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Two new sponge-associated *Branchiosyllis* (Annelida: Syllidae: Syllinae) from Northeastern Brazil

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Abstract

Here we describe two new species in the genus *Branchiosyllis* Ehlers, 1887 associated with sponges. *Branchiosyllis belchiori* **sp. nov.** was found in Todos os Santos Bay, state of Bahia, and in the Fernando de Noronha Island (Northeastern Brazil), and *Branchiosyllis gonzaguinhai* **sp. nov.** was found in the Fernando de Noronha Island and Rocas Atoll. We compare the species herein described with their morphologically most similar congeners and provide a synoptic table of the morphological variation among the type-series of the two new species. An identification key for the species of *Branchiosyllis* recorded in Brazil is also provided.

Key words: Islands, Fernando de Noronha, Taxonomy, Atlantic Ocean, Polychaeta

Introduction

The Syllidae Grube, 1850 is one of the most speciose families of annelid polychaetes, with approximately 700 described species; a general introduction to the group can be found in San Martín (2003), Aguado *et al*. (2012), and San Martín & Aguado (2014). The syllids are a common polychaete group in Brazilian waters, especially in the shallow habitats. Up to now, considering only those accounted for in taxonomic publications, 96 species of syllids are known from Brazilian waters, most of these records are from coastal regions and from Southeastern Brazil (Moura *et al*. 2018), with only a few from the continental slope and the deep sea (Barroso *et al*. 2017). The genus *Branchiosyllis* Ehlers, 1887 has a circumtropical distribution, and currently only four species have been reported from Brazil: *B. diazi* Rioja, 1958, *B. oculata* Ehlers, 1887 and *B. tamandarensis* Paresque, Fukuda & Nogueira, 2016 only from Northeastern Brazil, and *B.* cf. *exilis* (Gravier, 1900) present in Northeast and Southeast Brazil (Paresque *et al*. 2016).

Despite being absent in most of its species, the genus was named after the "branchiae", which are dorsal evaginations of the parapodial lobes of unknown physiological function (San Martín *et al*. 2013). Syllids of the genus *Branchiosyllis* are easily recognized by the presence of "ungulae", modified, claw-shaped falciger chaetae with blades rotated 90° compared to their usual position, distributed across the body or restricted to the mid- and posterior body regions (Góngora-Garza *et al*. 2011; Álvarez-Campos *et al*. 2012). In terms of the systematics of the group, the ungulae are important to define *Branchiosyllis* as a monophyletic clade (Aguado *et al*. 2012).

Branchiosyllis species are found in several substrates (coral rubble, sand, algae) and in association with other invertebrates such as sponges, bryozoans, ascidians or brittle stars (Álvarez-Campos *et al*. 2012). The number of described species within the genus has greatly increased in the last few years (San Martin *et al*. 2008, 2013; Góngora-Garza *et al*. 2011; Álvarez-Campos *et al*. 2012; Paresque *et al*. 2016; Lucas Rodríguez *et al*. 2018) and currently it stands at 24, including the new species described herein. In this article, we describe two new species of *Branchiosyllis* associated with marine sponges from Brazilian shallow tropical waters of Todos os Santos Bay, Fernando de Noronha Island and Rocas Atoll. Also, we provided a synoptic table with detailed comparison among the most similar congeneric species and an identification key to all species reported in Brazilian waters.

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Material and methods

The specimens were collected in two oceanic islands and in a coastal region, in Northeastern Brazil, SW Atlantic (Fig. 1A). The first locality is known as Buraco da Raquel, in the Fernando de Noronha island (Fig. 1B), located 360 km off the coast of Natal, state of Rio Grande do Norte, Brazil (3°52' S, 32°25' W). The second and third localities are known as Canal da Barretinha and Piscina das Tartarugas, respectively, in the Rocas Atoll (Fig. 1C), the only atoll in the South Atlantic Ocean, at 260 km NE of Natal, Rio Grande do Norte, Brazil (3°51' S, 33°40' W). The fourth locality is known as Ilha dos Frades, a coastal environment in the Todos os Santos Bay (Fig. 1D), Salvador, Bahia, Brazil (12°46'47.55" S, 38°37'11.32" W).

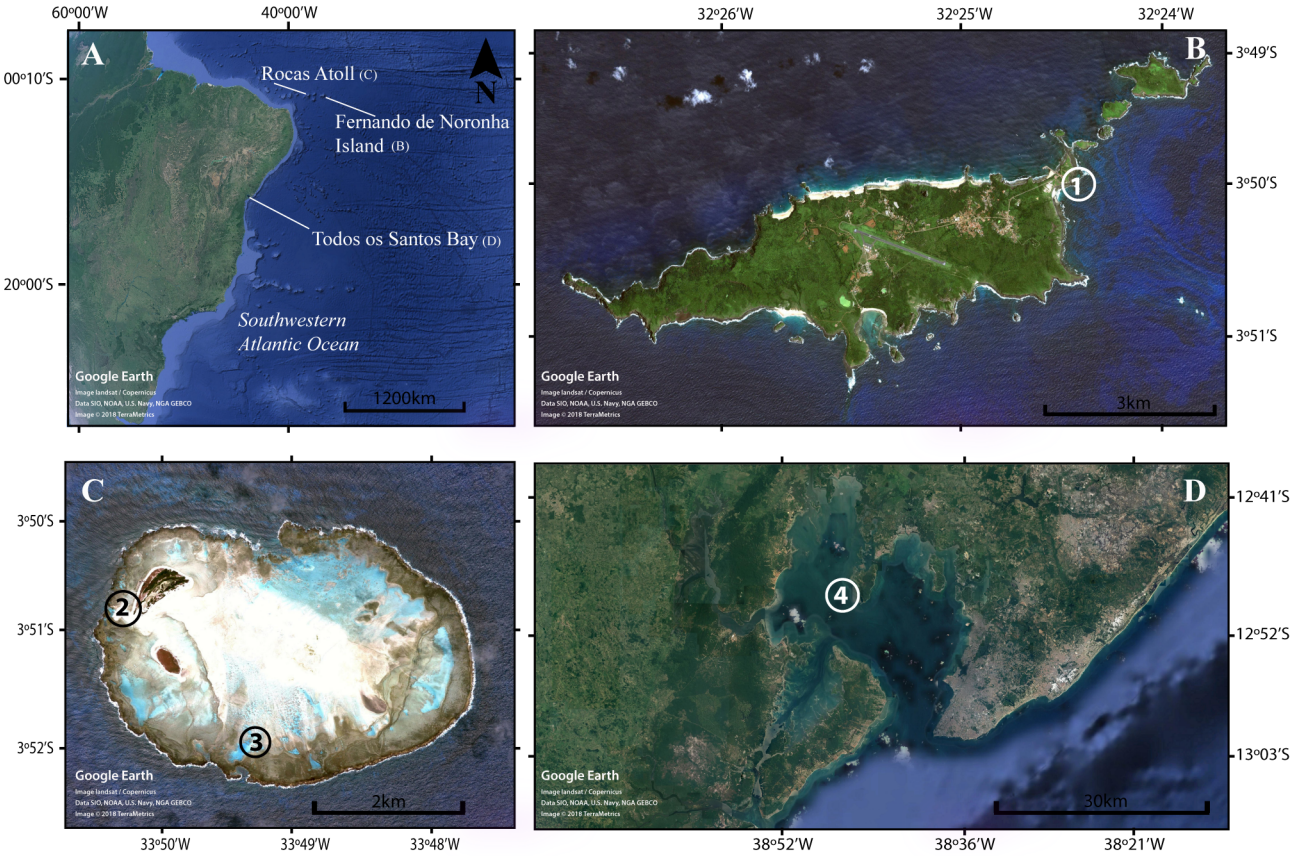

FIGURE 1. Map showing collection localities. A, the two oceanic islands and a coastal region in Northeastern Brazil; B, Fernando de Noronha Island, 1: Buraco da Raquel; C, Rocas Atoll, 2 and 3: Canal da Barretinha and Piscina das Tartarugas, respectively; D, Todos os Santos Bay, 4: Ilha dos Frades. Colors of numbers and circles are just for a better view.

All specimens of *Branchiosyllis* analyzed were found associated with sponges. The specimens were fixed in 92% ethanol and preserved in the same solution. Morphological traits were observed and measured under a Zeiss Stemi SV 11 stereomicroscope and Zeiss Axio Lab A1 microscope. In addition, some specimens were examined using scanning electron microscopy (SEM). For SEM, specimens were first dehydrated in a graded series of increasing concentrations of ethanol (92–100%), critical point-dried, coated with ~35 nm of gold, and examined and photographed at the Laboratório de Imagem e Microscopia Óptica e Eletrônica (LABIM–UFRJ). Line drawings were done from slide-mounted specimens with the aid of a drawing tube. The length of specimens was measured from the tip of palps to the tip of pygidium, excluding anal cirri; width was measured at proventricular level, excluding parapodia. Type material and other examined specimens are deposited at the Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJP), Brazil, and at the Museu de Zoologia, Universidade de São Paulo (MZUSP), Brazil.

Results

Family Syllidae Grube, 1850

Subfamily Syllinae Grube, 1850

Genus *Branchiosyllis* Ehlers, 1887

Type species: *Branchiosyllis oculata* Ehlers, 1887

Diagnosis. Body slender with medium to large size, with numerous segments, subcylindrical, dorsoventrally flattened or, in a few species, laterally compressed. Palps totally free from each other or partially free along half of their length. Prostomium with four eyes, some species also with two anterior eyespots, and three antennae. Two pairs of peristomial cirri. Antennae, peristomial, dorsal and anal cirri distinctly articulated. Parapodial lobes dorsally provided with branchiae in some species. Modified falciger chaetae with blades rotated 90°, claw-shaped ('ungulae'). Simple chaetae absent. Pharynx with anterior tooth, trepan absent, with soft papillae on opening in some species. Proventricle usually as long as pharynx. Reproduction by acephalous stolon (cf. San Martín 2005).

Identification key of the genus *Branchiosyllis* currently recorded from Brazilian waters

1	Branchiae absent	*B. exilis* (Gravier, 1900)
-	Branchiae present	2
2(1)	Chaetae as bidentate and unidentate falcigers; ungulae from midbody parapodia onwards	*B. diazi* Rioja, 1958
-	Chaetae as ungulae only	3
3(2)	Flattened, dome-shaped or pyriform branchiae	4
-	Lobulated branchiae	5
4(3)	Relatively small, subcylindrical body; ovate to pyriform branchiae; pharynx and proventricle through 3.5 and 3 segments respectively	*B. belchiori* **sp. nov.**
-	Relatively large, flattened to dome-shaped branchiae, proventricle through 8 segments	*B. oculata* Ehlers, 1887
5(3)	Subcylindrical to slightly flattened body; branchiae with up to five lobes; antennae inserted in line	*B. gonzaguinhai* **sp. nov.**
-	Flattened body; branchiae with up to six lobes; median antenna inserted posteriorly in relation to lateral antennae	*B. tamandarensis* Paresque, Fukuda & Nogueira, 2016

Branchiosyllis belchiori sp. nov.

Figures 2–5; Table 1

Type series. *Holotype*: Atlantic Ocean, Brazil, state of Bahia, Todos os Santos Bay, Ilha dos Frades (12°46'47"S, 38°37'11"W), 3 m depth, associated with *Haliclona caerulea*: (MNRJP1430). *Paratypes*: Atlantic Ocean, Brazil, state of Bahia, Todos os Santos Bay, Ilha dos Frades (12°46'47"S, 38°37'11"W), 3 m depth, associated with *Haliclona caerulea:* four paratypes (MNRJP1431–MNRJP1434) coll. R. Dias, 16. Nov. 2015. Morphological data from specimens of the type series provided in Table 1.

Additional Material. Atlantic Ocean, Brazil, state of Bahia, Todos os Santos Bay, Ilha dos Frades (12°46'47"S, 38°37'11"W), 3 m depth, associated with *Haliclona caerulea*: 6 specimens (MNRJP1436), coll. R. Dias, 16. Nov. 2015; state of Pernambuco, Fernando de Noronha Island, Buraco da Raquel (3°50'11"S, 32°20'34"W), 0.5 m depth, associated with *Haliclona caerulea*: 2 specimens (MNRJP1437), coll. R. Nascimento, 21. April. 2016.

TABLE 1. Morphological variation among selected characters of the type series of *Branchiosyllis belchiori* **sp. nov.**

	Holotype MNRJP1430	**Paratype 1 MNRJP1431**	**Paratype 2 MNRJP1432**	**Paratype 3 MNRJP1433**	**Paratype 4 MNRJP1434**
Number of chaetigers / Total length × width at proventricle (mm)	42 / 4 × 0.32	48 / 5 × 0.30	42 / 4.1 × 0.31 (incomplete)	47 / 4.4 × 0.31	28 / 2.7 × 0.3 (incomplete)
Length of pharynx (chaetigers/mm)	3.5	3.5	3.5	3.5	3.5
Length of proventricle (chaetigers/mm) × number of muscle cell rows	3 × 24	3 × 26	3 × 25	3 × 25	3 × 24
Number of articles					
Median antenna	9	12	10	12	lost
Lateral antennae (left, right)	10, 11	11, 11 (lost)	lost, lost	lost, lost	10, 11
Dorsal peristomial cirri (left, right)	23, 20	23, 19	21, lost	21, lost	23, 24
Ventral peristomial cirri (left, right)	10, 11	10, lost	lost, lost	lost, lost	11, 12
Number of ungulae per parapodium					
Anterior body	3–4	3–4	3–4	3–4	3
Midbody	3–5	5–5	3–5	3–5	3–5
Posterior body	2–3	3	2–3	2–3	lost
Number of aciculae per parapodium (anterior/mid-/posterior body)	1 / 1 / 1	1 / 1 / 1	1 / 1 / 1	1 / 1 / 1	1 / 1 / 1

Description. Holotype complete, 4 mm long, 0.32 mm wide, with 42 segments (Figs 2A–B; 3A; Table 1). Longest specimen analysed paratype 1, 5 mm long, 0.3 mm wide, with 48 segments (Table 1). Body subcylindrical (Figs. 2A–B; 3A). Live specimens pigmented, dorsally with brownish spots on prostomium and alternating chaetigers with no pigmentation and chaetigers with brown transverse stripes interrupted in the center, forming dark spots on each side (Figs 2A–B, D–E; 3A); orange colored in ventral view, organized in thin bands more concentrated in the mouth region and becoming sparser and clearer towards proventricle (Fig. 2C). Color pattern preserved in specimens maintained in 92% ethanol. Distally rounded palps, fused only at bases (Figs 2A–C; 3A). Prostomium subpentagonal to ovate, with two pairs of eyes in trapezoidal arrangement (Figs 2B; 3A). Lateral antennae inserted on anterior margin of prostomium, with 10–11 articles each; median antenna inserted between and slightly anteriorly to anterior pair of eyes, slightly posteriorly to lateral ones, of similar size as lateral antennae, longer than combined length of prostomium and palps, with 9–12 articles (Figs 2B; 3A). Peristomium dorsally inconspicuous, covered by chaetiger 1 (Fig. 3A); dorsal peristomial cirri longer than median antenna, with 19–23 articles each (Figs 2A–B; 3A), proportionally longer in juveniles (Fig. 2E); ventral peristomial cirri shorter than dorsal ones, with 10–12 articles each (Fig. 3A; Table 1). Chaetiger 1 with a mid-dorsal projection over peristomium and prostomium (Fig. 3A). Dorsal cirri on chaetiger 1 with 15–17 articles each; on chaetiger 2 with 12–15, on chaetiger 3 with 17–20 articles, on chaetiger 4 with 10–13 articles, and on chaetiger 5 with 13–16 articles each (Fig. 3A); dorsal cirri slightly alternating in length in remaining chaetigers, longer cirri with 17 articles, shorter cirri with 12 articles (Figs 2A–B; 3A; 5A). Ventral cirri digitiform, inserted at midlength of parapodial lobes, extending until tip of parapodial lobes or slightly beyond (Fig. 3C). Parapodia distally bilobed, pre-chetal lobe larger than post-chaetal one, both digitiform (Figs 3B, C; 5D). Single branchia per parapodium, dorsally inserted close to base of parapodial lobes, well developed; ovate to pyriform, slightly flattened (Figs 3B–C; 4A–B; 5A). Compound chaetae as ungulae only, regular falcigers absent; anterior body with 3–4 ungulae per parapodium; midbody with 3–5, posterior body with 2–3 ungulae per parapodium (Table 1); ungulae with shafts subdistally slightly spinulated (Fig. 5C–D), shafts progressively thicker ventralwards throughout body (Fig. 3D–F); blades unidentate with dorsoventral gradation in length, ventralmost ungulae larger and slightly thicker than dorsalmost ones throughout (Figs 3D–F; 5B–D). Parapodia with only one acicula each, straight, slightly inflated and oblique subdistally, with acute, rounded tip slightly protruding from parapodial lobes; aciculae progressively thicker towards posterior body (Fig. 3G–I). Pygidium semicircular, with two articulated anal cirri slightly longer than posterior dorsal cirri (Fig. 2D,E), lost in most examined specimens. Pharynx slightly thinner than proventricle, through 3.5 segments (Table 1); conical pharyngeal tooth close to anterior border (Fig. 3A). Proventricle through three segments, with 24–26 rows of muscle cells (Figs 2A–C; 3B; Table 1).

Reproduction. One specimen with 40 chaetigers was found with attached pigmented acephalous stolon, 0.61 mm long, 0.25 mm wide, with 6–7 chaetigers (Fig. 2D). In addition, some juveniles were found (Fig. 2E), suggesting that the species completes its life cycle, or spends most of it, within the sponge.

Remarks. *Branchiosyllis belchiori* **sp. nov.** resembles *B. australis* Hartmann-Schröder, 1981, *B. lamellifera* Verrill, 1900, *B. oculata* Ehlers, 1887, *B. pacifica* Rioja, 1941, and *B. tamandarensis* by the presence of branchiae and only ungulae as compound chaetae throughout the body. *Branchiosyllis australis* has been reported from Western Australia and the Philippines; *B. pacifica* has been reported from the Eastern Tropical Pacific (Mexico), whereas both *B. lamellifera* and *B. oculata* occur in the North Atlantic region, in the Gulf of Mexico, and in the Caribbean Sea, respectively (Table 2). *Branchiosyllis tamandarensis* is the only of those species described from the South Atlantic, specifically from the states of Paraíba and Pernambuco, Northeastern Brazil, and to date is only known from the original description.

Branchiosyllis belchiori **sp. nov.** differs from all species mentioned above in the characteristic color pattern, in the size and shape of body, length of pharynx and proventricle, in the unique shape of branchiae, and the number of ungulae per parapodium (Table 2). *Branchiosyllis pacifica* lacks distinctive color pattern, *B. oculata*, *B. tamandarensis, B. lamellifera* and *B. australis* have uniform color pattern; in contrast, *B. belchiori* **sp. nov.** has brownish spots dorsally on the prostomium, and alternates chaetigers with no pigmentation and chaetigers with brown transverse stripes interrupted in the center, forming dark spots on each side (Table 2). Specimens of *B. australis*, *B. lamellifera*, *B. oculata*, *B. pacifica*, and *B. tamandarensis* have longer and wider bodies than *B. belchiori* **sp. nov.**, including larger pharynx and proventricle (Table 2). *Branchiosyllis lamellifera*, *B. pacifica*, and *B. tamandarensis* have multilobed branchiae with up to three, four, and six lobes, respectively; *B. oculata* branchiae are dome-shaped or slightly flattened, and in *B. australis*, branchiae are small, nearly inconspicuous.

TABLE 2. Morphological comparison of *Branchiosyllis* species with well-developed branchiae (adapted from Paresque *et al*. 2016).

	Branchiosyllis australis	***Branchiosyllis belchiori* sp. nov.**	***Branchiosyllis gonzaguinhai* sp. nov.**	***Branchiosyllis lamellifera***	***Branchiosyllis oculata***	***Branchiosyllis pacifica***	***Branchiosyllis tamandarensis***
Original description	Hartmann-Schröder, 1981	This paper	This paper	Verrill, 1900	Ehlers, 1887	Rioja, 1941	Paresque *et al.* 2016
Additional descriptions	San Martín *et al.* (2008)	none	none	Pawlik, (1983) (as *B. oculata*) and Álvarez-Campos *et al.* (2012)	Rioja (1941) and Uebelacker (1984)	Capa (2003)	none
Color pattern	Uniformly light brown	Alternating chaetigers with brown transversal stripes interrupted in the center, with dark spots on each side and unpigmented chaetigers	Holotype with brownish spots on prostomium and dark spots on each side of the segments, in the base of the cirrophores. Other specimens less pigmented or without pigmentation	Yellowish, brown, purple, depending on the sponge in which the specimens dwell	Uniformly dark (brown to black)	Absent	Yellowish to orange
Length (mm)	100	5	4.6	20	21	8.5	5.5
Width (mm)	0.8	0.3	0.40	2	2.8	1.5	0.8
Peristomium	Dorsally reduced	Dorsally reduced	Dorsally reduced	Dorsally reduced	Dorsally reduced	Dorsally reduced	Dorsally reduced
Number of chaetigers	92 (+11 stolon)	48	52	140	112	71	52
Shape of branchiae	Very small and without pigment	Ovate to piriform	Up to five lobes	Up to three lobes	Dome or slightly flattened	Up to four lobes	Up to six lobes
Number of anterior/posterior ungulae	4–6 / 3–2	3–6 / 2–3	4–5 / 4–6	3 / 3	3–5 / 3–5	2–4 / 2–4	4–6 / 2–3
Pharynx length (number of segments)	5	3.5	5	9	6	5–7	5
Proventricle length (number of segments)	6–7	3	4	9	8	4–5	3.5–5
Number of muscle cell rows in proventricle	26–30	24–27	24	30	22	22	25–30
Habitat	Sponges, algae, coral rubble	Associated with the sponge *Haliclona caerulea*	On and within sponges	On and within sponges	Sand, algae, coral rubble	Coral rubble, algae	On and within sponges
Distribution	Western Australia, Philippines	Brazil (Todos os Santos Bay, Fernando de Noronha Island)	Brazil (Fernando de Noronha Island and Rocas Atoll)	Bermuda, Gulf of Mexico	Caribbean Sea (Florida, Cuba, Mexico, Venezuela)	Eastern Tropical Pacific (Mexico, Panama)	Only known from type locality. South Atlantic (states of Paraíba and Pernambuco)

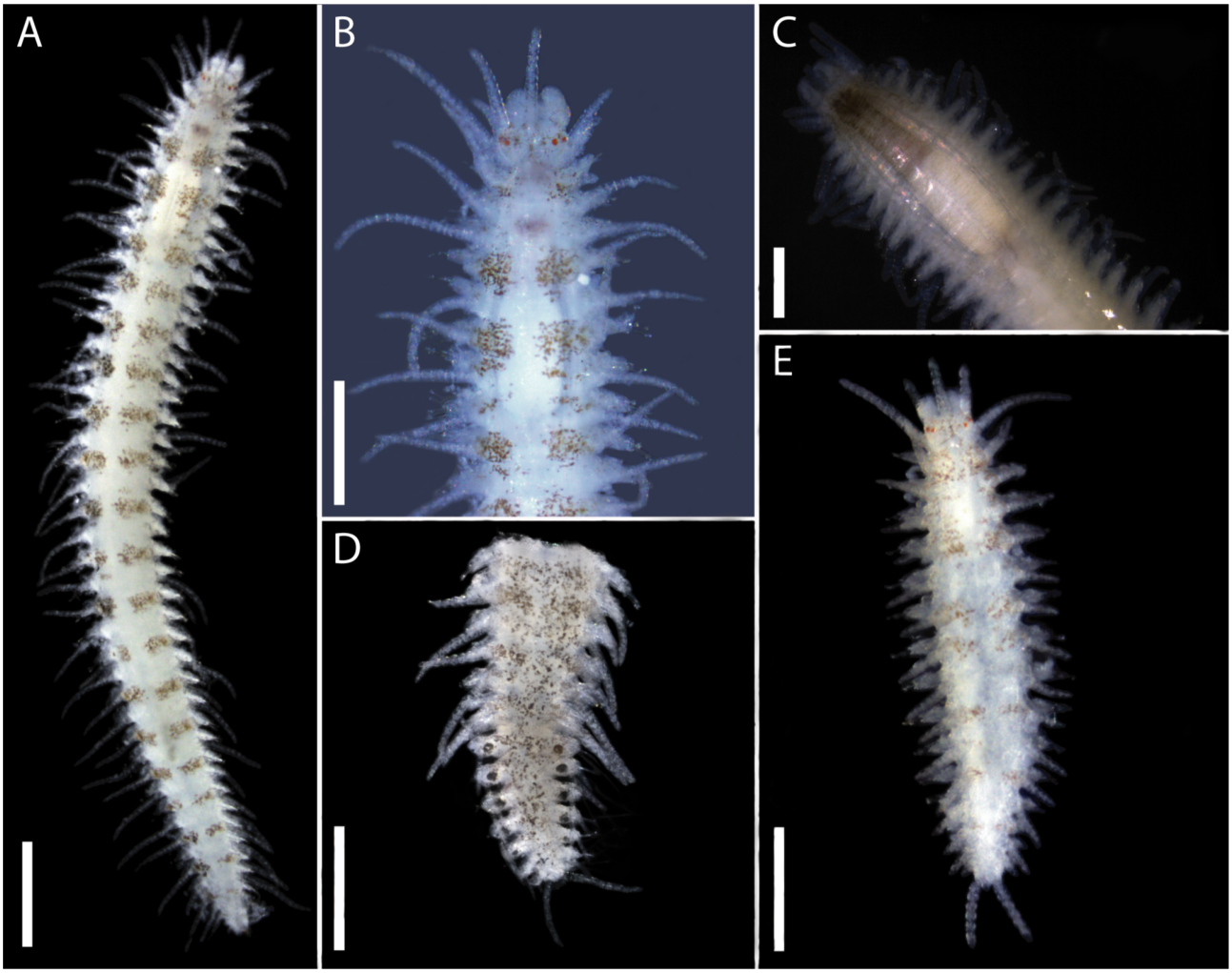

FIGURE 2. *Branchiosyllis belchiori* **sp. nov.** A, complete specimen, dorsal view; B, anterior body, dorsal view; C, anterior body, ventral view; D, acephalous stolon, dorsal view; E, juvenile specimen, dorsal view. Scale bars: A, B, D, 0.5 mm; C and E, 0.2 mm.

Habitat. Species found in association with the sponge *Haliclona caerulea* (Hechtel, 1965). Infestation was accomplished by few specimens in a small sponge fragment (2–5 cm^3 in volume). The collection methods prevented us to confirm whether this association is species-specific.

Distribution. South Atlantic, Brazil: states of Bahia (Todos os Santos Bay) and Pernambuco (Fernando de Noronha Island).

Etymology. Named after Antônio Carlos Belchior (stage name Belchior), a remarkable Brazilian popular singer and songwriter (02.Oct.1946 — 30.April.2017) who has amazed and inspired generations with his talent, and who is the first author's favorite artist.

Branchiosyllis gonzaguinhai **sp. nov.**
Figures 6–8; Table 3

Type series. *Holotype* (MNRJP 1912): Atlantic Ocean, Brazil, state of Pernambuco, Fernando de Noronha Island, Buraco da Raquel (3°50'11"S, 32°24' 34"W), 1 m depth, on *Plakortis insularis*, coll. R. Nascimento, 21. April. 2016. *Paratypes*: Atlantic Ocean, Brazil, state of Rio Grande do Norte, Rocas Atoll, Piscina das Tartarugas (3°52'20.5"S, 33°48'31.4"W), 1 m depth, on sponges: *Paratype* 1 (MZUSP 3533), coll. 21. Oct. 2000; Canal da Barretinha (3°51'35.3"S, 33°49'04.6"W), 1 m depth, on sponges: Paratype 2 (MZUSP 3534), *Paratype* 3 (MNRJP 1913), coll. 10. Oct. 2000; state of Pernambuco, Fernando de Noronha Island, Buraco da Raquel (3°50'11"S,

32º24’ 34”W), 1 m depth, on *Aiolochroia crassa*: Paratype 4 (MNRJP 1914), Paratype 5 mounted for SEM (MNRJP 1983) coll. R. Nascimento, 21. April. 2016. Morphological data from specimens of the type series provided in Table 3.

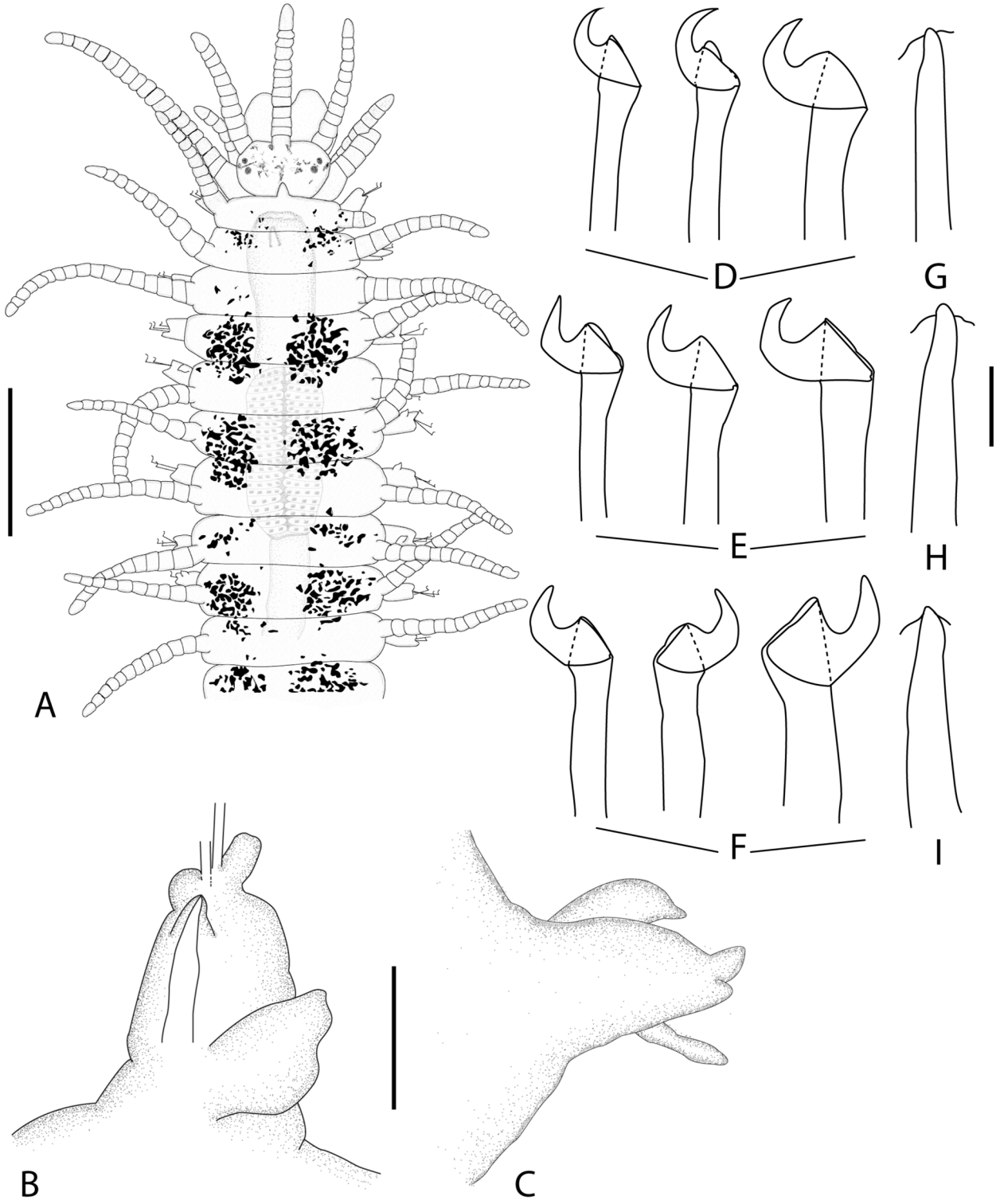

FIGURE 3. *Branchiosyllis belchiori* **sp. nov.** A, anterior body, dorsal view; B, anterior parapodium, dorsal view; C, midbody parapodium, lateral view; D, E, F, ungulae, anterior, mid-, and posterior body, respectively; G, H, I, aciculae, anterior, mid-, and posterior body, respectively. Scale bars: A, 0.28 mm; B and C, 28 µm; D–I, 10 µm.

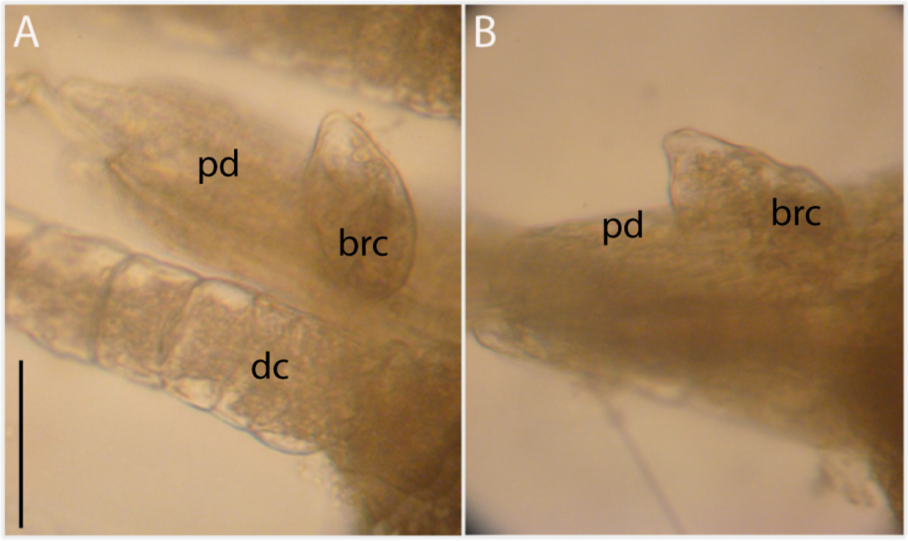

FIGURE 4. *Branchiosyllis belchiori* **sp. nov.** A, dorsal, and B, dorso-lateral view of branchiae. **dc**—dorsal cirrus; **pd**—parapodium; **brc**—branchia. Scale bar: A, B, 30 µm.

Description. Holotype complete, with 4.6 mm long, 0.40 mm wide, with 52 segments (Figs 6A; 7A; Table 3). Longest specimen analyzed paratype 1 (MZUSP 3533), 6.6 mm long, 0.47 mm wide, with 55 segments (Table 3). Subcylindrical to slightly flattened body (Figs 6A; 7A; 8A). Holotype pigmented, dorsally with brownish spots on prostomium and dark spots on each side of the segments, close to bases of cirrophores (Fig. 6A). Distally rounded palps fused only at bases (Figs 6A, D; 7A; 8B). Prostomium subpentagonal to rectangular, with two pairs of eyes in trapezoidal arrangement (Figs 6A; 7A); antennae inserted on anterior margin of prostomium; median antenna with 13–17 articles, lateral antennae with 13–17 articles each (Figs 6A; 7A; 8A; Table 3). Nuchal organs as pair of densely ciliated rows dorso-laterally located on posterior border of prostomium (Fig. 8C). Peristomium dorsally inconspicuous, covered by chaetiger 1 (Figs 7A; 8C); dorsal peristomial cirri longer than median antenna, with 25–31 articles each (Table 3); ventral peristomial cirri shorter than dorsal ones, with 12–15 articles each (Table 3). Chaetiger 1 with dorsal projections as rounded swollen areas at bases of cirrophores, and a mid-dorsal, triangular projection over peristomium and prostomium (Figs 7A; 8C). Dorsal cirri on chaetiger 1 with 18–25 articles each; on chaetiger 2 with 16–26, on chaetiger 3 with 26–36 articles, on chaetiger 4 with 15–20 articles, and on chaetiger 5 with 17–24 articles each; dorsal cirri slightly alternating in length in remaining chaetigers, longer cirri with up to 34 articles, shorter cirri with up to 20 articles (Figs 6A; 7A; 8A). Ventral cirri digitiform, inserted at midlength of parapodial lobes, not reaching tip of parapodial lobes (Figs 6C; 8B). Parapodia distally bilobate, pre-chaetal lobe larger than post-chaetal one, both digitiform (Fig. 8G). A single branchia per parapodium, dorsally inserted, well-developed, multilobulated (Fig. 8A, D–F), with up to five lobes (Fig. 8E), and granular appearance internally. Compound chaetae as ungulae only, regular falcigers absent; anterior body with 4–5 ungulae per parapodium; midbody with 4–6, posterior body with 4–6 ungulae per parapodium (Table 3); ungulae with shafts subdistally slightly spinulated, shafts progressively thicker ventralwards throughout body (Figs 7C–E; 8G, H); blades unidentate with dorsoventral gradation in length, ventralmost ungulae larger and thicker than dorsalmost ones throughout (Figs 7C–E; 8H). Aciculae straight, with acute tip, progressively slightly thicker towards posterior body; anterior parapodia with two aciculae each (Fig. 7F); midbody and posterior parapodia with only one acicula each (Fig. 7G, H; Table 3), sometimes slightly protruding from parapodial lobes (Figs 7F–H; 8H). Pygidium semicircular, with two articulated anal cirri approximately as long as posterior dorsal cirri (not considering cirri of growth region). Pharynx thinner than proventricle (Figs. 6A; 7B), through 5–5.5 segments (Table 3), with opening surrounded by 11 soft papillae (Figs 6B, D; 8B); conical pharyngeal tooth close to anterior border (Fig. 7B). Proventricle through 4–5 segments, with 21–24 rows of muscle cells (Fig. 7B; Table 3).

Variation. *Branchiosyllis gonzaguinhai* **sp. nov.** shows some variation in pigmentation: the holotype has dark brown spots on prostomium and dorsally on each side of segments, in the bases of cirrophores; in some segments there is a thin and sparse line of these dark brown spots, however, in Paratype 1 (MZUSP 3533, there is only a thin and sparse line present. In Paratype 5 (MNRJ 1983), the median antenna is originated slightly posteriorly than

lateral ones. The dorsal projection on first chaetiger is slightly shorter in some specimens analyzed. We consider these variations as intraspecific.

Remarks. *Branchiosyllis gonzaguinhai* **sp. nov.** differs from all its congeners in having a pair of dorsal swollen areas close to bases of cirrophores on first chaetiger (Fig. 8A, C), however, the new species herein described resembles *B. lamellifera* Verril, 1900, *B. pacifica* Rioja, 1941, and *B. tamandarensis* Paresque, Fukuda & Nogueira, 2016 by having multi-lobed branchiae and only ungulae on all parapodia (Álvarez-Campos *et al.*, 2012; Paresque *et al*., 2016).

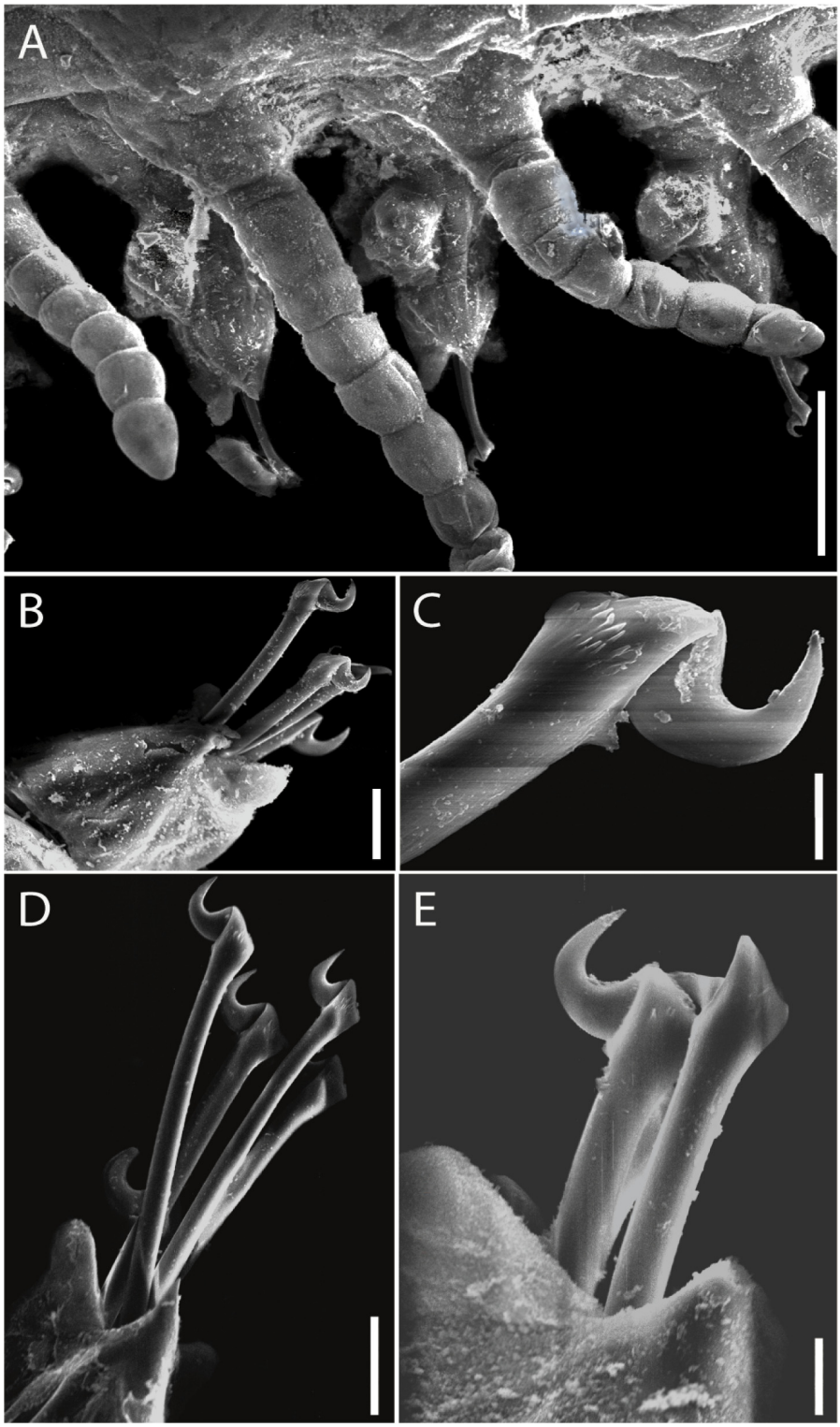

FIGURE 5. *Branchiosyllis belchiori* **sp. nov.** A, midbody parapodia, dorsal view; B, C, ungulae anterior body; D, E, ungulae mid- and posterior body, respectively. Scale bars: A, 50 µm; B, 10 µm; C, 2 µm; D, 10 µm; E, 5 µm.

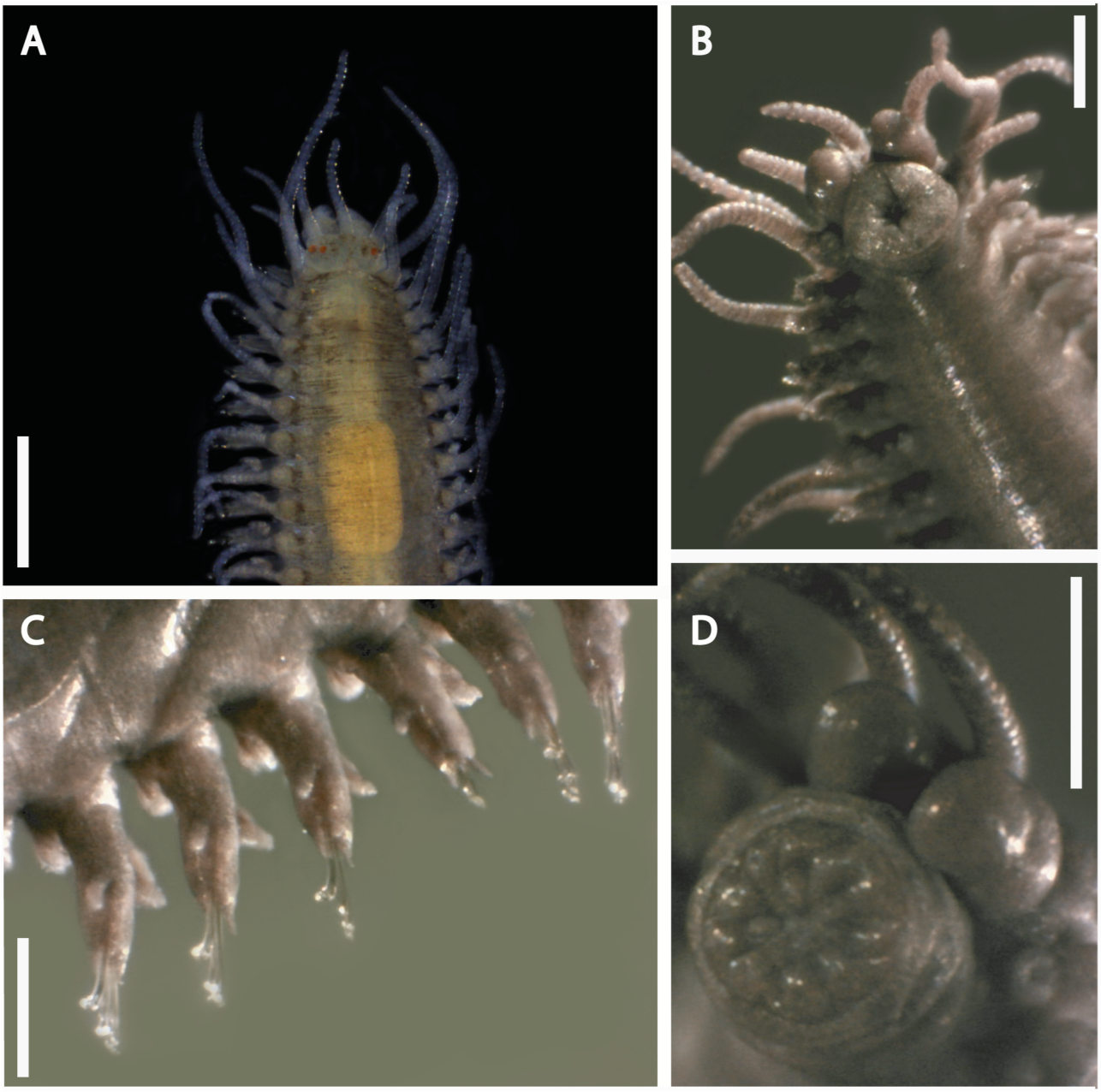

FIGURE 6. *Branchiosyllis gonzaguinhai* **sp. nov.** A, anterior body, dorsal view; B, anterior body, ventral view; C, parapodial lobes, ventral view; D, partially everted pharynx, fronto-ventral view. Scales bars: A, 0.30 mm; B and D, 0,11 mm; C, 81µm.

Branchiosyllis tamandarensis is the most similar species to *B*. *gonzaguinhai* **sp. nov.** *B. tamandarensis* has a yellowish to orange color, whereas *B. gonzaguinhai* **sp. nov.** has dark brown spots dorsally, on each side of each segment (Table 2). Furthermore, *B. tamandarensis* presents wider bodies, branchiae with up to six lobes and median antenna inserted between or slightly anteriorly to anterior pair of eyes, whereas *B. gonzaguinhai* **sp. nov.** has branchiae with up to five lobes and median antenna inserted in line with the lateral ones (Table 2).

Branchiosyllis lamellifera and *B. pacifica* are larger and wider than *B. gonzaguinhai* **sp. nov. (**Table 2). *Branchiosyllis*. *lamellifera* and *B. pacifica* have multilobed branchiae with up to three and four lobes respectively, whereas *B. gonzaguinhai* **sp. nov.** has branchiae with up to five lobes (Table 2). The species also differ in the number of ungulae, with *B. gonzaguinhai* **sp. nov.** presenting comparatively more ungulae per parapodium on anterior and posterior body (Table 2). *B*. *gonzaguinhai* **sp. nov.** has both median and lateral antennae longer than *B. pacifica*, and dorsal and ventral peristomial cirri longer than *B. lamelifera* and *B. pacifica* (San Martín *et al*. 2013). Finally, *B. lamellifera* has pharynx and proventricle larger than *B. gonzaguinhai* **sp. nov.** (Table 2).

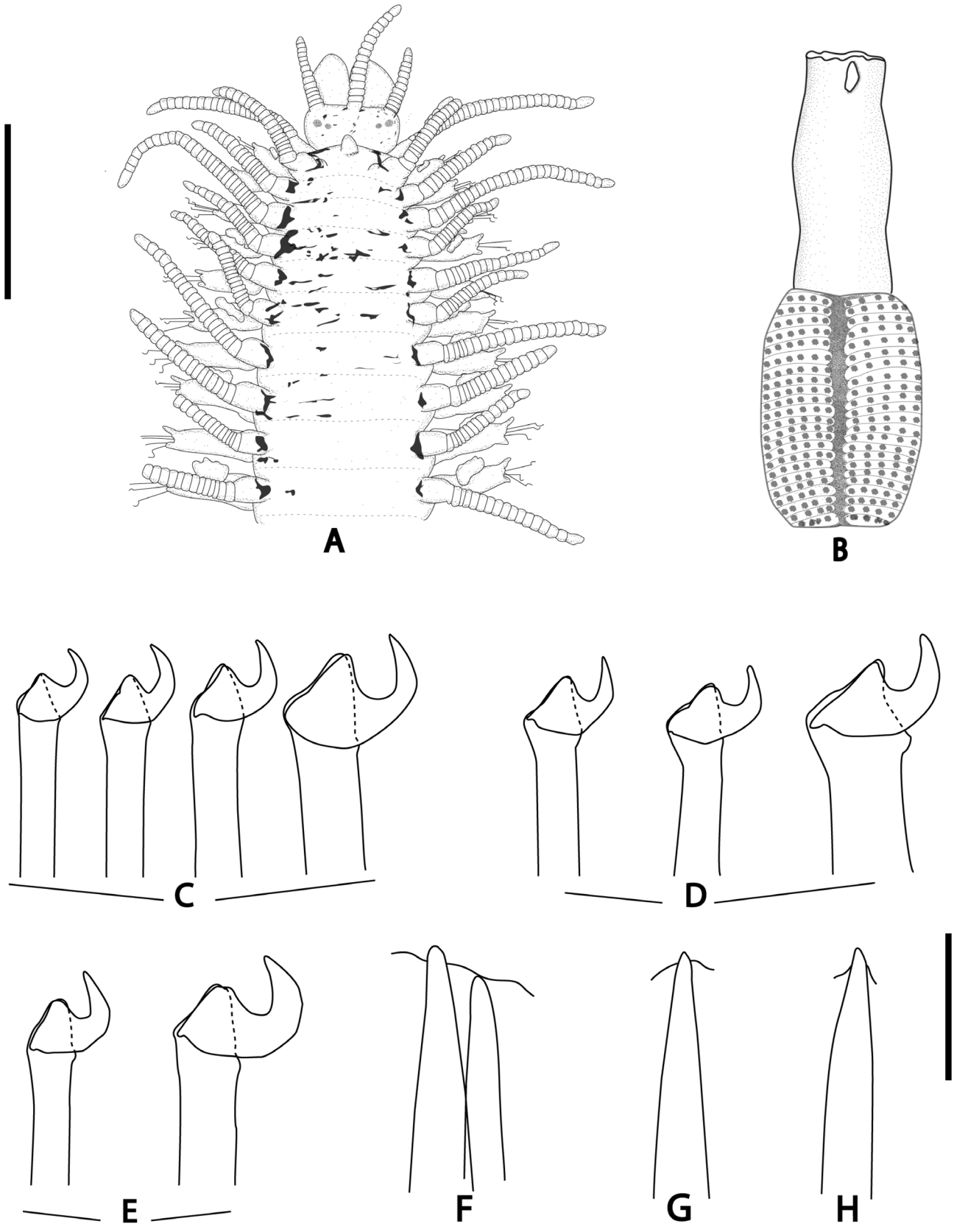

FIGURE 7. *Branchiosyllis gonzaguinhai* **sp. nov.** A, anterior body, dorsal view; B, pharynx and proventricle, dorsal view; C, D, E, ungulae, anterior, mid- and posterior body, respectively; F, G, H, aciculae, anterior, mid- and posterior body, respectively. Scale bars: A and B, 0.40 mm; C–H, 20 µm.

TABLE 3. Morphological variations among selected characters of the type series of *Branchiosyllis gonzaguinhai* **sp. nov.**

	Holotype MNRJP 1912	**Paratype 1 MZUSP 3533**	**Paratype 2 MZUSP 3534**	**Paratype 3 MNRJP 1913**	**Paratype 4 MNRJP 1914**	**Paratype 5 MNRJP 1983**
Number of chaetigers / Total length x width at proventricle (mm)	52 / 4.6 x 0.40	55 / 6.6 x 0.47	56 / 5.25 x 0.42	36 / 4.5 x 0.42 incomplete	39 / 4.5 x 0.50 Whole body with dark purple pigmentation	27 / 3.7 x 0.48 (incomplete) Whole body with dark purple pigmentation. Mounted for SEM
Length of pharynx (chaetigers)	5	5.5	5.5	5	not visible	not visible
Length of proventricle (chaetigers x number of muscle cell rows)	4 x 24	4 x 21	5 x 23	4.5 x 22	not visible	not visible
Number of articles						
Median antenna	16	13	14	14	17	17
Lateral antennae	15, 13	16, 17	14, 14	13, lost	lost, 14	13, 14
Dorsal peristomial cirri (left, right)	25, 30	28, 29	31, 21 incomplete.	27, lost	26, 27	31, 30
Ventral peristomial cirri (left, right)	lost, 13	lost, 13	13, lost	15, 13	13, 13	12, 13
Number of ungulae per parapodium						
Anterior body	4–5	4–5	4–5	4–5	4–5	4–5
Midbody	4–5	5–6	4–5	4–5	4–5	4–6
Posterior body	4–6	5-6	4–5	lost	4–5	lost
Number of aciculae per parapodium (anterior/midbody/ posterior body)	2 / 1–2/ 1	2 / 1–2/ 1	2 / 1–2/ 1	2 / 1–2/ lost	2 / 1–2/ 1	2 / 1–2 / lost

Habitat. Species found in association with sponges. The holotype was collected in *Plakortis insularis* Moraes & Muricy, 2003, and the paratype 4 in *Aiolochroia crassa* (Hyatt, 1875) from the Fernando de Noronha Island. The paratypes 1, 2, 3 and 5, from Rocas Atoll, were "on and within sponges", without more information about these sponges. Moraes (2011) reported both *Plakortis insularis* and *Aiolochroia crassa* from Rocas Atoll.

Distribution. South Atlantic, Brazil: states of and Pernambuco (Fernando de Noronha Island) and Rio Grande do Norte (Rocas Atoll).

Etymology. Named after Luiz Gonzaga do Nascimento Júnior (stage name Gonzaguinha), a remarkable Brazilian popular songwriter and singer (22.Sept.1945–29.April.1991) who has amazed and inspired generations with his talent, especially for his artistic production during the last period of military dictatorship in Brazil.

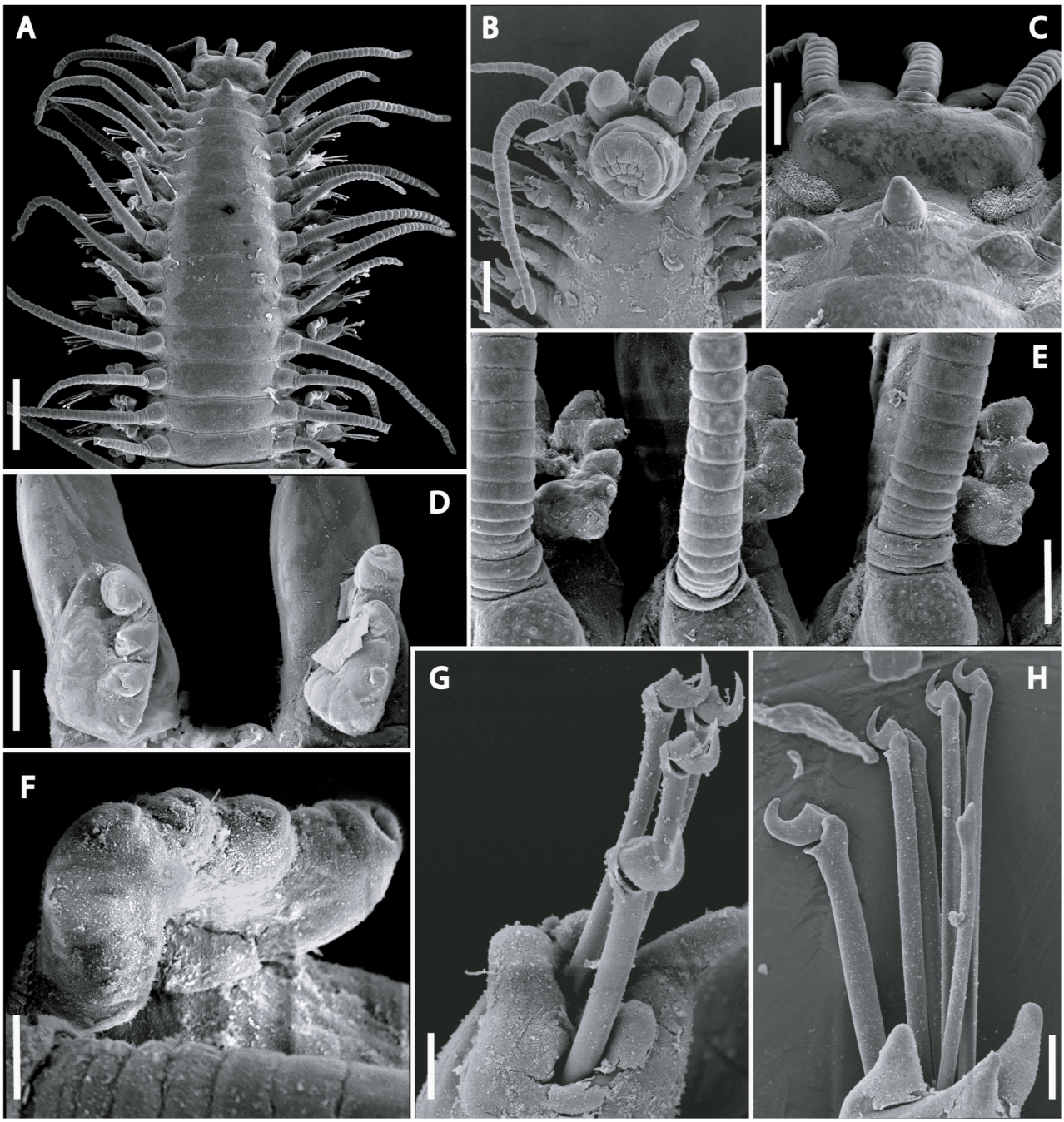

FIGURE 8. *Branchiosyllis gonzaguinhai* **sp. nov.** A, anterior body, dorsal view; B, anterior body, ventral view; C, close up view of prostomium and chaetigers 1–2, dorsal view; D, branchiae, mid-posterior body parapodia; E, F, branchiae, anterior and midbody parapodia, respectively; G, ungulae, anterior parapodia; H, ungulae, mid-posterior parapodia, white arrow indicating protruding acicula. Scale bars: A, 250 µm; B, 100 µm; C and E, 50 µm; D, 25 µm; F and H, 20 µm; G, 10 µm.

Discussion

Recently Moura *et al*. (2018) published a list of all species of Syllidae recorded from Brazilian waters. Until the present paper there were 150 species reported from Brazilian waters (Amaral *et al*. 2013; Moura *et al*. 2018), but only 96 species formally published, with description, illustration and voucher number for deposited material; most of these records are from coastal and shallow habitats and from the Southeast region (Moura *et al*. 2018). The syllids from the Northeastern region accounts with only 34 of these species (Moura *et al*. 2018). The two new species described herein raise these numbers to 98 and 36, respectively. Paiva *et al*. (2007) published a list of some polychaetes from Rocas Atoll, a total of five syllid species, including *Branchiosyllis oculata* (Ehlers, 1887); however, this record lacks a description and details on deposited material. The present paper is the first on Syllidae taxonomy in Brazilian oceanic islands.

Species in the genus *Branchiosyllis* appear to be divided into two groups based on body shape and presence of branchiae and ungulae (San Martín *et al*. 2008). The first group comprises species that have dorsoventrally flattened bodies and possess branchiae and compound chaetae as ungulae only, without regular falcigers; the second group includes species with subcylindrical body shape, lacking branchiae, and having ungulae only on mid- and posterior body. This division, however, is not clear-cut, as many species possess features from both groups, highlighting the need for further studies on the phylogenetic relationships within the genus (Álvarez-Campos *et al*. 2012; Lucas Rodriguez *et al*. 2018). The new species herein described are further examples of this mixture, by having bodies rather more subcylindrical (especially in *B. gonzaguinhai* **sp. nov.)**, but presenting branchiae, and ungulae as the only type of compound chaetae throughout the body.

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