. escabrosus* (J.L. Barnard, 1962)

CONCLUSIONS

Rhodolith beds, the habitat in which *Pariphinotus amadoi* sp. nov. was sampled, have been reported among the most extensive marine bottoms in the Brazilian economic exclusive zone (EEZ). Since the 1970's, carbonate bottoms have been suggested to cover a large latitudinal range throughout continental shelf (Amado-Filho et al. 2017). However, only in the last decade have these bottoms been approached as biologically constructed habitats rather than geological deposits (see Amado-Filho and Pereira-Filho 2012). Brazilian rhodolith beds are now recognized as highly diverse marine habitats, occurring from the Amazon River mouth (*i.e.*, ~1°N) southward to 24°S, with a

small and isolated rhodolith bed at 27°S (Moura et al. 2016; Amado-Filho et al. 2017; Pereira-Filho et al. 2019; Carvalho et al. 2020). Despite their extensiveness and global importance to carbonate cycling (Amado-Filho et al. 2012), marine biodiversity associated with these habitats is still underestimated (Santos et al. 2016), hampering thorough environmental impact assessments of steadily growing industrial activities (e.g., Sissini et al. 2020). Paradoxically, uncertainties in predicting environmental impacts have been evoked by economic groups to approve mining activities in areas covered by rhodolith beds (Santos et al. 2016).

Recent increased biological sampling revealed several important new finds regarding marine algae: five new species (*Lithophyllum depressum*, *Sporolithon tenue*, *Sporolithon yoneshigueae*, *Sporolithon franciscanum*, *Lithophyllum atlanticum*) (Villas-Boas et al. 2009; Vieira-Pinto et al. 2014; Bahia et al. 2014a 2015; Leão et al. 2020), three new occurrences for the Atlantic Ocean (*Scinaia aborealis*, *Sporolithon ptychoides*, *Hydrolithon rupestris*, *Sporolithon ptychoides*, *Sporolithon molle*) (Amado-Filho et al.

2010; Bahia et al. 2011 2014b; Pereira-Filho et al. 2012), two new occurrences for the western Atlantic Ocean (*Mesophyllum engelhartii*, *Reticulocaulis mucosissimus*) (Guimarães and Amado-Filho 2009; Amado-Filho et al. 2010), five new occurrences for the Southwestern Atlantic Ocean (*Acrosymphyton caribaeum*, *Dudresnaya crassa*, *Naccaria corymbosa*, *Platoma* sp. and *Predaea feldmannii*) (Guimarães and Amado-Filho 2008) and four new occurrences for the Brazilian coast (*Dasya ramosissima*, *Halymenia elongate*, *Udotea abbottiorum*, *Lithothamnion muelleri*) (Riul et al. 2009; Amado-Filho et al. 2010).

At present, fauna associated with rhodoliths still represent a gap in our knowledge. Santos et al. (2011) described a new species of Polychaeta associated with rhodolith beds (*Sabellaria corallinea*) and reported, for the first time, the occurrence of *Sabellaria pectinata* in the western Atlantic Ocean. In addition to the rediscovery a “rare” genus of Polychaeta associated with Southwestern Atlantic (SWA) rhodolith beds (*Nuchalosyllis*), Santos et al. (2016) discuss difficulties in sampling small, soft bodies animals associated

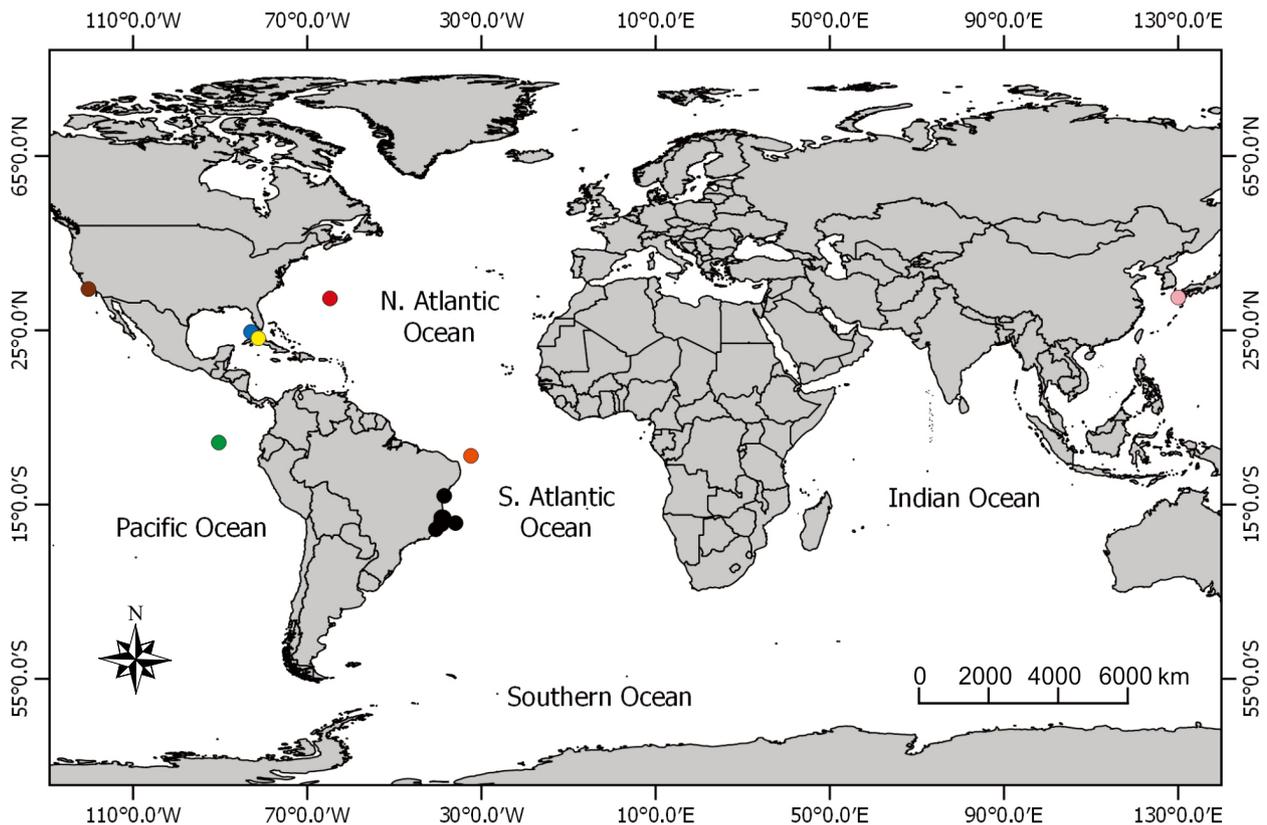


Fig. 5. Type-localities of world species of *Pariphinotus*, plus occurrence of *P. seclusus* (*sensu* Wakabara and Leite 1977) from Brazil: (orange dot) *P. amadoi* sp. nov. – Fernando de Noronha Archipelago, Brazil; (brown dot) *P. escabrosus* (Barnard, 1962) – Point Conception, California; (green dot) *P. galapagoanus* (Barnard, 1979) – Isla Santa Cruz, Galapagos; (pink dot) *P. lepas* (Hirayama, 1987) – Tomioka Bay, Japan; (blue dot) *P. seclusus* (Shoemaker, 1933) – Tortugas, Florida; (black dots) *P. seclusus* (*sensu* Wakabara and Leite 1977) – Bahia and Espírito Santo state coast, Brazil; (yellow dot) *P. seticoxa* (Ortiz, 1976) – Hicacos Peninsula, Cuba; and (red dot) *P. tuckeri* Kunkel, 1910 – Bermuda, Caribbean.

with rhodoliths, highlighting the importance of in situ SCUBA sampling to avoid loss and fragmentation of animals. Interestingly, *P. seclusus* (*sensu* Wakabara and Leite 1977), the only register of the genus in the Southwestern Atlantic before our findings, was also sampled in areas where rhodolith beds is the major bottom features (Salvador and Doce River shelves) (Bahia et al. 2010; Holtz et al. 2020). The description of this new amphipod species associated with rhodolith beds supports the adoption of the precautionary principle to safeguard undocumented biodiversity and ecosystem services provided by the SWA rhodolith beds.

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