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A new species of *Boca* Lowry & Stoddart, 1997 (Amphipoda: Lysianassoidea: Aristiidae) from a mesophotic coral ecosystem off Puerto Rico, Caribbean Sea

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Abstract

A new species of the genus *Boca* Lowry & Stoddart, 1997 is described from a mesophotic coral ecosystem off southwestern Puerto Rico, in the Caribbean Sea. The new species is easily recognized from the others in the genus mainly by the following characters: (1) maxilliped, inner plate with 2 long apical simple setae; palp, articles slender, subequal in length; (2) gnathopod 1, propodus slightly elongate, about 2.5 × longer than wide, and palm extremely acute, quite long and distinctly demarked by a robust seta at the palmar corner; (3) gnathopod 2, carpus slightly elongate, about 3.7 × longer than wide; (4) pereopod 5, basis widely expanded posteriorly, posterior margin rounded and smooth, and posteroventral lobe weakly developed. We also present a key to world species of *Boca*. This is the fifth species of *Boca* from world's oceans and the first record of the genus from Puerto Rico.

Key words: taxonomy, Biodiversity, *Boca gurui* **sp. nov.**, Mesophotic Coral Ecosystems, Western Atlantic

Introduction

The Aristiidae Lowry & Stoddart, 1997 is a family of lysianassoid amphipods widely spread around the world, with more than 30 species grouped in the genera *Aristias* Boeck, 1871, *Boca* Lowry & Stoddart, 1997, *Memana* Stoddart & Lowry, 2010, *Perrierella* Chevreux & Bouvier, 1892 and *Pratinas* Stoddart & Lowry, 2010. Until now, just four species are known for the genus *Boca*: *B. campi* Lowry & Stoddart, 1997, *B. elvae* Lowry & Stoddart, 1997, *B. megachela* Lowry & Stoddart, 1997, all from the Gulf of Mexico, and *B. normae* Ortiz, Winfield & Varela, 2012, from southwestern Cuba. Mesophotic Coral Ecosystems (MCEs) are relatively deep benthic habitats found at depths between 30–40 m to 100 m in the tropics (Locker *et al.* 2010). MCEs are visually dominated by macroalgae, sponges and reef-building corals and have proven to be a trove of new records and new species of peracarid crustaceans, especially cumaceans (e.g. Petrescu *et al*. 2012, 2013). The present study is part of a US National Oceanic and Atmospheric Administration-funded research programme (DeepCres) to characterize the biodiversity of MCEs. We describe the first new species of amphipods from samples collected during DeepCres.

Material and methods

The material was collected from Hole-in-the-Wall, one of the diving sites of the DeepCres research program, off southwestern Puerto Rico, in the Caribbean Sea. On June 8, 2010, divers equipped with Tri-Mix Rebreathers collected loose rubble, corals, sponges and algae from 90.5 m (297 ft.) depth. All substrata were placed over a 1 mm

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and 0.125 mm sieve and washed with filtered seawater. The portion of fauna retained in the 0.125 mm sieve was extracted and examined under a dissecting microscope. All specimens were transferred in 100% ethanol. The holotype is deposited at the Crustacea Collection of *Museu de Zoologia da Universidade Federal da Bahia* (UFBA), and the paratype is deposited at the Museum of Marine Invertebrates, University of Puerto Rico, Mayagüez (MMI-UPRM) kept in 70% ethanol. For the taxonomic study, the appendices and mouthparts of the holotype were dissected and mounted on glycerol gel slides (Reid 2000) and then drawn under optical microscope with camera lucida (Motic BA-310). The drawings were digitalized on CorelDRAW X6, with a Wacom Intuos 4 graphics tablet, following protocols adapted from Coleman (2003). The classification of setae used in this study follows Watling (1989) and the nomenclature for the palms of gnathopods is adapted from Poore & Lowry (1997). The following abbreviations have been used in the figures: Hd+E, head + epistome; A1–2, antennae 1–2; Mx1IP, maxilla 1 inner plate; Mx2, maxilla 2; Md, mandible; Mp, maxilliped; Gn1–2, gnathopods 1–2; P3–7, pereopods 3–7; Cx5, coxa 5; Ur 1–3, urosomites 1–3; U1–3, uropods 1–3; Ep1–3, epimeral plates 1–3; T, telson.

Results

Order Amphipoda Latreille, 1816

Suborder Senticaudata Lowry & Myers, 2013

Superfamily Lysianassoidea Dana, 1849

Family Aristiidae Lowry & Stoddart, 1997

Genus *Boca* Lowry & Stoddart, 1997

Boca Lowry & Stoddart 1997: 20.—Ortiz *et al.* 2012: 60.

Diagnosis. See Lowry & Stoddart (1997).

Type species. *Boca campi* Lowry & Stoddart, 1997.

Composition. The genus *Boca* includes five species: *B. campi* Lowry & Stoddart, 1997; *B. elvae* Lowry & Stoddart, 1997; *B. gurui* **sp. nov.**; *B. megachela* Lowry & Stoddart, 1997; and *B. normae* Ortiz, Winfield & Varela, 2012.

Boca gurui sp. nov.

(Figs 1–3)

Etymology. The specific epithet is given in honor of Professor B. C. Guru, Utkal University, Orissa, India, thesis advisor (in D. Sc.) of one of the authors (Dr. Tapas Chatterjee).

Material examined. Holotype: female, 2.9 mm, Hole in Wall, 90.5 m (297 ft.), June 8, 2010, 0.125 mm sieve, UFBA 2129. Paratype: 1 female, 2.3 mm, Hole in Wall, 90.5 m (297 ft.), Jun 8, 2010, 0.125 mm sieve, (MMI-UPRM 10003).

Diagnosis. Antenna1, primary flagellum 4-articulate. Epistome and upper lip fused without central notch. Mandible, palp article 3 falciform, inner margin minutely setose, concave. Maxilla 2, outer plate, apical margin with 6 simple setae between 1 plumose seta at the outer corner and 1 plumose seta at the inner corner; inner plate, apical margin with 4 plumose setae and 4 simple setae near the outer corner. Maxilliped, inner plate with 2 long apical simple setae, outer plate about 3 × longer than wide, palp slender, articles subequal in length, article 2 apically truncate; gnathopod 1, propodus slightly elongate, about 2.5 × longer than wide, palm extremely acute, quite long and distinctly demarked by a robust seta at the palmar corner; pereopods 5–7, propodus with non articulated anterodistal spur; telson with 1 apical robust seta on each lobe.

Description. Head about 1.4 × deeper than long, lateral cephalic lobe weakly produced, eyes reniform. Epistome and upper lip fused without central notch. Antenna 1, about 0.2 × the body length, peduncular article 1 about 1.5 ×

longer than wide, without setae, article 2 as long as wide, about half length of article 1, ventral margin with 1 distal slender seta, article 3 about 1.3 longer than wide, slightly shorter than article 2, dorsal margin with 1 distal slender seta; primary flagellum 4-articulate, with a row of aesthetascs, callynophore not visible, without flagellar robust setae, calceoli absent, article 4 elongate, with 3 apical slender setae; accessory flagellum 2-articulate, about half length the primary flagellum, article 1 elongate, about 3.4 × the article 2 length, article 2 with 3 apical slender setae. Antenna 2 subequal in length to antenna 1, peduncle without brush setae, weakly geniculate between articles 2 and 3, article 4 slightly shorter than articles 1 to 3 combined, article 5 subequal in length to article 4, dorsodistal and ventrodistal corners each with set of slender setae; flagellum 4-articulate, article 3 longer than others, article 4 with 2 apical slender setae. Mandible, incisor large, with sinuous margin, bearing an acute spine anteriorly; lacinia mobilis a small, apically subacute peg; accessory setal row represented by 6 short, stout simple setae; molar a smooth flap; palp 3-articulate, attached proximally, article 1 subquadrate, without setae, article 2 elongate, about 4 × longer than wide, about 1.7 × longer than article 3, bearing 2 simple setae ventrodistally, article 3 falciform, inner margin minutely setose, concave, with 2 apical slender setae. Maxilla 1, inner plate short, apical margin with 3 stout plumose setae, inner margin with 5 slender simple setae. Maxilla 2, outer plate, apical margin with 6 simple setae between 1 plumose seta at the outer corner and 1 plumose seta at the inner corner, inner plate, apical margin with 4 plumose setae and 4 simple setae near the outer corner. Maxilliped, inner plate with 2 long apical simple setae, outer plate about 3 × longer than wide, palp, articles slender, subequal in length, article 2 apically truncate.

Gnathopod 1, basis about 3.5 × longer than wide; merus and carpus, posterior margin setose; propodus slightly elongate, about 2.5 × longer than wide, palm extremely acute, quite long and distinctly demarked by a robust seta at the palmar corner, posterior margin almost straight, minutely setose, bearing 3 curved robust setae spread on the distal half; dactylus curved, large, reaching 1/3 of posterior margin. Gnathopod 2, carpus slightly elongate, about 3.7 × longer than wide, weakly setose; propodus subrectangular, about 2.4 × longer than wide, anterior margin convex, palmar corner slightly projected, subacute; dactylus proximally enlarged, globular. Pereopod 3, coxa slightly wider than deep, all margins smooth, posteroventral corner with small notch; basis suboval, about 2.2 × longer than wide, anterior margin smooth, with a distal concavity, posterior margin smooth, convex; merus smooth, about 1.4 × longer than wide, and about 0.45 × the basis length; carpus short, rounded; propodus subrectangular, about 2.2 × longer than wide, about 0.9 × the merus length, distal spur present; dactylus simple, curved, inner margin minutely setose. Pereopod 4, coxa broadly rounded, slightly wider than deep, margins naked and smooth; basis ovatorectangular, about 1.8 × longer than wide, anterior and posterior margins smooth; merus about half length of basis; carpus short, subquadrate; propodus subrectangular, about 2.3 × longer than wide, anterior margin convex, bearing acute spur; dactylus robust, curved, posterior margin minutely setose. Pereopod 5, coxa bilobate, posterior lobe strongly produced ventrally; basis widely expanded posteriorly, posterior margin rounded and smooth, posteroventral lobe weakly developed; merus slightly expanded posteriorly; propodus subrectangular, about 2.4 × longer than wide, anterior and posterior margins without setae, bearing weak anterodistal spur; dactylus robust, curved. Pereopod 6, basis expanded posteriorly, anterior margin bearing 4 small stout setae, posterior margin weakly crenulate, posteroventral lobe weakly produced; propodus subrectangular, about 2.9 × longer than wide, anterior and posterior margins without setae, bearing acute anterodistal spur; dactylus robust, curved. Pereopod 7, basis expanded posteriorly, anterior margin bearing 4 small stout setae, posterior margin weakly crenulate, posteroventral lobe weakly produced; propodus subrectangular, about 3 × longer than wide, anterior and posterior margins without setae, bearing acute anterodistal spur; dactylus robust, curved.

Pleonites 1–3, dorsal margins smooth. Epimeral plates 1–3, margins smooth and naked, epimeral plates 1–2, posteroventral lobe slightly produced and subacute, epimeral plate 3, posteroventral lobe slightly produced and round. Urosomites 1–3, dorsal margins smooth, urosomite 1 dominant in size, dorsally without concavities. Uropod 1, peduncle with 1 apicolateral robust seta; rami subequal in length, without robust setae, dorsal margins minutely setose. Uropod 2, peduncle with 1 apicolateral stout seta; outer ramus slightly longer than inner ramus, dorsal margin minutely setose, without dorsal setae; inner ramus, dorsal margin minutely setose, without dorsal setae, without constriction. Uropod 3, peduncle short, about 1.2 × longer than wide, without dorsolateral flange, without robust setae; rami lanceolate, subequal in length; outer ramus 2-articulate, article 1, dorsal margin minutely setose distally, article 2 long, acute, without setae; inner ramus, dorsal and ventral margins minutely setose distally. Telson flat, deeply cleft, up to 70% of its length, about 1.7 × longer than wide, lobes apically slightly truncate and cuspidate, each lobe bearing 1 robust seta.

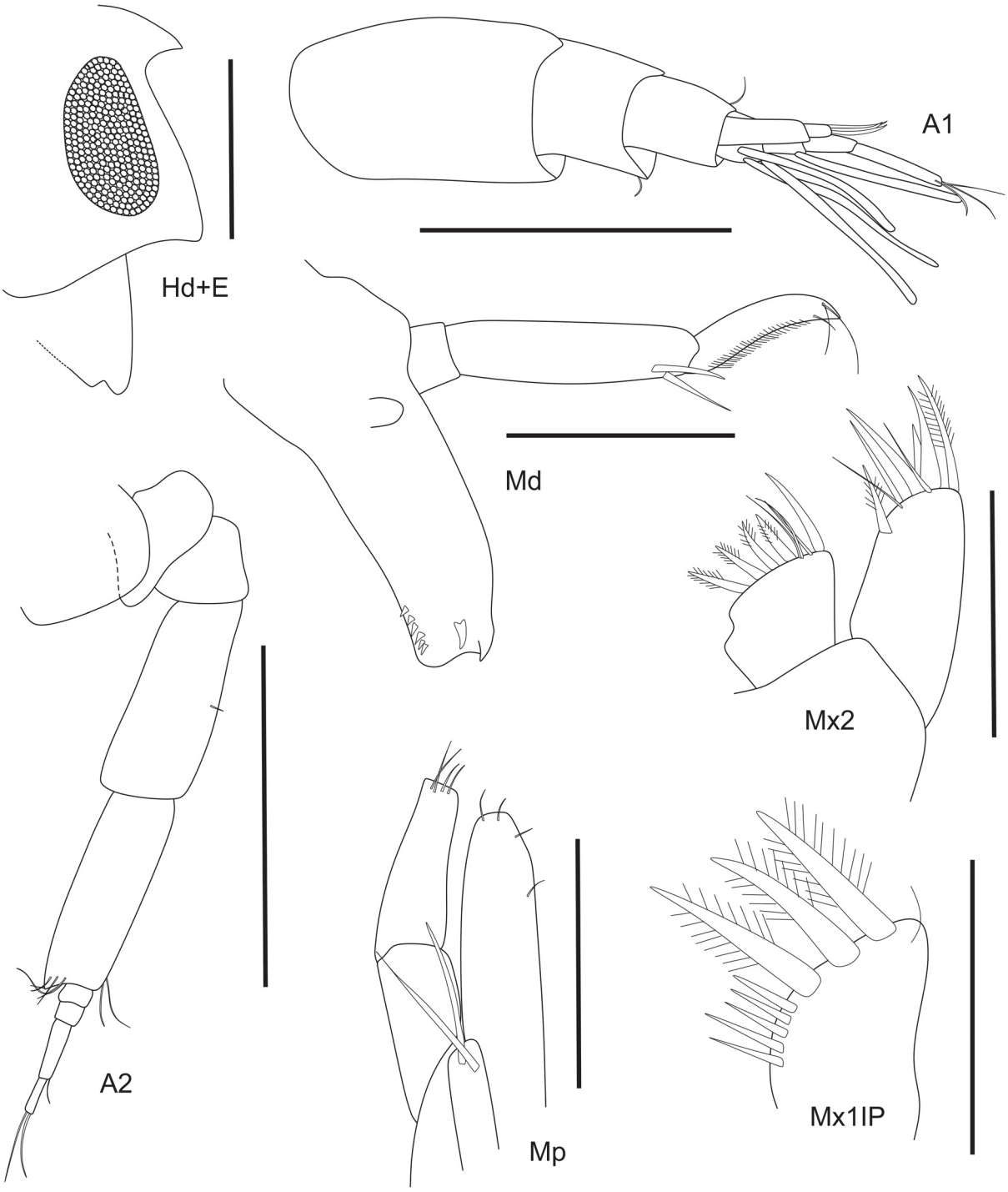

FIGURE 1. *Boca gurui* **sp. nov.** Hole-in the-Wall, 90.5 m (297 ft.), off SW Puerto Rico, Caribbean Sea, UFBA 2129. Scale bars: 0.2 mm for Hd+E and A1–2; 0.05 mm for Mx1IP; 0.1 mm for the remainder.

Geographic distribution and bathymetry. The new species is known only from the type locality, Hole-in the-Wall, La Parguera, off southwestern Puerto Rico, Caribbean Sea, 90.5 m (297 ft.), June 8, 2010, (17°53′04.5960″N, 67°01′18.9120″W) (Fig 4).

Remarks. The new species described in this paper fits the genus *Boca*, as diagnosed by Lowry & Stoddart 1997. *Boca gurui* **sp. nov.** can be distinguished from its congeners in a number of characters. It differs from *B. campi* by: peraopods 5–7, propodus with non articulated anterodistal spur (articulated in *B. campi*); and telson with 1 apical robust seta on each lobe (without apical robust setae in *B. campi*). The new species can be easily recognized from *B. elvae* by presenting: mandible lacinia mobilis a small, apically subacute peg (a stemmed, distally serrate blade in

B. elvae); and gnathopod 1 merus, carpus and propodus anterior margin naked, and dactylus curved (with patches of robust setae and dactylus bent at right angle proximally in *B. elvae*). From *B. megachela*, the new species is differentiated as follows: gnathopod 1 weakly subchelate, dactylus large (massively subchelate, dactylus very large in *B. megachela*); and telson with 1 apical robust seta on each lobe (without apical robust setae in *B. megachela*). *Boca gurui* **sp. nov.** is also easily recognized from *B. normae* as well as this species presents some autapomorphic characters that differentiates it from all other species in the genus, mainly the mandible incisor shape, with 4 spines surrounding 1 stout and central spine, and the antenna 1, primary flagellum 3-articulate. Besides that, *B. gurui* **sp. nov.** presents the uropod 3 inner ramus subequal in length to outer ramus (*versus* subequal in length to outer ramus article 1 in *B. normae*).

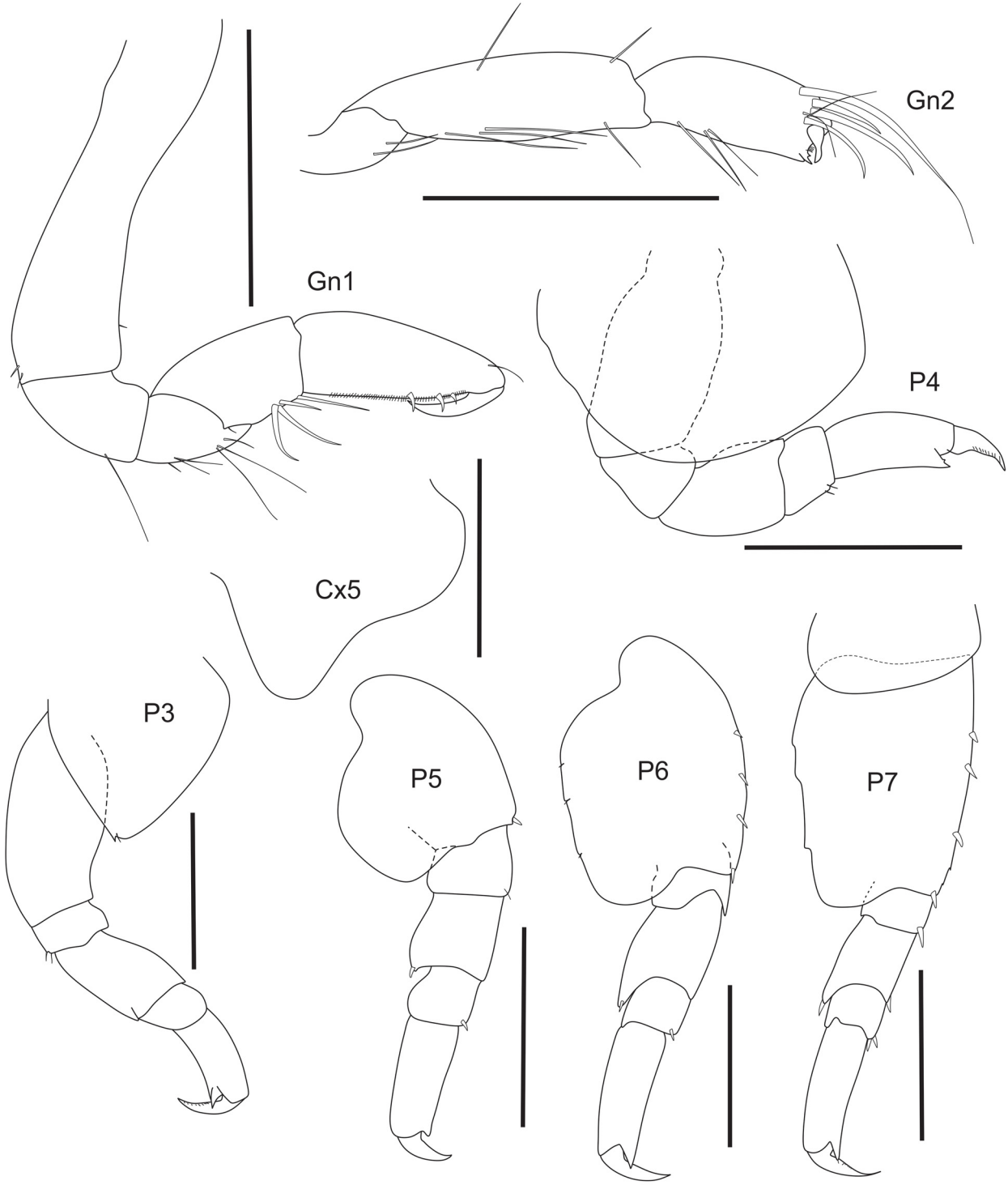

FIGURE 2. *Boca gurui* **sp. nov.** Hole-in the-Wall, 90.5 m (297 ft.), off SW Puerto Rico, Caribbean Sea, UFBA 2129. Scale bars: 0.2 mm.

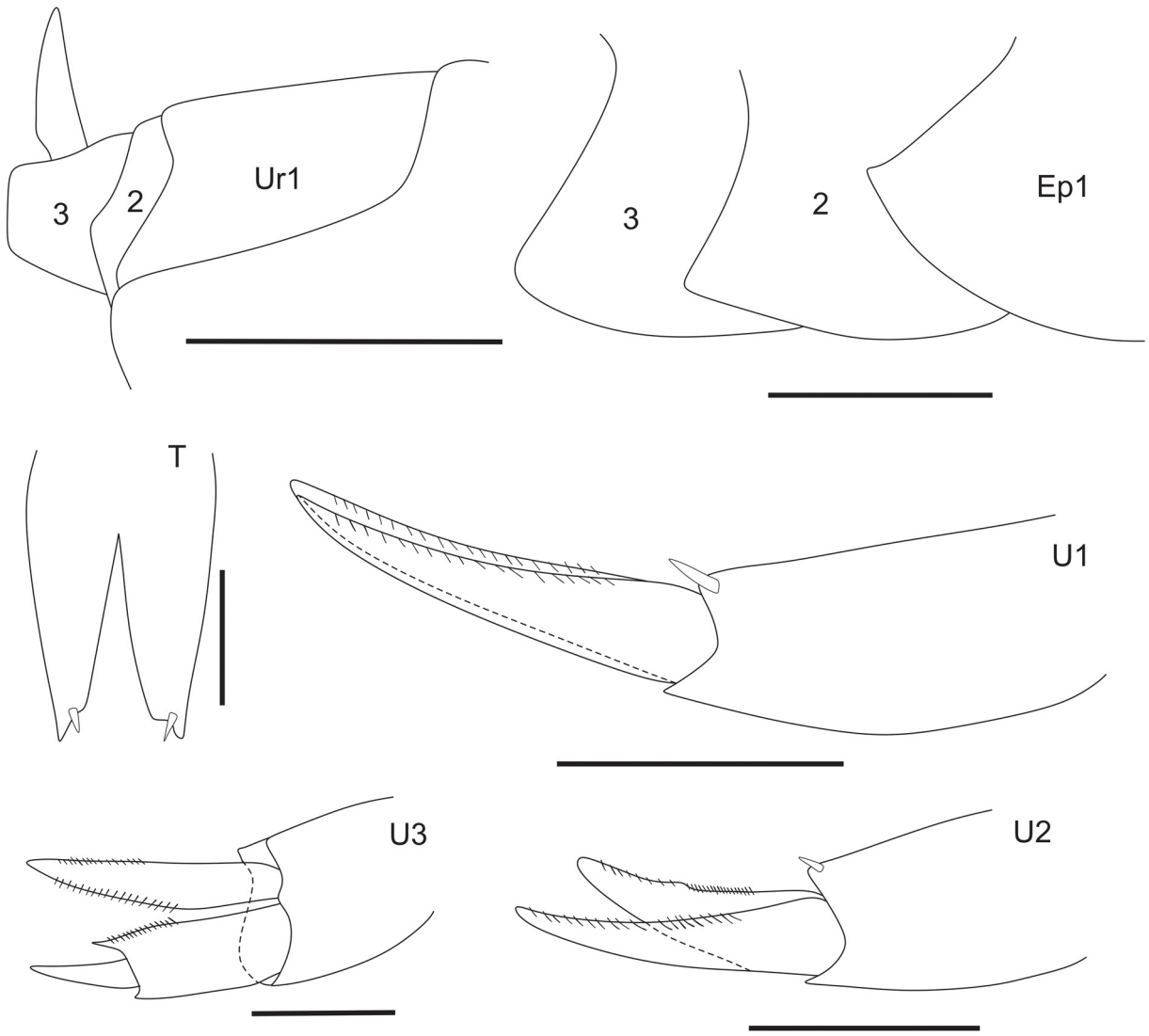

FIGURE 3. *Boca gurui* **sp. nov.** Hole-in the-Wall, 90.5 m (297 ft.), off SW Puerto Rico, Caribbean Sea, UFBA 2129. Scale bars: 0.2 mm for Ep1-3 and Ur1-3; 0.05 mm for U3 and T; 0.1 mm for the remainder.

Additionally, *B. gurui* **sp. nov.** presents some exclusive characters that differentiates it from all of its congeners, such as: epistome and upper lip fused, without central notch; antenna 1, accessory flagellum reaching the primary flagellum article 3; and mandible palp article 3 falciform, with inner margin minutely setose and concave. This new species represents the first species of the genus *Boca* from Puerto Rico and increases the described number of world species in the genus to five.

Key to species of the genus *Boca*

1a. Antenna 1, primary flagellum 4-articulate; mandible, incisor smooth or minutely serrate, with 1 anterior stout spine; uropod 3, inner ramus longer than outer ramus article 1 2

1b. Antenna 1, primary flagellum 3-articulate; mandible, incisor with 4 spines surrounding 1 stout and central spine; uropod 3, inner ramus subequal in length to outer ramus article 1 . . . . . *Boca normae*

2a. Epistome and upper lip fused, with central notch; antenna 1, accessory flagellum reaching the primary flagellum article 2 or shorter; mandible, palp article 3 suboval, inner margin naked, distally straight to slightly falcate; uropod 3, inner ramus reaching about the half of the outer ramus article 2. 3

2b. Epistome and upper lip fused, without central notch; antenna1, accessory flagellum reaching the primary flagellum article 3; mandible, palp article 3 falciform, inner margin minutely setose, concave; uropod 3, inner ramus reaching about the apex of the

outer ramus article 2 . . . . . *Boca gurui* **sp. nov.**
3a. Gnathopod 1, dactylus curved; telson without apical robust setae 4
3b. Gnathopod 1, dactylus bent at right angle proximally; telson with 1 apical robust seta on each lobe . . . . . *Boca elvae*
4a. Gnathopod 1 weakly subchelate, dactylus large; pereopods 5–7, propodus with articulated anterodistal spur . . . . *Boca campi*
4b. Gnathopod l massively subchelate, dactylus very large; pereopods 5–7, propodus with non articulated anterodistal spur. . . . . *Boca megachela*

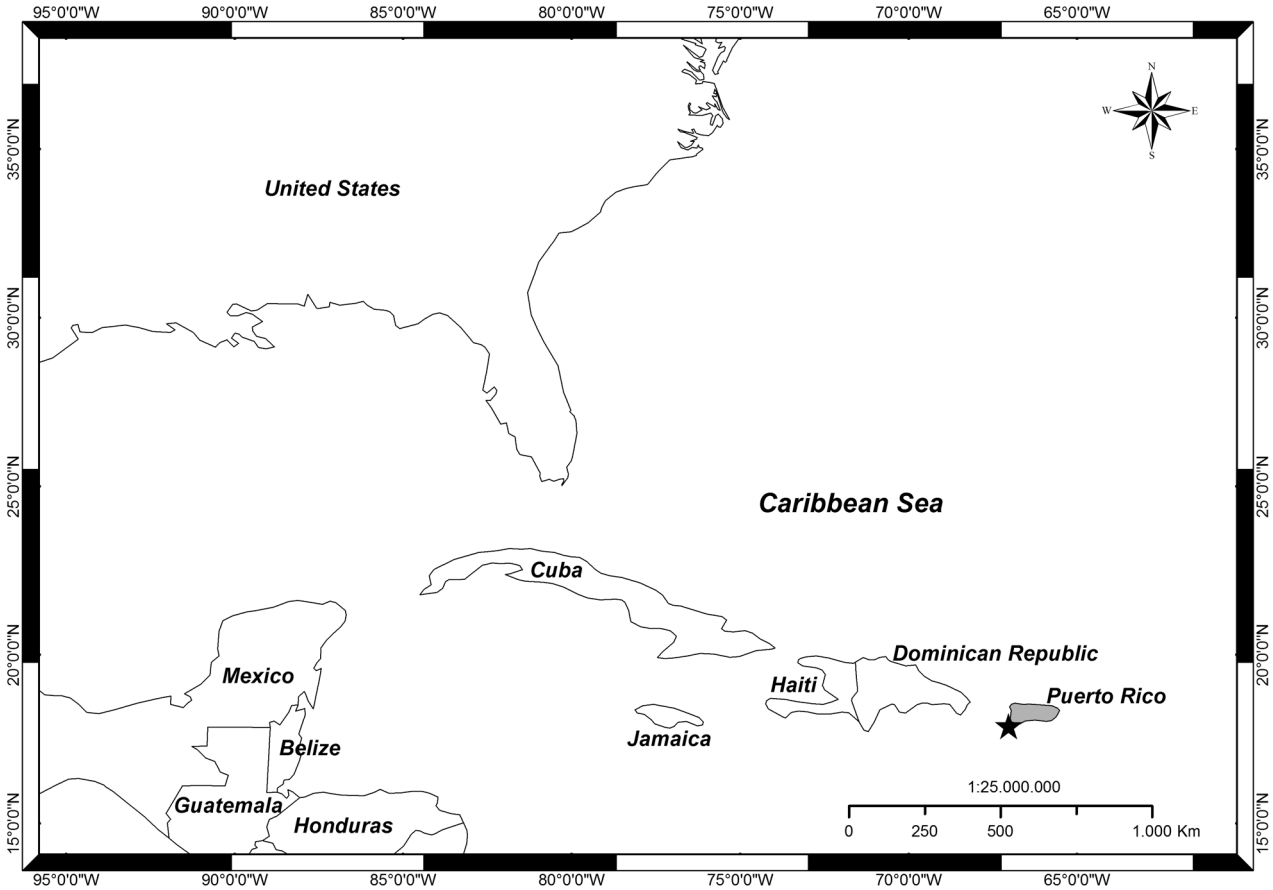

FIGURE 4. Type locality of *Boca gurui* **sp. nov.** Hole-in the-Wall, 90.5 m (297 ft.), off SW Puerto Rico, Caribbean Sea (Distribution map by Danielle P. Cintra).

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