



***Eurycercus (Bullatifrons) norandinus* (Crustacea: Branchiopoda: Eurycercidae), a new species of Cladocera in the Neotropical Region**

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Abstract

Eurycercus (Bullatifrons) norandinus **sp. nov.** is described from Lago de Tota, Boyacá, Colombia. It differs from other species of subgenus *Bullatifrons* in the lower number of denticles on the dorsal margin of the postabdomen, the lower number of denticles on the postadominal claw, and the higher number of denticles on scrapers 2, 3 and 4 of trunk limb II. Regression statistics comparing the new species with other species of the subgenus indicate that during ontogeny, the rate of increase in teeth number of the dorsal margin of the postabdomen in relation to postabdominal length is higher than in other species. With the present record, the distribution of *Eurycercus* expands to the central part of the Neotropical Region and that of subgenus *Bullatifrons* to South America.

Key words: taxonomy, benthic Cladocera, Andean lake, Lago de Tota, Colombia

Introduction

The genus *Eurycercus* Baird, 1843 is distributed in the Holarctic region, with individual reports from the Southern Hemisphere in South Africa, Argentina (Frey 1978) and Brazil (Montú & Gloeden 1986, cited by Elmoor-Loureiro 1997) (see Tab. 1). Until now, eight species of the genus are known whereas Dumont and Negrea (2002) affirm that this number could possible increase up to twelve. It has been demonstrated in cladocerans, that species initially considered cosmopolitan, have actually a more restricted distribution (Frey 1971, 1978, 1986; Hann 1982, 1989). Frey (1975) established 3 subgenera within the genus *Eurycercus*. One of them, *Bullatifrons*, includes four species with a holarctic distribution.

During a faunistic survey of the aquatic invertebrates of the high mountain Lago de Tota in the Andean Colombian Cordillera Oriental, a *Eurycercus* species was collected in the littoral zone between water weeds. Its morphological characteristics assign it to the subgenus *Bullatifrons* (morphology of the head median pore, labrum, as well as on the one-looped intestine).

As the genus *Eurycercus* was already known from Argentina, Brazil and Mexico, the discovery of this species in Colombia expands its distribution to the central Neotropical region. The most southern report of the genus in North America was Mexico City (Juday 1915; Elias-Gutiérrez *et al.* 1999) and the most northern in South America was Laguna de Patos, Rio Grande do Sud, Brazil (Elmoor-Loureiro 1997).

Material and methods

Samples were collected between January and February 2004 at the littoral zone of Lago de Tota, using a standard zooplankton net (mesh size 80µm). Samples were fixed with formaldehyde (final concentration

Material and methods

The specimens were collected from intertidal to subtidal localities along the Brazilian coast (Fig. 1). Part of the material analyzed here was obtained from a long-term study (BIOTA/FAPESP/Bentos Marinhos Project) of the marine fauna of São Paulo state. Selected living and fixed specimens were photographed digitally using stereoscopic microscopy. Some specimens were selected for critical-point drying, being first dehydrated in a graded series of ethanol-water mixtures to 100% ethanol. The samples were mounted on stubs and coated with a gold-palladium alloy for observation by scanning electron microscopy using a Zeiss LEO 440 or Zeiss DSM 940. Measurements (Tables 1, 2) were made by light microscopy using Zeiss SV-11 stereo microscope.

The studied material is lodged in the bryozoan collection at the Museu de Zoologia of the Universidade de São Paulo, Brazil (MZUSP) (Table 6), Setor de Comunidades Bentônicas of the Universidade Federal de Alagoas, Brazil (UFAL), and Virginia Museum of Natural History, USA (VMNH).



FIGURE 1. Map of sampling localities.

Abbreviations: CE—Ceará state; PE—Pernambuco state; AL—Alagoas state; ES—Espírito Santo state; RJ—Rio de Janeiro state; SP—São Paulo state; PR—Paraná state; SC—Santa Catarina state.

Systematic account

Phylum Bryozoa Ehrenberg, 1831

Class Gymnolaemata Allman, 1856

Order Cheilostomata Busk, 1852a

Suborder Neocheilostomina d'Hondt, 1985

Infraorder Flustrina Smitt, 1868

Superfamily Buguloidea Gray, 1848

Family Beaniidae Canu & Bassler, 1927

Genus *Beania* Johnston, 1840

Beania australis Busk, 1852b

(Fig 2–4, 18; Table 1)

Beania australis Busk, 1852b: 32, pl. 16, fig 1–3; Marcus 1937: 63, pl. 13, fig. 32; Marcus 1949: 2; Vieira *et al.* 2008: 17 (checklist).

Material examined. MZUSP 023, Santos, São Paulo state, Brazil, E. Marcus *det.* (1938) on rock; MZUSP 377–378.

Description. Colony uniserial, branched, white in color. Zooids oblong, suberect, with an erect boat-shaped portion and a long and slender connective tube. Erect portion obliquely inclined, convex basally, with a flat wholly membranous frontal surface. Connective tube proximal, about 0.271–0.802 mm in length and 0.037–0.043 mm in width, joined to the basal part of zooid; each zooid with 1–3 basal tubes. Two pairs of short distal (oral) spines around operculum and 10–19 opesial spines on each side, overarching frontal membrane, sometimes overlapping. Opesial spines reaching or sometimes exceeding the midline of membrane. Tubular radicles with branched ends present proximal to boat-shaped portion of some zooids. Avicularia absent. Ovicells absent.

Remarks. *Beania australis* was described from Cape Horn by Busk (1852b), as characterized by autozooids with 18–20 spines on each side of the frontal membrane, reaching to midpoint of the opesia. Marcus (1937) recorded this species in Santos (São Paulo state, Brazil) and described zooids with 17–22 pairs of lateral spines. However, specimens identified by Ernst Marcus and deposited in the Museu de Zoologia (MZUSP 023) have only 10–15 pairs. In the Brazilian specimens, the number of opesial spines may increase with the size of the zooid.

Hayward and Ryland (1995) described a new species, *Beania pectinata*, collected on *Sargassum* sp. from Heron Island (Australia). It resembles *B. australis* in several aspects – dimensions of autozooids, presence of four short distal spines, four basal connective tubes, peri-opesial spines forming a comb-like frontal shield, and lack of avicularia – but the 25 pairs of closely aligned lateral spines in *B. pectinata* are highly distinctive.

The frontal membrane of specimens of *B. australis* from Alagoas state (Brazil) is about 0.5 mm long, whereas, according to a drawing by Marcus (1937) of specimens from Santos (Brazil), the length of the frontal membrane is about 0.85 mm. We examined specimens from Santos in the Museu de Zoologia da

Universidade de São Paulo (MZUSP 023) identified by Ernst Marcus and found that their length to be ca 0.60 mm, slightly longer than specimens from Alagoas.

The beaniid genus *Stolonella*, established monotypically for *S. clausa* Hincks, 1883 from the Australian region, resembles *B. australis* in autozooid appearance (with a comb-like frontal shield and lack of avicularia), but the zooids are borne directly on kenozooids (true stolons). The basal tubular processes in autozooids of *Beania australis* are similar to those in *B. mirabilis*, being formed by the slender proximal tube of the zooid rather than a kenozooid, indicating a closer relationship with *Beania*.

Biological notes. The colonies of *B. australis* studied were collected on rocky shores in shallow water, where it is epiphytic on red algae and epilithic on rocks (Table 6). Some colonies were also found in shrimp bycatch in the south of Alagoas state, at ca 15 m deep on the bryozoan *Celleporaria* sp.

Distribution. Atlantic: Cape Horn and Patagonia (Busk 1852b); Brazil: São Paulo (Marcus 1937; present study), Espírito Santo (Marcus 1949) and Alagoas (present study).

TABLE 1. Measurements (mm) of uniserial *Beania* species.

	<i>Beania australis</i>	<i>Beania cupulariensis</i>	<i>Beania klugei</i>	<i>Beania maxilladentata</i>	<i>Beania mirabilissima</i>
Zooid length*					
Mean (St Dev)	1.04 (0.26)	0.89 (0.05)	0.93 (0.04)	0.91 (0.07)	1.34 (0.19)
Min–Max	0.77–1.32	0.81–0.98	0.87–1.03	0.80–1.05	1.12–1.71
Zooid width					
Mean (St Dev)	0.17 (0.01)	0.34 (0.01)	0.31 (0.02)	0.22 (0.01)	0.24 (0.01)
Min–Max	0.16–0.19	0.32–0.36	0.28–0.33	0.21–0.23	0.23–0.26
Frontal membrane					
Mean (St Dev)	0.51 (0.02)	0.77 (0.03)	0.76 (0.05)	0.66 (0.04)	0.68 (0.06)
Min–Max	0.49–0.54	0.74–0.80	0.70–0.83	0.57–0.69	0.59–0.87
Avicularia length					
Mean (St Dev)	-	0.14 (0.01)	0.12 (0.01)	0.14 (0.02)	-
Min–Max	-	0.13–0.16	0.11–0.13	0.11–0.16	-

*Including slender proximal tube.

***Beania cupulariensis* Osburn, 1914**

(Figs 5, 6, 19; Table 1)

Beania cupulariensis Osburn, 1914: 190, figs 6–7; 1940: 399; Marcus 1944: 1, figs 1–4; 1955: 291, pl. 4, figs 41–43; Fransen 1986: 80, figs 26a–d; Winston 1986: 5; Vieira *et al.* 2008: 17 (checklist).

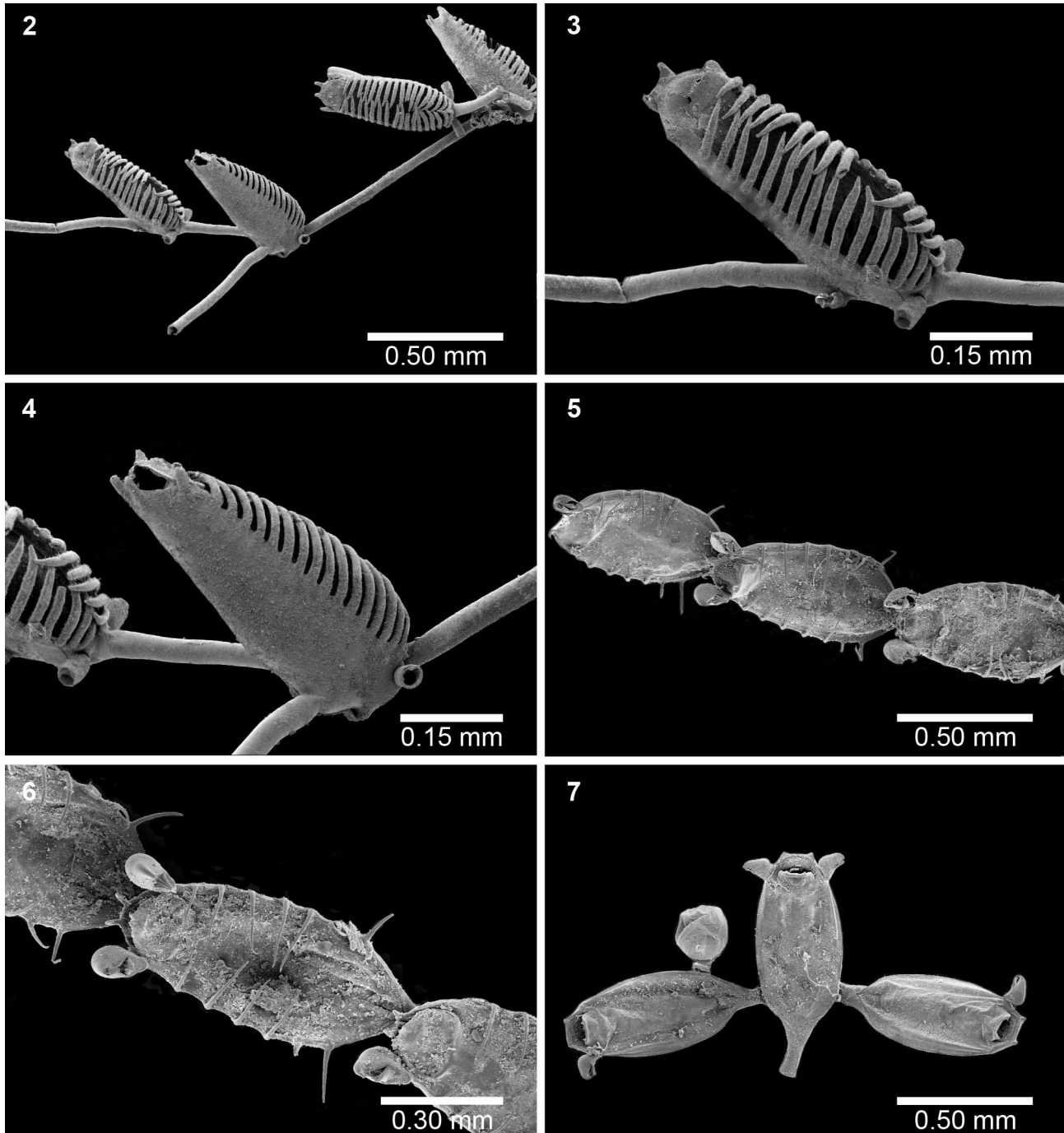
Material examined. MZUSP 007, 1948, Ilhabela, São Paulo state, Brazil, E. Marcus *det.* on algae; MZUSP 379–381.

Description. Colony uniserial, rarely branched, white–translucent in color. Zooids oblong, boat-shaped, higher than wide, with lightly calcified walls; connective tubes short, the distal end of the zooid overlapping the proximal end of the subsequent zooid. Frontal membrane occupying the whole frontal surface. Marginal spines numbering 5–7 on each side, overarched the frontal membrane with only the most proximal pair directed outward; one pair of distal spines. One pair of pedunculate avicularia on distal corners of zooids, with rostrum hooked, mandible hard and curved. Ovicells absent.

Remarks. *Beania cupulariensis* was described from the Tortugas, Florida (USA) by Osburn (1914). This species is characterized by zooids connected by short tubes, the distal ends of zooids overlapping the proximal ends of subsequent zooids, the frontal membrane overarched by 5–7 pairs of spines, with the most proximal

pair directed to the outside, and one pair of distal spines. Harmer (1926, p. 419, pl. 28, figs 13–14) recorded two forms of *B. cupulariensis*. The first form, collected from the Philippines, has broader zooids with 7–9 pairs of uniformly spaced spines directed to the outside. An Indonesia form has longer and narrower zoecia, with 3–4 shorter pairs of marginal spines. These forms probably represent two distinct, undescribed species.

The number of tentacles found in *Beania cupulariensis* is variable: the Brazilian specimens have 26 tentacles (Marcus 1955), but Cook (1985) reported polypides with 20–22 tentacles in material from Ghana; a figured specimen (*ibid.*, fig. 37) also differs in lacking the most proximal pair of spines directed to the outside. It too may represent a different species.



FIGURES 2–7. SEM of uniserial species of *Beania* from the Brazilian coast. **2–4.** *Beania australis* Busk, 1852, MZUSP 377, Alagoas state; **2**, colony with four zooids; **3**, close-up of a zooid; **4**, lateral view of a zooid, note the basal connective tubes. **5–6.** *Beania cupulariensis* Osburn, 1914, MZUSP 379, Alagoas state; **5**, colony with three zooids; **6**, close-up of a zooid, note the most proximal spine directed to the outside. **7.** *Beania klugei* Cook, 1968, MZUSP 391, São Paulo state, small colony with three zooids.

Biological notes. The colonies of *B. cupulariensis* studied by us were collected from rocks in shallow water about 5 m deep (Table 6), where the current flow is strong. Colonies from São Paulo state were found on mollusk shells and algae. Vieira *et al.* (2007) noted the association of this species with the bryozoan *Vasignyella oviceolata* (Catenicellidae) in northeastern Brazil. Osburn (1914, 1940) found some colonies of *B. cupulariensis* on dorsal surfaces of *Cupuladria* sp. from 18–40 m depth while the colonies reported by Marcus (1955) from the Brazilian coast were epiphytic on algae.

Distribution. Atlantic. Brazil: São Paulo (Marcus 1944, 1955; present study) and Alagoas (Vieira *et al.* 2007; present study); Porto Rico (Osburn 1940); Curaçao (Fransen 1985); USA: Tortugas Island (Osburn 1914); ?Ghana (Cook 1985).

***Beania klugei* Cook, 1968**

(Figs 7, 8, 20; Table 1)

Beania intermedia: Marcus 1937: 61, pl. 13, fig. 30; 1939: 113; 1949: 2; Osburn 1940: 398; Maturo 1966: 579, fig. 18. Non *Diachoris intermedia* Hincks, 1881.

Beania klugei Cook, 1968: 165, figs 2A,B; Winston 1982: 131, fig. 46; Cook 1985: 119, fig. 4A; Winston & Håkansson 1986: 18, fig. 39; Fransen 1986: 82, figs 27A–C; Tilbrook *et al.* 2001: 46; Vieira *et al.* 2008: 18 (checklist); Ramalho *et al.* 2010: 501, fig. 2.

Material examined. MZUSP 023, *Beania intermedia*, Santos, São Paulo state, Brazil, E. Marcus *det.* (1938) on rock; MZUSP 072, 210–211, 252, 265, 269, 382–390, 404; UFAL 034, Maceió, Alagoas state, 27.iv.2006, on hydroids; UFAL 051, Maceió, Alagoas state, 24.iv.2006 on bryozoans; VMNH 2569.00, *Beania klugei*, Spanish Anchor, off West Palm Beach, Florida, USA, coll. Littler and Littler, 15.vii.1999 on algae; VMNH 3150.01, *Beania klugei*, North Beach, Fort Pierce, St. Lucie County, Florida, USA, coll. J. E. Winston 21.vi.2003, on drift alga with *Beania hirtissima* (= *B. americana*).

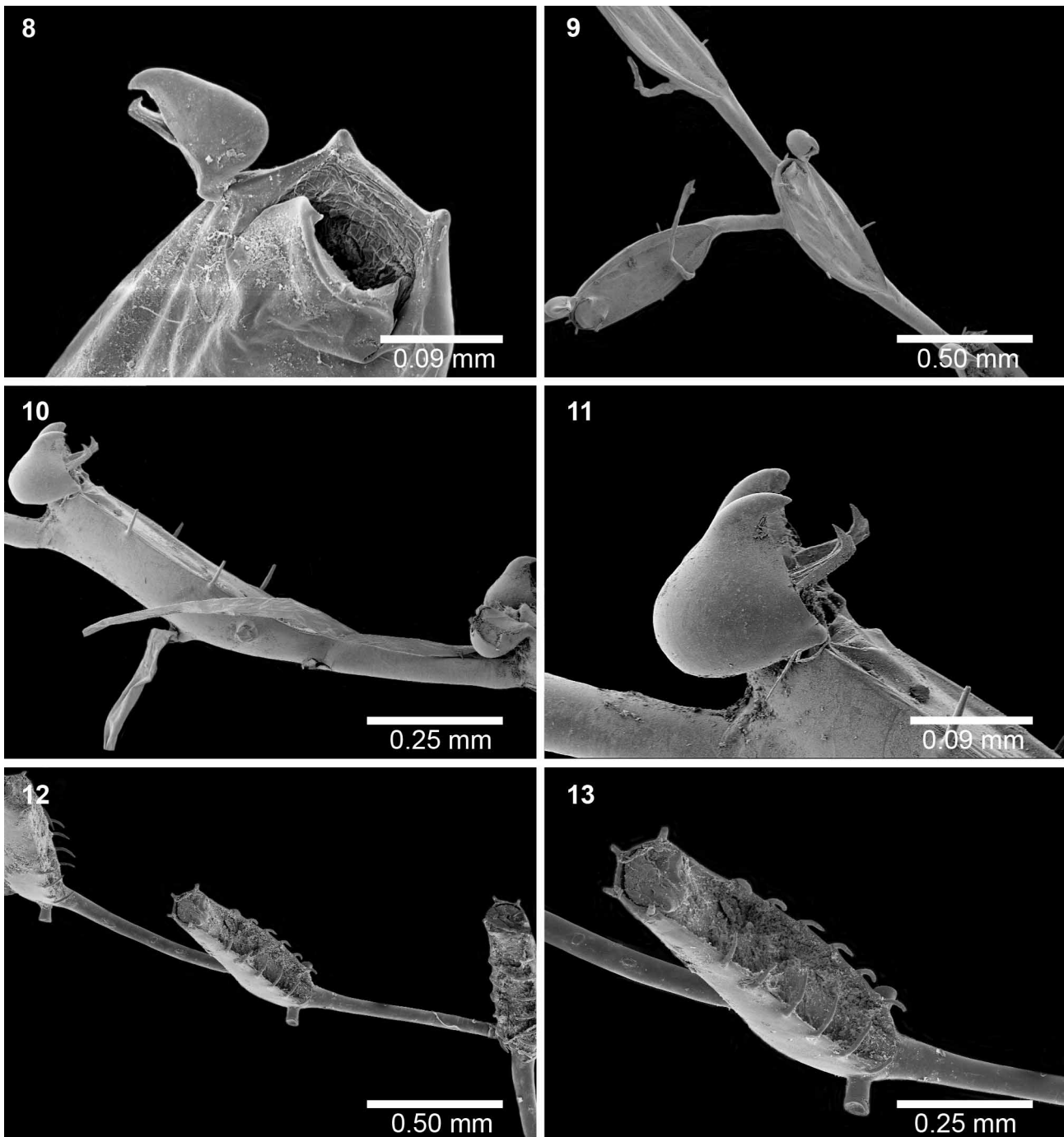
Description. Colony uniserial, sometimes branching laterally, attached loosely to the substratum, often with a portion free from the substratum. Zooids transparent yellowish-tan in color, large, boat-shaped, with a flat frontal membrane and rounded abfrontal surface; short connective tubes slender: a proximal tube with zooid budded from the one proximal or proximal-lateral to it, with occasional lateral chains of zooids. Operculum delicately chitinized and barely visible. Marginal spines absent. One pair of pedunculate avicularia on distal ends of zooids. Polypides with a large lophophore and 26 tentacles. Ovicells absent.

Remarks. Marcus (1937) used the name *Beania intermedia* for this species, but Cook (1968) showed that *B. intermedia* Hincks, 1881 is a spinous species with small zooids, and she introduced the name *Beania klugei* for populations of a large, uniserial *Beania* with small paired avicularia and no marginal spines. The species was recently discussed by Ramalho *et al.* (2010), who noted small differences between Brazilian and Florida (USA) materials. Although there are slight differences in size between Brazilian and Florida colonies described by Winston (1982), specimens of both places are characterized by zooids without spines, similar-shaped avicularia, and a lophophore with 26 tentacles.

Specimens recorded from the Great Barrier Reef by Hayward and Ryland (1995, p. 542) as *B. klugei* were redescribed by Tilbrook *et al.* (2001) as *Beania cookae*; this species differs from *B. klugei* by the shape of the avicularia and by the presence of short lateral spines on some zooids.

Biological notes. The specimens studied by us were found from the intertidal to 15 m deep on rock surfaces, algae including *Sargassum* sp., ascidians, bryozoans [viz. *Anguinella palmata*, *Bugula* spp., *Crisia pseudosolena* and *Amathia vidovici*] and hydroids (Table 6). Some zooids of *B. klugei* were found with other bryozoans on a shipwreck off the coast of Pernambuco state (Brazil), at 24 m deep. This species was previously recorded from the Caribbean at 10–64 m deep (Osburn 1940). In Florida (USA), it is common on hydroid stems and benthic algae, and on the drift alga *Soliera tenera* (Winston 1982); a two-zooid colony was also found attached to a vibraculum of a *Cupuladria doma* colony (Winston & Håkansson 1986). Both African (Cook 1985) and Brazilian specimens have lophophores with 24–26 tentacles.

Distribution. Widely distributed in tropical and subtropical waters (Tilbrook *et al.* 2001). Brazil: Paraná (present study), São Paulo (Marcus 1937; present study), Rio de Janeiro (Marcus 1949; Ramalho *et al.* 2010; present study), Alagoas (present study), Pernambuco (Marcus 1939; present study) and Ceará (present study).



FIGURES 8–13. SEM of uniserial species of *Beania* from the Brazilian coast. **8.** *Beania klugei* Cook, 1968, MZUSP 391, São Paulo state, close-up of distal end of a zoid, note the shape of avicularium and the two distal projections of zoecium; **9–11,** *Beania maxilladentata* Ramalho, Muricy & Taylor, 2010, MZUSP 400, Rio de Janeiro state; **9,** portion of colony; **10,** lateral view of a zoid, note the small lateral spines; **11,** close-up of paired distal avicularia; **12–13,** *Beania mirabilissima* n. sp., MZUSP 405 (Holotype), São Paulo state; **12,** three zooids of a colony; **13,** close-up of a zoid, note the large gap between oral spines and most distal marginal spines.

***Beania maxilladentata* Ramalho, Muricy & Taylor, 2010**

(Fig 9–11, 21; Table 1)

Beania maxilladentata Ramalho *et al.*, 2010: 504, fig. 4.

Material examined. MZUSP 400.

Remarks. *Beania maxilladentata* was recently described from Rio de Janeiro state on bryozoans, shells, serpulids and algae in 3–6 m of water. The species is characterized by small spines that never overarch the frontal membrane and by the presence of a strongly curved avicularian mandible with one or two tooth-shaped accessory structures.

Distribution. Atlantic. Brazil: Rio de Janeiro (Ramalho *et al.* 2010; present study).

***Beania mirabilissima* n. sp.**

(Figs 12, 13, 22, 23; Table 1)

Beania mirabilis: Osburn 1914: 189; 1940: 398; Marcus 1937: 60, pl. 12, fig. 29; Winston 1982: 133, fig. 45; 1986: 5; López-Gappa 2001: 73, figs 1, 2, 9; Vieira *et al.* 2008: 18 (checklist); Ramalho *et al.* 2010: 503, fig. 3.

Non *Beania mirabilis* Johnston, 1840: 272, fig 1, 2; 1847: 372, figs 69–70; Busk 1852b: 32, pl. 24, figs 4–5; Hincks 1880: 96, pl. 4, figs 8–10; Hayward & Ryland 1998: 244; Hayward & McKinney 2002: 26, figs 10C,D.

Material examined. *Holotype*: MZUSP 405. *Paratype*: MZUSP 406. *Additional material*: MZUSP 407–414; UFAL 049, Maceió, Alagoas state, 27.iv.2006, on hydroids; VMNH 2992.00, *Beania mirabilis*, Walton Rocks, South Hutchinson Island, St Lucie County, Florida, USA, coll. J. E. Winston 15.vii.2002, intertidal on hydroid stolon; VMNH 3116.00, *Beania mirabilis*, Fort Pierce Inlet, USA, coll. J. E. Winston, 14.vii.2003, beach drift on aluminum can, with *Aetea* sp.

Description. Colony uniserial, branched, lightly attached to substratum, translucent white in color. Zooids oblong, suberect, with an erect boat-shaped portion and a long and slender connective tube. Erect portion inclined, convex basally with a flat, expanded membranous frontal surface. Connective tube proximal, about 0.05 mm in diameter, joined to basal part of zooid. Orifice about 0.06 mm long and 0.12 mm wide. Two pairs of short distal spines around operculum and 5–8 (often 6) pairs of small spines overarching the frontal membrane; sometimes the proximal spines are slightly longer than the distal ones. Tubular basal radicles present in all zooids, between connective tubes. Avicularia and ovicells absent. Polypides with 18–20 tentacles.

Remarks. Johnston (1840) described a new British genus and species, *Beania mirabilis*, found loosely attached to shell. The species has been characterized by several authors as having slender zooids with 5–11 pairs of lateral spines in addition to the four distal spines. It has been considered to be a species with a worldwide distribution in warm and temperate waters (e.g. Winston 1982; Ramalho *et al.* 2010). However, Cook (1985) suggested that *B. mirabilis* may represent a species complex in the warm waters of the Atlantic and Indo-Pacific oceans. Later, López-Gappa (2001) observed slight differences (zooid length, number and position of spines) between British and Patagonian specimens of putative *B. mirabilis*, but did not introduce a new species name for the southwestern Atlantic material. Recently, Ramalho *et al.* (2010) remarked that specimens from Rio de Janeiro (Brazil) had fewer spines, but considered that the number of spines of those specimens fell within the range for the species.

Tilbrook *et al.* (2001) redescribed Johnston's material of *Beania mirabilis*, characterized by zooids about 0.70 mm long, connective tubes 1.5 times longer than the boat-shaped portion, two pairs of oral spines and 9–10 pairs of lateral spines overarching the frontal membrane; neanic colonies identified by Johnston from the type locality have only 2–6 spines. Tilbrook *et al.* (2001) also noted that several specimens previously attributed to *B. mirabilis* represent undescribed species. Later, Hayward and McKinney (2002) described and figured specimens of *Beania mirabilis* from the Adriatic; they are similar to Johnston's specimens.

These descriptions have made it possible to compare precisely the Brazilian colonies with material from North Atlantic and Adriatic. Both English and Adriatic ephebic specimens differ from those found in shallow-

water localities of the West Atlantic in the presence of 10 pairs of short, short-spaced lateral spines, and deeper (about 0.2 mm), wider zooids (about 0.28 mm wide) connected by longer proximal tubes. *Beania mirabilis* sensu stricto is probably restricted to the northeastern Atlantic (Johnston 1840; Busk 1852b; Hincks 1880), Red Sea (Dumont 1981) and Mediterranean-Adriatic (Gautier 1962; Zabala & Malquer 1988; Hayward & McKinney 2002).

The material from Vanuatu previously identified as *Beania* cf. *mirabilis* (Tilbrook *et al.* 2001) was recently redescribed by Tilbrook (2006) as *Beania lagenula*, also characterized by a large gap between marginal and oral spines, but differing from those found in the western Atlantic in the shape of the zooid and the presence of 6–8 pairs of marginal spines that overlap each other in the midline.

Beania mirabilissima n. sp., which name alludes to the morphological likeness with *Beania mirabilis* Johnston, 1840, is characterized by oblong, shallower zooids (about 0.17 mm deep) joined by a shorter proximal connective tube (about 1.1 times longer than the boat-shaped portion), 5–8 pairs of lateral spines overarching the frontal membrane but not reaching its midpoint, and a large gap between the marginal and oral spines. Two small colonies from deep water off Brazil deposited at the MZUSP (MZUSP 040, 088) are readily distinguished from *B. mirabilissima* by their smaller, deeper zooids (about 0.21 mm deep) connected by a longer proximal connective tube (ca 1.5–2.5 times longer than the boat-shaped portion) and 8–10 shorter-spaced pairs of lateral spines with slightly curved distal tips; these resemble European *B. mirabilis* and the eastern Atlantic colonies described by Cook (1985) but have slightly shorter zooids (about 0.4 mm). We suggest molecular genetics and further morphometric studies will resolve the identity and morphological variations of different populations of *B. mirabilis* with 8–11 spines in Atlantic waters.

Biological notes. Colonies of *B. mirabilissima* were found on rocky shores from the intertidal to 20 m deep, epiphytic on algae including *Halimeda* sp. and *Sargassum* sp., and epizoitic on bryozoans (e.g. *Amathia* sp.) and hydroids (Table 6). It was previously recorded in the West Atlantic by several authors (Osburn 1914; Marcus 1937; Winston 1982; Ramalho *et al.* 2010) as *Beania mirabilis*, growing on rocks, shells, other bryozoans and hydroid stems. It was previously recorded from Caribbean at 9–36 m deep (Osburn 1914, 1940). According to Winston (1982), embryos probably develop inside the zooids, and as she remarked, there is still no information available on its reproduction. Specimens collected in São Paulo state, Brazil, have about 18–20 tentacles while African specimens of *B. mirabilis* collected on shells have 12–14 (Cook 1985) and probably represent an undescribed species.

Distribution. Western Atlantic: Argentina (López-Gappa 2001); Brazil: Santa Catarina (present study), Paraná (present study), São Paulo (Marcus 1937; present study), Rio de Janeiro (Ramalho *et al.* 2010) and Alagoas (Vieira *et al.* 2007; present study); USA: Tortugas Island (Osburn 1940) and Florida (Winston 1982; present study).

***Beania americana* n. sp.**

(Figs 14, 15, 24; Table 2)

Beania hirtissima: Marcus 1937: 62, pl. 14, fig. 31; 1941: 19, fig. 12; Osburn 1940: 397; Lagaaij 1963: 180, pl. 8, fig. 4; Maturo 1966: 579, fig. 17; Winston 1982: 131, fig. 56; Vieira *et al.* 2008: 17 (checklist).
Non *Diachoris hirtissima* Heller, 1867.

Material examined. *Holotype*: MZUSP 415. *Paratype*: MZUSP 416, *Additional material*: Marcus collection (19), *Beania hirtissima* E. Marcus *det.* on rocks; MZUSP 417–428; VMNH 760.00, *Beania hirtissima*, Walton Rocks, South Hutchinson Island, St Lucie County, Florida, USA, coll. J. E. Winston, 28.xi.1998, intertidal beach rock; VMNH 2612.00, *Beania hirtissima*, Juno Ledge, off Palm Beach, Florida, USA, coll. Littler and Little, 18.vii.1999, drift dive, 20 m, on alga; VMNH 3150.01, *Beania hirtissima*, North Beach, Fort Pierce, St Lucie County, Florida, USA, coll. J. E. Winston 21.vi.2003, beach drift alga, with *B. mirabilis* (= *B. mirabilissima*).

Description. Colony reticulate, semierect, grayish-brown in color, often heavily coated with mud and debris. Zooids with lightly calcified curving lateral and basal walls and a membranous frontal surface; zooids

joined by 6 tubular processes and attached loosely to substratum by tubular radicles. Frontal surface constricted into two parts, a smaller oval opercular area surrounded by a halo of 8–10 long, straight stout spines, and a larger oval proximal region with 9–13 pairs of spines arched over the frontal membrane plus some projecting outward from the lateral walls. Tubular radicles extend from the proximal portion of zooids. Avicularia and ovicells absent.

Remarks. *Beania hirtissima* has been considered to have a worldwide geographical distribution in shallow, warm-temperate to tropical seas (Winston 1982; Cook 1985; Hayward & McKinney 2002). Hayward and McKinney (2002) examined the type of *Beania hirtissima* (Heller, 1867) and designated its lectotype, a specimen with vicarious avicularia, autozooids 0.8–1.0 mm long with seven stout spines surrounding the operculum like a halo (three distal and two on each side), and only five erect spines on each lateral margin of the frontal membrane, each with a shorter spine at its base, curving medially over the frontal membrane. They remarked that records of *Beania hirtissima* should “be reexamined in light of the characteristics of the lectotype”. They examined one such taxon with reticulate colonies that had often been attributed to *Beania hirtissima* f. or var. *cylindrica*, and designated it as *Beania cylindrica* (Hincks, 1886). Cook (1985) showed that *B. hirtissima* may represent a species complex and, more recently, Tilbrook (2006) noted that some reports previously attributed to this species represent undescribed species.

Beania cylindrica (Hincks, 1886) has bigger autozooids (1.0 x 0.25 mm), a terminal operculum orientated perpendicular to the frontal membrane, only six distolateral spines and another 8–10 pairs of slightly incurved lateral spines. In the erect tufts of *Beania cylindrica*, each autozooid is linked to six neighbors by tubular connections, three proximal and closely spaced and the other three mid-basal. In contrast, colonies of *B. hirtissima* are unilaminar sheets with autozooids closely spaced and linked by a ring of six short connecting tubes around their proximal ends.

Marcus (1937) characterized colonies of *Beania hirtissima* from Santos (São Paulo state, Brazil) as having a distal halo of 10 long spines and 12 pairs of shorter lateral spines; additionally, he described some basal spines, sometimes bi- or trifurcated. We consider that *Beania hirtissima* sensu Marcus (1937, 1941) is a previously undescribed species, named herein as *Beania americana* n. sp.

Although *B. americana* is similar to the lectotype of *B. hirtissima* in the general habit of the colony and characters of the autozooid, it is clearly distinguishable, particularly by the number and size of spines and size of zooids (see Table 2). Shared features of the Brazilian and Western Atlantic colonies also led us to reassign some specimens previously recorded as *Beania hirtissima* (viz. Osburn 1940; Lagaaij 1963; Maturo 1966; Winston 1982) to *B. americana*.

TABLE 2. Measurements (mm) of reticulate *Beania* species. European species *Beania hirtissima* and *Beania cylindrica* measurements from Hayward and McKinney (2002). MA, distance between midpoints of adjacent apertures.

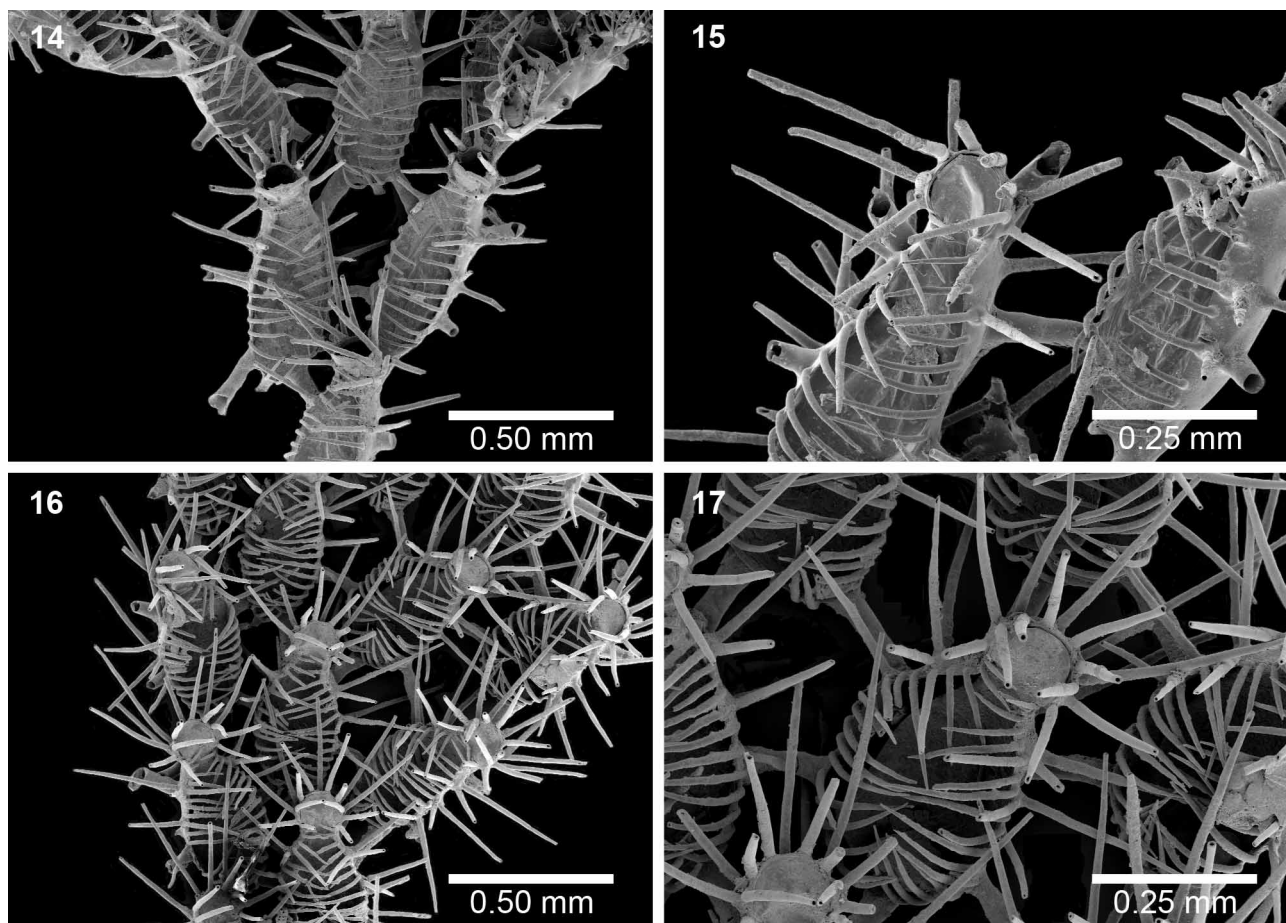
	<i>Beania americana</i>	<i>Beania correae</i>	<i>Beania metrii</i>	<i>Beania hirtissima</i>	<i>Beania cylindrica</i>
Zooid length					
Mean (St Dev)	0.647 (0.039)	0.615 (0.029)	0.731 (0.078)	-	0.993 (0.097)
Min–Max	0.569–0.723	0.569–0.662	0.612–0.878	-	0.900–1.204
Zooid width					
Mean (St Dev)	0.274 (0.039)	0.303 (0.017)	0.356 (0.034)	-	0.381 (0.034)
Min–Max	0.231–0.338	0.277–0.338	0.306–0.408	-	0.327–0.443
MA					
Mean (St Dev)	0.503 (0.054)	0.508 (0.030)	0.521 (0.036)	0.499 (0.065)	0.549 (0.092)
Min–Max	0.385–0.615	0.462–0.569	0.440–0.600	0.394–0.600	0.377–0.792

Beania americana and *B. cylindrica* are similar in the number of spines arched over the frontal membrane, but *B. americana* differs in having smaller zooids (reaching 0.723 x 0.338 mm), a halo of 8–10 stout distal spines, and autozooids linked to six neighbors by long, well-spaced tubular connections. The other

similar Brazilian species, described herein as *Beania correiae* n. sp., is readily distinguished by the number of marginal spines arched over the frontal membrane.

Biological notes. *Beania americana* was found on rocky shores from the intertidal to 20 m deep on rocks, macroalgae including red algae and *Sargassum* sp., and other bryozoans [viz. *Amathia* spp. and *Anguinella palmata*]; it was also present on shallow soft bottoms (6–10 m) on rocks and shell fragments (Table 6). In Florida (USA), it was found year-round, epibiotic on hydroids and encrusting beach rocks partially buried in sand (Winston 1982). Colonies are also utilized as a substratum by other cheilostome bryozoans. Colonies coated with sediment can hardly be seen *in situ*.

Distribution. Atlantic. Brazil: Paraná (Marcus 1941; present study), São Paulo (Marcus 1937; present study) and Alagoas (present study); Porto Rico and Bermuda (Osburn 1940); USA: North Carolina, Georgia (Maturó 1966), Florida (Maturó 1966; Winston 1982; present study) and Gulf of Mexico (Lagaaij 1963).



FIGURES 14–17. SEM of reticulate species of *Beania* from the Brazilian coast. **14–15.** *Beania americana* n. sp., MZUSP 415 (Holotype), São Paulo state; **14**, portion of colony; **15**, close-up of oral region of a zoid; **16–17.** *Beania correiae* n. sp., MZUSP 402, Alagoas state; **16**, portion of a colony; **17**, close-up of a zoid.

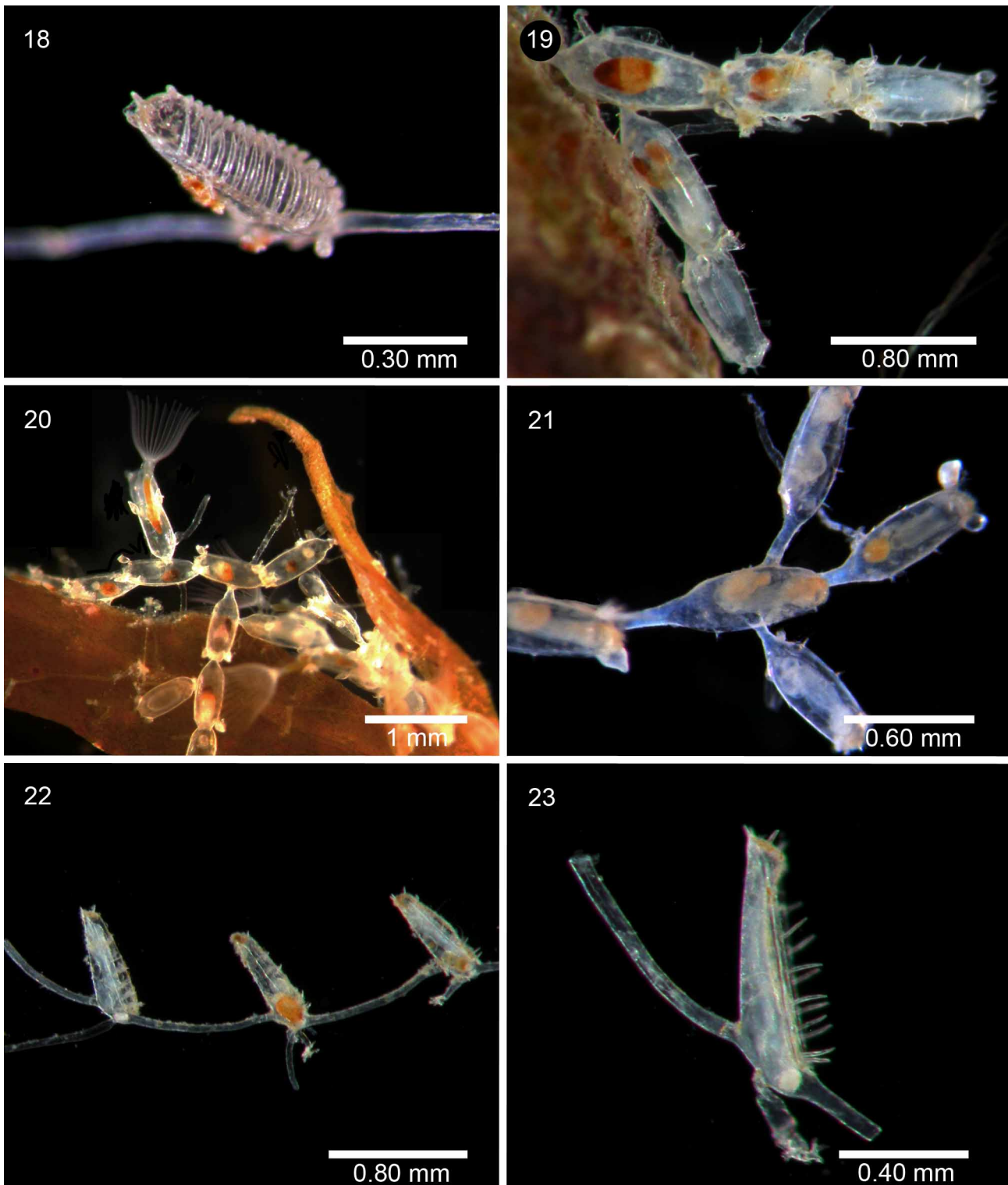
***Beania correiae* n. sp.**

(Figs 16, 17, 25; Table 2)

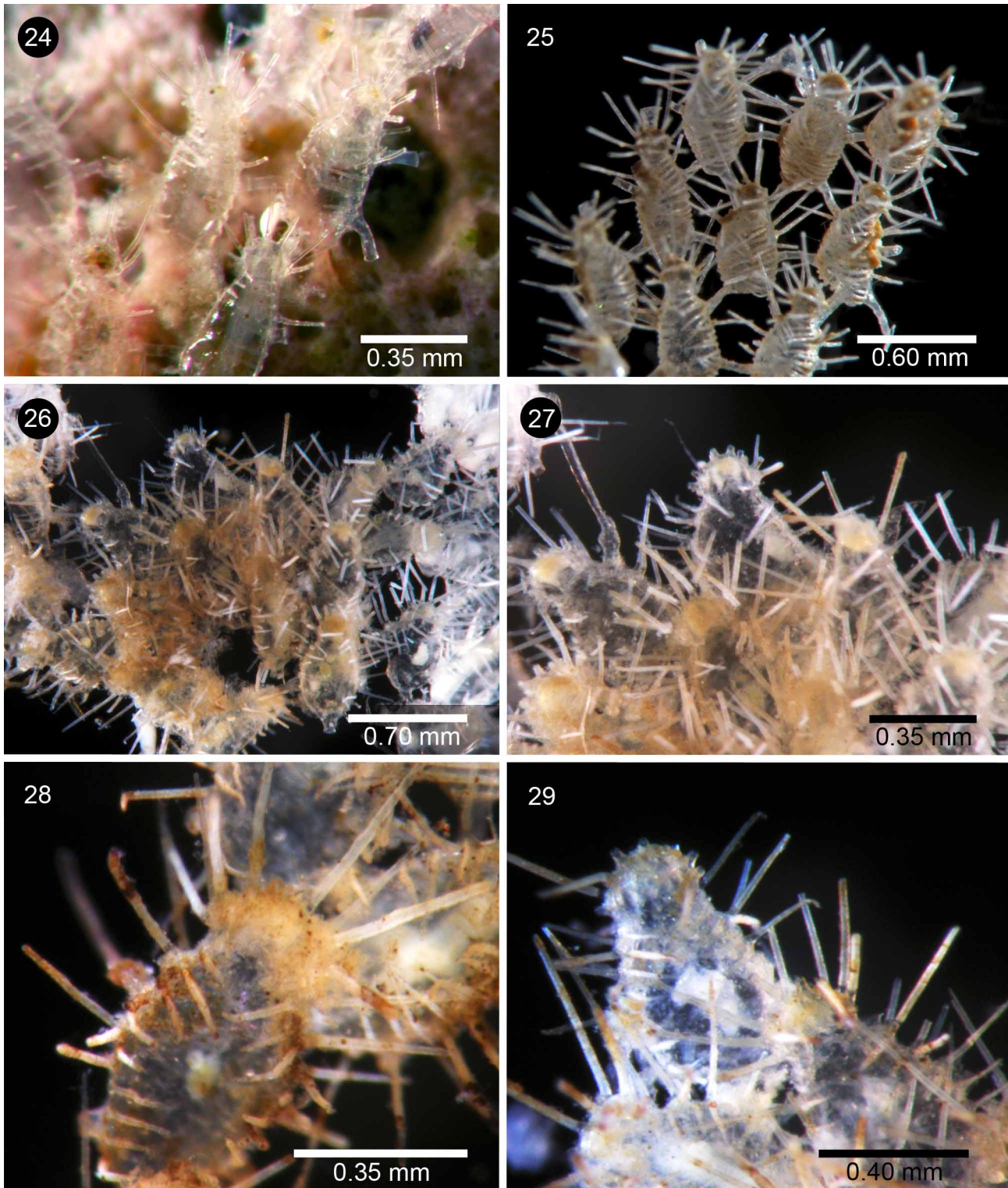
Material examined. *Holotype*: MZUSP 402. *Paratype*: MZUSP 403.

Description. Colonies reticulate, semierect, grayish-brown in color, often heavily coated with mud and debris. Zooids with lightly calcified, curving lateral and basal walls and a membranous frontal surface; zooids joined by 6 tubular processes and attached loosely to the substratum by tubular radicles. Frontal surface constricted into two parts, a smaller oval opercular area surrounded by a halo of 8 long, symmetrical stout spines plus 5 long distally directed spines at its base, and a larger oval proximal region with 14–20 pairs of spines (often 18) arched over the frontal membrane. Long spines project outwards from the lateral walls on

each side of the frontal membrane; 3 regular clusters of 1–3 spines (often 2): the first clusters placed closest to constriction below the halo, the other 2 placed in distal third and half portion of zooid. Long spines on basal wall; 2–5 spines (often 5) in distal and 4–5 spines (often 5) in proximal basal portion of zooid. Tubular radicles in proximo-lateral portion of zooids. Avicularia and ovicells absent.



FIGURES 18–23. Light micrography of uniserial species of *Beania* from the Brazilian coast. **18.** *Beania australis* Busk, 1852, MZUSP 377, Alagoas state; **19.** *Beania cupulariensis* Osburn, 1914, MZUSP 381, São Paulo state; **20.** *Beania klugei* Cook, 1968, MZUSP 391, São Paulo state; **21.** *Beania maxilladentata* Ramalho, Muricy & Taylor, 2010, MZUSP 400, Rio de Janeiro state; **22–23.** *Beania mirabilissima* n. sp., MZUSP 405 (Holotype), São Paulo state; **22,** colony; **23,** lateral view of a zooid.



FIGURES 24–29. Light micrography of reticulate species of *Beania* from the Brazilian coast. **24.** *Beania americana* n. sp., MZUSP 415 (Holotype), São Paulo state. **25.** *Beania correae* n. sp., MZUSP 403 (Paratype), Alagoas state; **26–29.** *Beania metrii* n. sp., MZUSP 401 (Holotype), Santa Catarina state; **26,** colony; **27,** distal end of colony; **28,** close-up of a zooid; **29,** close-up of a distal zooid of colony.

Remarks. *Beania correae* n. sp., named in honour of Dr Monica Dorigo Correia (Universidade Federal de Alagoas, Brazil) who encouraged the first author to study bryozoans, is characterized by eight long stout spines in the distal halo plus five distally directed spines at its base, and often up to 16 pairs of long spines arched over the frontal membrane and overlapping each other across its midline. Colonies of *B. correae*

resemble *B. cylindrica*, but the last differs from the former in having bigger zooids and fewer spines around the distal halo and the frontal membrane.

Biological notes. *Beania correae* grew on rocks found in shrimp bycatch in the south of Alagoas state (Brazil), in water about 15 m deep. It was also found on bryozoans (e.g. *Celleporaria* spp.) and shells (Table 6). Some colonies were heavily coated with mud and debris, like *B. americana* and *B. metrii* **n. sp.**, the other reticulate species described here.

Distribution. Atlantic. Brazil: Alagoas (present study).

***Beania metrii* n. sp.**

(Figs 26–29; Table 2)

Material examined. *Holotype*: MZUSP 401.

Description. Colony reticulate, loosely encrusting, white in color, surface often heavily coated with mud and debris. Zooids close spaced and slightly overlapping distally; lightly calcified curving lateral and basal walls with some spines; zooids joined by 6 very short tubular processes. Frontal surface oval, membranous, broader proximally than distally, with the operculum in a narrower distal semicircular area surrounded by a halo of 8 spines; 8–10 pairs of small, often straight, lateral spines usually directed over the frontal membrane; lateral walls also with several straight spines, 6–16 on each side, projecting outwards. Avicularia and ovicells absent.

Remarks. *Beania metrii* **n. sp.**, named after Rafael Metri (Universidade Estadual do Centro-Oeste, Brazil) who collected the specimen, is very distinct from the other reticulate species described here in its zooidal dimensions (bigger than other species), the number of frontal spines and very short connective tubes joining autozooids.

The distance between the midpoints of adjacent apertures of *Beania metrii* are similar to those described for Adriatic specimens of both *B. cylindrica* and *B. hirtissima*, but *B. metrii* is clearly distinguished by the number of spines in the distal halo. *Beania hirtissima* also differs in having bigger zooids and only five pairs of lateral spines.

Biological notes. The species occurred in a bank of calcareous algae (*Halimeda* sp.) at Arvoredo Island (Santa Catarina state) between algal nodules in water ca 6–20 m deep (Table 6).

Distribution. Atlantic. Brazil: Santa Catarina (present study).

Discussion

Although in previous decades a number of bryozoan taxa have been attributed wide geographical distributions, recent studies have shown that many of them represent species complexes (Tilbrook 2006; Herrera-Cubilla *et al.* 2006, 2008; Berning & Kuklinski 2008; Berning *et al.* 2008). Re-examination of putatively widespread species of *Beania* has been important in resolving the taxonomic identity of some European species (Tilbrook *et al.* 2001; Hayward & McKinney 2002; Tilbrook 2006), whose distributions were hitherto thought to be broadly Atlantic. We have identified a distinct, previously unrecognized tropical to subtropical Western Atlantic fauna, which can help in understanding the diversity and morphological variations of *Beania* species worldwide. Berning *et al.* (2008) suggested that inadequate understanding of morphological and geographic variation in some bryozoan taxa has resulted in low faunal diversities in some localities, which may explain the low number of *Beania* species previously reported from the Brazilian coast. Our account of *Beania* from the Brazilian coast includes eight of the 10 known species (Table 3). The morphological characteristics of zooids, spines and avicularia are useful in distinguishing both the linear and reticulate species reported herein (Tables 4–5). Three species are apparently endemic to Brazil, viz *B. maxilladentata* and the reticulate species *B. correae* **n. sp.** and *Beania metrii* **n. sp.** Another three reticulate species of *Beania* are found in Brazil – *Beania americana* **n. sp.** (previously recorded in the western Atlantic as *B. hirtissima*), *B. cf. inermis* (Busk, 1852b), and *B. magellanica* (Busk, 1852b), the latter two both recorded

from Espírito Santo state by Hastings (1943) and distinguished from *B. americana*, *B. correiae* and *B. metrii* by the presence of avicularia. Of the other species dealt with here, *B. australis* is also known from Cape Horn and Patagonia, and three species (*B. cupulariensis*, *B. klugei*, *B. mirabilissima* [= *Beania mirabilis* sensu Osburn 1914, 1940; Marcus 1937; Winston 1982, 1986, López-Gappa 2001; Ramalho *et al.* 2010]) are known from other localities in the tropical and subtropical western Atlantic.

TABLE 3. Species of *Beania* Johnston, 1840 recorded in Brazil.

Species	Occurrence	Reference
<i>Beania americana</i> n.sp.	AL*, SP, PR	Marcus (1937, 1941), Rocha (1995)
<i>Beania australis</i>	AL*, ES, SP	Marcus (1937, 1949), Rocha (1995)
<i>Beania cupulariensis</i>	AL, SP	Marcus (1944, 1955), Vieira <i>et al.</i> (2007)
<i>Beania correiae</i> n.sp.	AL*	-
<i>Beania</i> cf. <i>inermis</i> ¹	ES	Hastings (1943)
<i>Beania klugei</i>	CE*, PE, AL*, RJ, SP, PR*	Marcus (1937, 1939, 1949), Rocha (1995), Ramalho <i>et al.</i> (2010)
<i>Beania magellanica</i> ¹	ES	Hastings (1943)
<i>Beania maxilladentata</i>	RJ	Ramalho <i>et al.</i> (2010)
<i>Beania metrii</i> n.sp.	SC*	-
<i>Beania mirabilissima</i> n.sp.	AL, RJ, SP, PR*, SC*	Marcus (1937), Vieira <i>et al.</i> (2007), Ramalho <i>et al.</i> (2010)

¹Species not found in present study; *First record in Brazil.

TABLE 4. Characteristics of uniserial *Beania* species found in Brazil.

	<i>Beania australis</i>	<i>Beania cupulariensis</i>	<i>Beania klugei</i>	<i>Beania maxilladentata</i>	<i>Beania mirabilissima</i>
Zooid					
Erect portion	flask-like	boat-shaped	boat-shaped	boat-shaped	boat-shaped
Connective tube	very long	very short	short	long	very long
Oral spines					
Number	4	2	-	2–4	4
Shape	short	short, pointed	-	short, pointed	very short
Position	equidistant	distal	-	inequidistant	equidistant
Lateral spines					
Number	10–19 pairs	5–7 pairs	-	1–6	5–8 pairs
Shape	long	short	-	very short	proximal spines slightly longer than the distal
Position	comb-like; reaching the midline of membrane	equidistant; overarching frontal, most proximal directed outwards	-	irregular, directed upwards or outwards	equidistant with large gap proximal; overarching frontal
Avicularium					
Rostrum	absent	present	present	present	absent
Mandible	-	hooked	longer than wider, hooked	wider than long, strongly curved	-
	-	hooked	hooked	hooked and with apparatus	-

TABLE 5. Characteristics of reticulate *Beania* species. Morphology of European species *Beania hirtissima* and *Beania cylindrica* given by Hayward and McKinney (2002).

	<i>Beania americana</i>	<i>Beania correiae</i>	<i>Beania metrii</i>	<i>Beania hirtissima</i>	<i>Beania cylindrica</i>
Oral spines					
Number	8–10	8	8	7	6
Position	evenly spaced	symmetric	evenly spaced	3 distal and 2 in each side	evenly spaced
Lateral spines					
Number	9–13 pairs	14–20 pairs	8–10 pairs	10	8–10 pairs
Shape/Position	long and incurved; regularly spaced	long and incurved; regularly spaced	short and straight, directed over the frontal membrane	5 straight erect spines with shorter, thinner spine at its base, curving medially	long, slightly incurved; regularly spaced
Additional spines	1–6 directed outwards plus 2–5 basal	3–9 directed outwards plus 6–10 basal	6–16, forming some latero-basal series	3–8 basal	present
Avicularium	Absent	absent	absent	present	absent

The presence of at least four species of *Beania* in both northern and southern hemispheres also indicates habitat connectivity in the western Atlantic fauna, as shown by Vieira *et al.* (2010). In addition, the occurrence of these shallow-water species on pelagic algae [viz. *B. americana*, *B. australis*, *B. klugei* and *B. mirabilissima*] is strong evidence that the dispersal of colonies can be facilitated by algal rafting as observed in other bryozoans (Taylor & Monks 1997). Among the species studied, only three (*B. maxilladentata*, *B. correiae*, *B. metrii*), appear to have a restricted distribution. Further morphological, ecological and genetic studies are important to understand faunal relationships and to evaluate the diversity of shallow-water species of *Beania* from the tropical to subtropical Western Atlantic.

TABLE 6. Catalogue of studied specimens of *Beania* from the Brazilian coast. MC, Marcus collection.

State	Locality	Date	Substrata	Depth (m)	MZUSP cat. number
<i>Beania americana</i>					
AL	Maceió, 9°37' S, 38°41'18" W	ii.2004	algae	0–2	421
-	-	-	rocks	-	(MC 19)
SP	Ubatuba, 23°27'30" S, 44°01'27" W	23.vii.2002	shell fragment (on moderately sorted very coarse sand)	10	415
SP	Ubatuba, 23°31'15" S, 45°04'52" W	25.ix.2002	stones (on poorly sorted fine sand)	6	416
SP	Ilha de Massaguaçu, Caraguatatuba, 23°35'04" S, 45°18'50" W	16.iii.2001	<i>Sargassum</i> sp.	5	417
SP	Ilha de Massaguaçu, Caraguatatuba, 23°35'04" S, 45°18'50" W	16.iii.2001	<i>Sargassum</i> sp.	8.5	418
SP	Ponta da Baleia, São Sebastião, 23°46'27" S, 45°40'31" W	10.iv.2001	<i>Sargassum</i> sp.	-	419
SP	Caraguatatuba, 23°35'29" S, 45°14'29" W	26.xi.2002	shell fragment (on moderately sorted very fine sand)	10	420
SP	Praia Preta, São Sebastião	07.vii.2009	Bryozoa: <i>Amathia</i> sp.	2	422
SP	Barequeçaba, São Sebastião, 23°49'41" S, 46°26'25" W	03.vii.2009	<i>Sargassum</i> sp.	0–2	423

Continued next page

TABLE 6. (continued)

State	Locality	Date	Substrata	Depth (m)	MZUSP cat. number
PR	Ponta da Nhá Pina, Ilha do Mel	15.xi.2009	Bryozoa: <i>Anguinella palmata</i>	0–2	424
PR	Ponta da Nhá Pina, Ilha do Mel	15.xi.2009	Bryozoa: <i>Amathia</i> sp.	0–2	425
PR	Morro do Sabão, Ilha do Mel	16.xi.2009	Bryozoa: <i>Anguinella palmata</i>	0–2	426
PR	Morro do Sabão, Ilha do Mel	16.xi.2009	rocks	0–2	427
PR	Morro do Sabão, Ilha do Mel	16.xi.2009	rocks	0–2	428
<i>Beania australis</i>					
AL	Maceió, 9°33'54" S, 35°38'40" W	07.ix.2007	red algae	0–2	377
AL	Jequiá da Praia, 10°04' S, 36°02' W	22.vi.2002	Bryozoa: <i>Celleporaria</i> sp.	15	378
SP	Santos	?1938	rocks	-	023 (MC)
<i>Beania correiae</i>					
AL	Jequiá da Praia 10°04' S, 36°02' W	22.vi.2002	rocks, shells	15	402
AL	Jequiá da Praia, 10°04' S, 36°02' W	22.vi.2002	Bryozoa: <i>Celleporaria</i> sp.	15	403
<i>Beania cupulariensis</i>					
AL	Marechal Deodoro, 9°46'33" S, 35°50'06" W	01.xii.2005	rocks	5	379
AL	Marechal Deodoro, 9°46'33" S, 35°50'06" W	30.vi.2006	rocks	5	380
SP	São Sebastião	24.i.2005	shells	-	381
SP	Ilhabela	1948	algae	-	007 (MC)
<i>Beania klugei</i>					
CE	Fortaleza, 3°43'28" S, 38°28'38" W	25.viii.2009	algae.	0–2	210
CE	Fortaleza, 3°43'28" S, 38°28'38" W	02.ix.2009	algae.	0–2	211
PE	Pirapama Shipwreck	2002	?	24	382
AL	Maceió, 9°31'30" S, 35°35'10" W	01.iv.2007	<i>Sargassum</i> sp.	0–2	383
AL	Maceió, 9°34'42" S, 35°39'19" W	31.iii.2007	<i>Sargassum</i> sp.	0–2	384
AL	Maceió, 9°40'42"S, 35°45'12"W	18.i.2007	bryozoans	1–3	385
AL	Maceió, 9°40'42"S, 35°45'12"W	27.iv.2006	hydroid	1–3	-
AL	Maceió, 9°40'42"S, 35°45'12"W	24.iv.2006	Bryozoa: <i>Bugula</i> sp.	1–3	-
AL	Marechal Deodoro, 9°46'33" S, 35°50'06" W	30.iii.2006	<i>Sargassum</i> sp.	0–2	386
AL	Jequiá da Praia, 10°04' S, 36°02' W	22.vi.2002	hydroid	15	387
RJ	Japaris Beach, Ilha Grande	27.vii.1966	ascidians	-	072
SP	Santos	?1938	rocks	-	023 (MC)
SP	Araçá Bay, São Sebastião	07.vii.2009	Bryozoa: <i>Bugula neritina</i>	-	252
SP	Araçá Bay, São Sebastião	07.vii.2009	Bryozoa: <i>Crisia pseudosolena</i>	-	265
SP	Araçá Bay, São Sebastião	07.vii.2009	Bryozoa: <i>Amathia vodovici</i>	-	269

Continued next page

TABLE 6. (continued)

State	Locality	Date	Substrata	Depth (m)	MZUSP cat. number
SP	As Ilhas, São Sebastião, 23°47'30" S, 45°43'30" W	10.iv.2001	<i>Sargassum</i> sp.	5	391
SP	Ilha de Massaguaçu, Caraguatatuba, 23°35'04" S, 45°18'50" W	27.ix.2001	<i>Sargassum</i> sp.	-	395
SP	Ilha dos Porcos, Ubatuba, 23°22'30" S, 44°53'58" W	18.x.2001	algae	-	393
SP	Ilha dos Porcos, Ubatuba, 23°22'30" S, 44°53'58" W	18.x.2001	algae	-	396
SP	Ilha dos Porcos, Ubatuba, 23°22'30" S, 44°53'58" W	18.x.2001	algae	-	398
SP	Ilha dos Porcos, Ubatuba, 23°22'30" S, 44°53'58" W	18.x.2001	algae	-	399
SP	Ilha dos Porcos, Ubatuba, 23°22'30" S, 44°53'58" W	08.vi.2001	algae	-	404
SP	Picinguaba, Ubatuba, 23°22'26" S, 44°50'20" W	08.vi.2001	algae	-	394
SP	Picinguaba, Ubatuba, 23°22'26" S, 44°50'20" W	09.v.2001	rocks	-	392
SP	Picinguaba, Ubatuba, 23°22'26" S, 44°50'20" W	09.v.2001	rocks	-	397
PR	Morro do Sabão, Ilha do Mel	16.xi.2009	Bryozoa: <i>Anguinella palmata</i>	0–2	388
PR	Morro do Sabão, Ilha do Mel	16.xi.2009	Bryozoa: <i>Amathia</i> sp.	0–2	389
PR	Ilha do Mel, 25°34'16" S, 46°18'56" W	07.x.2006	<i>Sargassum</i> sp.	1	390
<i>Beania maxilladentata</i>					
RJ	Ilha Grande, 23°11' S, 44°21' W	vii.2007	bryozoans	-	400
<i>Beania metrii</i>					
SC	Arvoredo, 27°06'00" S, 48°22'41" W	25.iv.2002	<i>Halimeda</i> sp.	6–20	401
<i>Beania mirabilissima</i>					
AL	Maceió, 9°40'45" S, 35°45'01" W	27.iv.2006	hydroids	0–3	-
AL	Marechal Deodoro, 9°46' S, 35°50'10" W	30.iii.2006	<i>Sargassum</i> sp.	0–2	410
SP	Ilhabela, São Sebastião	16.iii.2001	?	-	409
SP	Praia Preta, São Sebastião	07.vii.2009	algae	2	411
SP	Praia da Baleia, São Sebastião, 23°46'51" S, 45°39'52" W	09.iv.2001	?	-	407
SP	Ilha dos Porcos, Ubatuba, 23°22'30" S, 44°53'58" W	08.vi.2001	algae	-	405
SP	As Ilhas, São Sebastião, 23°47'30" S, 45°43'30" W	10.iv.2001	<i>Sargassum</i> sp.	?	406
SP	Praia Martim de Sá, Caraguatatuba, 23°37'35" S, 45°22'31" W	13.iii.2001	bryozoans	-	408
PR	Ilha do Mel, 25°34'16" S, 46°18'56" W	07.x.2006	bryozoans	1	412
PR	Morro do Sabão, Ilha do Mel	16.xi.2009	Bryozoa: <i>Amathia</i> sp.	0–2	413
SC	Arvoredo, 27°06'00" S, 48°22'41" W	25.iv.2002	<i>Halimeda</i> sp.	6–20	414

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References

- Allman, G. (1856) *A Monograph of the Freshwater Polyzoa, including all the known species, both British and foreign*. Ray Society, London. 119 p., 11 pls.
- Berning, B. & Kuklinski, P. (2008) North-east Atlantic and Mediterranean species of the genus *Buffonellaria* (Bryozoa, Cheilostomata): implications of biodiversity and biogeography. *Zoological Journal of the Linnean Society*, 152, 537–566.
- Berning, B., Tilbrook, K.J. & Rosso, A. (2008) Revision of the north-eastern Atlantic and Mediterranean species of the genera *Herentia* and *Therenia* (Bryozoa: Cheilostomata). *Journal of Natural History*, 42, 1509–1547.
- Bock, P. (2008) Bryozoan Home Page: Recent and Fossil Bryozoa [Internet]. 2008. Mount Waverley (VIC): Philip Bock; [cited 2008 September 3]. Available from: <http://bryozoa.net/>
- Busk, G. (1852a) An account of the Polyzoa, and Sertularian Zoophytes, collected in the Voyage of the Rattlesnake, on the coasts of Australia and the Lousiade Archipelago, &c. In: MacGillivray, J. (Ed.), *Narrative of Voyage of H.M.S. Rattlesnake, commanded by the late Captain Owen Stanley, R.S., F.R.S. &c. during the years 1846–1850; including discoveries and surveys in New Guinea, the Lousiade Archipelago, etc., to which is added the account of Mr. E. B. Kennedy's expedition for the exploration of the Cape York Peninsula*, Vol. 1. T.W. Boone, London (UK), pp. 343–402 (Appendix IV).
- Busk, G. (1852b) *Catalogue of Marine Polyzoa in the Collection of the British Museum, I. Cheilostomata (Part)*. Trustees of the British Museum (Natural History), London. 54 p.
- Busk, G. (1867) Zoophytology. *Quarterly Journal of Microscopical Science*, n.s. 7, 27, 241–243.
- Canu, F. & Bassler, R.S. (1927) Classification of the cheilostomatous Bryozoa. *Proceedings of the United States National Museum*, 69(14), 1–42.
- Cook, P.L. (1968) Bryozoa (Polyzoa) from the coasts of tropical West Africa. *Atlantide Report*, 10, 11–262.
- Cook, P.L. (1985) Bryozoa from Ghana. *Tervuren, België Koninklijk Museum voor Midden-Afrika. Zoologische Wetenschappen*, 238, 1–315.
- Dumont, J.P.C. (1981) A report on the cheilostome Bryozoa of the Sudanese Red Sea. *Journal of Natural History*, 15, 623–637.
- Ehrenberg, C.G. (1831) *Symbolae Physicae, seu icones et descriptiones corporum naturalium novorum aut minus cognitorum, quae ex itineribus per Libyam, Aegyptum, Nubiam, Dongalam, Syriam, Arabian et Habessiniam ... studio annis 1820–25 redierunt. Pars Zoologica, Vol 4. Animalia Evertebrata exclusis Insectis*. Mittler, Berlin.
- Fransen, C.H.J.M. (1986) Caribbean Bryozoa: Anasca and Ascophora Imperfecta of the inner bays of Curaçao and Bonaire. *Studies of Fauna Curaçao and other Caribbean Islands*, 68(210), 1–19.
- Gautier, Y.V. (1962) Recherches écologiques sur les Bryozoaires chilostomes en Méditerranée occidentale. *Recueil des Travaux de la Station marine d'Endoume, Faculté des Sciences de Marseille*, 38, 1–434.
- Gray, J.E. (1848) Polyzoa. In: Gray, J.E., *List of the specimens of British Animals in the Collection of the British Museum. Part. 1. Centroniae or Radiated Animals*. Trustees of the British Museum (Natural History), London, pp. 91–151.
- Harmer, S.F. (1926) The Polyzoa of the Siboga Expedition, Part 2. Cheilostomata Anasca. *Siboga-Expeditie*, 28b, 183–501.
- Hastings, A.B. (1943) Polyzoa (Bryozoa) I. Scrupocellariidae, Epistomiidae, Farciminariidae, Bicellariellidae, Aeteidae, Scrupariidae. *Discovery Reports*, 22, 301–510, pls. 5–13.
- Hayward, P.J. & Ryland, J.S. (1995) Bryozoa from Heron Island, Great Barrier Reef. 2. *Memoirs of the Queensland Museum*, 38, 533–573.
- Hayward, P.J. & Ryland, J.S. (1998) Cheilostomatous Bryozoa: 1. Aeteoidea – Cribrilinoidea: notes for the identification of British species. 2nd edn. *Synopses of the British Fauna*, n.s., 10: i–vii, 1–366.
- Hayward, P.J. & McKinney, F.K. (2002) Northern Adriatic Bryozoa from the vicinity of Rovinj, Croatia. *Bulletin of the American Museum of Natural History*, 270, 1–139.
- Heller, C. (1867) Die Bryozoen des adriatischen Meeres. *Verhandlungen der Zoologisch-botanischen Gesellschaft in Wien*, 17, 77–136.
- Herrera-Cubilla, A., Dick, M.H., Sanner, J. & Jackson, J.B.C. (2006) Neogene Cupuladriidae of tropical America I: Taxonomy of recent *Cupuladria* from opposite sides of the Isthmus of Panama. *Journal of Paleontology*, 80, 245–263.
- Herrera-Cubilla, A., Dick, M.H., Sanner, J. & Jackson, J.B.C. (2008) Neogene Cupuladriidae of tropical America II: Taxonomy of recent *Discoporella* from opposite sides of the Isthmus of Panama. *Journal of Paleontology*, 82, 279–298.
- Hincks, T. (1880) *A History of the British Marine Polyzoa*. John Van Voorst, London. 355 p.
- Hincks, T. (1881) Contributions towards a general history of the marine Polyzoa. Part VIII. Foreign Cheilostomata (miscellaneous). *Annals and Magazine of Natural History*, ser. 5, 8, 132–136.

- Hincks, T. (1883) Contributions towards a general history of the marine Polyzoa. Part XI. Foreign Cheilostomata (Australia and New Zealand). *Annals and Magazine of Natural History, ser. 5*, 11, 193–202.
- Hincks, T. (1886) The Polyzoa of the Adriatic, I. *Annals and Magazine of Natural History, ser. 5*, 17, 254–271.
- Hondt, J.-L. d' (1985) Contribution à la systématique des Bryozoaires Eurystomes. Apports récents et nouvelles propositions. *Annales des Sciences naturelles, Zoologie et Biologie animale*, 7, 1–12.
- Johnston, G. (1840) Description of a new genus of British zoophyte. *Annals and Magazine of Natural History, ser. 1*, 5, 272–274.
- Johnston, G. (1847) *A History of the British Zoophytes*, 2nd edn. John Van Voorst, London. 488 p.
- Lagaaij, R. (1963) New additions to the bryozoan fauna of the Gulf of Mexico. *Publication of the Institute of Marine Science (University of Texas)*, 9, 162–236.
- López-Gappa, J.J. (2001) Presence of *Beania mirabilis* Johnston in the Gulf of San Matias (Argentina) with a key to the Argentine species of *Beania* (Bryozoa, Cheilostomea). *Revista del Museo Argentino de Ciencias Naturales, n.s.*, 3, 73–76.
- Marcus, E. (1937) Bryozoários marinhos brasileiros, 1. *Boletim da Faculdade de Filosofia, Ciências e Letras da Universidade de São Paulo, Zoologia*, 1, 5–224.
- Marcus, E. (1939) Bryozoários marinhos brasileiros, 3. *Boletim da Faculdade de Filosofia, Ciências e Letras da Universidade de São Paulo, Zoologia*, 3, 111–353.
- Marcus, E. (1941) Briozoários marinhos do litoral Paranaense. *Arquivos do Museu Paranaense*, 1, 7–36.
- Marcus, E. (1944) *Beania cupulariensis* Osb. (Bryozoa Cheilost.) nova para o Brasil. *Comunicaciones Zoológicas del Museo de Historia Natural de Montevideo*, 1(12), 1–3.
- Marcus, E. (1949) Some Bryozoa from the Brazilian coast. *Comunicaciones Zoológicas del Museo de Historia Natural de Montevideo*, 3(53), 1–33.
- Marcus, E. (1955) Notas sobre briozoos marinhos brasileiros. *Arquivos do Museu Nacional do Rio de Janeiro*, 42, 273–341.
- Maturo, F.J.S. (1966) Bryozoa of the south-east coast of the United States: Bugulidae and Beaniidae (Cheilostomata: Anasca). *Bulletin of Marine Science*, 16, 556–583.
- Osburn, R.C. (1914) The Bryozoa of the Tortugas Islands, Florida. *Publication of the Carnegie Institution of Washington*, 182, 183–222.
- Osburn, R.C. (1940) Bryozoa of Porto Rico with a résumé of the West Indian bryozoan fauna. *Scientific Survey of Porto Rico and the Virgin Island*, 16, 321–486.
- Ramalho, L.V., Muricy, G. & Taylor, P.D. (2010) Taxonomy of *Beania* Johnston, 1840 (Bryozoa, Flustrina) from Arraial do Cabo, Rio de Janeiro state, Brazil. *Arquivos do Museu Nacional do Rio de Janeiro*, 66, 499–508.
- Rocha, R.M. (1995) Abundance and distribution of sessile invertebrates under intertidal boulders (São Paulo, Brazil). *Boletim do Instituto Oceanográfico*, 43, 71–88.
- Smitt, F.A. (1868) Kritisk förteckning öfver Skandinavians Hafs-Bryozoer. III. *Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar*, 24, 279–429.
- Taylor, P.D. & Monks, N. (1997) A new cheilostome bryozoan genus pseudoplanktonic on molluscs and algae. *Invertebrate Biology*, 116, 39–51.
- Tilbrook, K.J., Hayward, P.J. & Gordon, D.P. (2001) Cheilostomatous Bryozoa from Vanuatu. *Zoological Journal of the Linnean Society*, 131, 35–109.
- Tilbrook, K.J. (2006) Cheilostomatous Bryozoa from the Solomon Islands. (*Studies in Biodiversity*, 3). *Santa Barbara Museum of Natural History Monographs*, 4, 1–386.
- Vieira, L.M., Gordon, D.P. & Correia, M.D. (2007) First record of a living ditaxiporine catenocellid in the Atlantic, with a description of *Vasignyella ovicellata* n. sp. (Bryozoa). *Zootaxa*, 1582, 49–58.
- Vieira, L.M., Migotto, A.E. & Winston, J.E. (2008) Synopsis and annotated checklist of Recent marine Bryozoa from Brazil. *Zootaxa*, 1810, 1–39.
- Vieira, L.M., Migotto, A.E. & Winston, J.E. (2010) *Marcusadorea*, a new genus of lepralioid bryozoan from warm waters. *Zootaxa*, 2348, 57–68.
- Winston, J.E. (1982) Marine bryozoans (Ectoprocta) of the Indian River area, Florida. *Bulletin of the American Museum of Natural History*, 173, 99–176.
- Winston, J.E. (1986) An annotated check-list of coral-associated bryozoans. *American Museum Novitates*, 2859, 1–39.
- Winston, J.E. & Håkansson, E. (1986) The interstitial fauna of the Capron Shoals, Florida. *American Museum Novitates*, 2865, 1–98.
- Zabala, M. & Malquer, P. (1988) Illustrated keys for the classification of Mediterranean Bryozoa. *Teballs del Museu de Zoologia Barcelona*, 4, 1–294.