

New records of *Catenicella* de Blainville, 1830 (Catenicellidae: Cheilostomata: Ascophora) in Rio de Janeiro State, Brazil

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ABSTRACT: Although there are six species of Catenicellidae recorded in Brazil, the three *Catenicella* species described here are the first mention of the genus in the state of Rio de Janeiro, enlarging their distribution along the Brazilian coast. Previously, *C. contei* was recorded in Pernambuco and São Paulo, while *C. elegans* was recorded in the states of Alagoas and São Paulo. The recent identification of these species in the state of Rio de Janeiro suggests two possibilities: it is difficult to find them due to small size and cryptic habitat, and/or they represent introduced species.

The superfamily Catenicelloidea (Busk, 1852) includes five families (Petalostegidae, Concatenellidae, Eurystomellidae, Savignyellidae, and Catenicellidae), with only the last two recorded in Brazil. Savignyellidae is represented by two species, *Savignyella lafontii* (Audouin, 1826) recorded from the states of Alagoas, São Paulo, and Rio de Janeiro (Marcus 1937; Vieira *et al.* 2008), and *Halysis diaphana* (Busk, 1860) from São Pedro and São Paulo Archipelago (Busk 1884, Harmer 1957). Catenicellidae is characterized for having erect, flexible, jointed and nodal colonies, attached to the substrate by rhizoids (Bock and Cook 1996). Autozooids are all turned to the same face, with 1-3 per internode; pore chamber variable, sometimes very large; ovicells occur in different positions depending of the genus and avicularia are usually present (Osburn 1952; Gordon 1984).

In Brazil, seven species of Catenicellidae [*Catenicella contei* (Audouin, 1826), *Catenicella elegans* (Busk, 1852), *Catenicella uberrima* (Harmer, 1957), *Vasignyella ovicellata* Vieira *et al.*, 2007, *Talivittaticella sacculata* (Busk, 1884), *Talivittaticella problematica* (d'Hondt, 1981), and *Talivittaticella axiomorpha* Gordon and d'Hondt, 1985] have been recorded principally in the states of Pernambuco and Alagoas (northeast region) and the state of São Paulo (southeast region) (for detailed distribution see Vieira *et al.* 2008; 2012). In this paper we describe three *Catenicella* species, the first records of this genus in the state of Rio de Janeiro.

All colonies were collected from 2002 to 2006 along the coast of the state of Rio de Janeiro (21°18' S, 40°57.6' W to 23°21' S, 44°43.2' W), Southeast Brazil (SW Atlantic). Colonies were found in six localities: Atafona, Campos, Arraial do Cabo, Guanabara Bay, Sepetiba, and Trindade (Figure 1). Samples were collected by dredging, scuba diving, snorkeling, and by hand, from intertidal level to 12 m depth. Bryozoans colonies were fixed in 70%

ethanol and stored at the Bryozoa Collection of the Museu Nacional, Universidade Federal do Rio de Janeiro. Scanning electron microscopy was made with specimens dried and coated by gold at the Instituto de Biofísica Carlos Chagas Filho, Universidade Federal do Rio de Janeiro and the Universidade Santa Úrsula.

Class Gymnolaemata Allman, 1856
Order Cheilostomata Busk, 1852
Infraorder Ascophora Levinsen, 1909
Superfamily Catenicelloidea Busk, 1852
Family Catenicellidae Busk, 1852



FIGURE 1. Map of study area, state of Rio de Janeiro. 1. Atafona; 2. Campos; 3. Arraial do Cabo; 4. Guanabara bay; 5. Sepetiba; 6. Trindade.

Genus *Catenicella* de Blainville, 1830

Diagnosis: Erect, jointed, branching colonies. Autozooids all facing the same way on branches, two or three zooids per internode. Frontal wall perforate by very small pores. *Vittae* present on either side of the front. Ovicell surrounded by beaded border and embedded in the base of the next distal zooid (modified from Osburn 1952; Gordon 1989).

Catenicella uberrima (Harmer, 1957) (Figure 2)

Vittaticella uberrima Harmer 1957: 772; Cook 1968a: 179; Winston 1982: 152.

Material examined: MNRJ-222, Atafona, state of Rio de Janeiro, Brazil; 12 m depth; IEAPM – Moman Project collector; 26/May/2004; MNRJ-136, Arraial do Cabo (Forno Beach), state of Rio de Janeiro, Brazil; 1.5 m depth; L.V. Ramalho collector; 30/September/2003; NHM 1975.11.5.27, Loslos Is., N. of New Guinea – Siboga Expedition, Harmer Coll.

Description: Colony delicate, branched, arborescent, forming large tufts up to 5 cm high (Figure 2A-B). Internodes formed by often one or two zooids (Figure 2B); fertile internodes with three or more zooids (Figure 2B). Colour translucent to white. Autozooid longer than wide, 366-458 (428) mm long and 132-234 (184) mm wide, with distal and median region dilated, tapering proximally. Frontal surface with few small pores; *vittae* long and

narrow on both sides of the zooid appearing immediately below the lateral chamber and spreading to the proximal end. Orifice semicircular with very shallow sinus and two small sclerites (Figure 2C). Scapular chamber well developed; a small avicularium 61-81 (69) mm long, with triangular mandible, present between the infra and supra-scapular chambers (Figure 2C-D); a giant avicularium sometimes occurs, 229-356 (271) mm long, with mandible slightly spatulate, obliquely directed on to the orifice.

Ooecium slightly longer than wide, 204-255 (222) mm long and 204-234 (222) mm wide, overlapping the distal zooid up to half of its length; base of distal border beaded wide and almost reaching the scapular chamber, median frontal windows present (Figure 2B and 2D-E).

Ecology: Found on artificial substrates (Forno Beach) and on rocks at a depth of 1.5 to 12 metres.

Remarks: *Catenicella uberrima* is very similar to *C. elegans*, but they can be distinguished as *C. elegans* has long zooids, long *vittae*, located frontally not laterally, and an elongate supra-scapular chamber, forming a small spine-like process on both distal corners of the zooid. An infra-scapular chamber is sometimes developed, forming a small tip directed almost horizontally.

Catenicella uberrima was previously mentioned by Vieira et al. (2008) as a synonym of *C. elegans* (Busk, 1852) *sensu* Busk (1884: 12) and Correa (1947: 1), but in these publications the colonies have frontal *vittae*, differently from *C. uberrima*. Therefore, we suggest these materials require reexamination to confirm the correct name. *Catenicella uberrima* here described is the first record of the species in the state of Rio de Janeiro. In Brazil, *Catenicella uberrima* was previously reported from Alagoas State (Vieira et al. 2007) and São Pedro and São Paulo Archipelago (Vieira et al. 2012).

Previous records of *C. uberrima* (Harmer 1957; Cook 1968) mention colonies growing on natural substrates (other bryozoans and calcareous substrates), whereas all colonies here were collected on artificial substrates in Arraial do Cabo and Atafona. Winston (1982) mentioned that colonies were found growing in a harbour environment, but did not specify which kind of substrate.

Geographic distribution: World: Indonesia (Siboga Expedition), Western Atlantic (Florida, Bermuda), Caribbean and Gulf of Mexico, Western Africa (Harmer 1957; Cook 1968; Winston 1982). Brazil: São Pedro e São Paulo Archipelago (Vieira et al. 2012), Alagoas (Vieira et al. 2007), São Paulo (Migotto et al. 2011); First record in the state of Rio de Janeiro (Atafona and Arraial do Cabo).

Catenicella contei (Audouin, 1826) (Figure 3)

Eucrateia contei Audouin 1826: 242.

Catenicella contei: Marcus 1937: 76; 1938: 31; 1939: 113.

Vittaticella contei: Osburn 1940: 465; Winston 1982: 154.

Material examined: MNRJ-134, Campos Basin, state of Rio de Janeiro, Brazil; 1.5 m depth; J.E.A. Gonçalves; 01/May/2002; MNRJ-067, Arraial do Cabo, Cabo Frio Island, state of Rio de Janeiro, Brazil; 5 m depth; L.V. Ramalho and R. Melo; 27/February/2003; MNRJ-135, Guanabara Bay, state of Rio de Janeiro, Brazil; 1 m depth; J. Quintanilha; 03/June/2002; MNRJ-133, Trindade Beach, state of Rio de Janeiro, Brazil; 1 m depth; L.V. Ramalho and D.C. Savi; 03/February/2005; NHM 1948.2.16.64, Santos, state of São

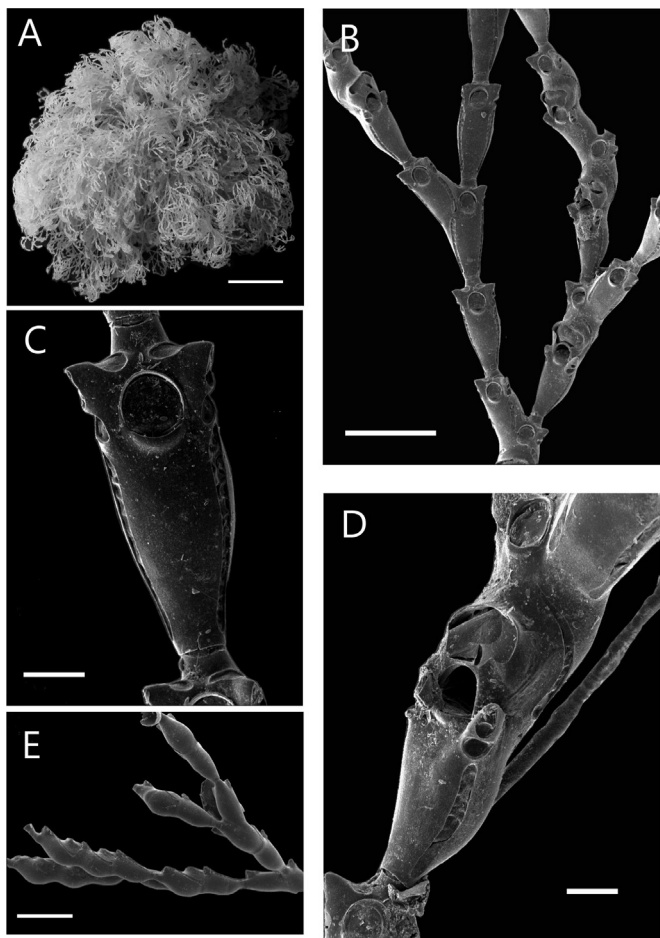


FIGURE 2. *Catenicella uberrima*. A. General view of the colony. B. Part of the colony, general and frontal view showing branched and internodes. C. Autozooid detail showing orifice, vittae, and scapular chambers. D. Lateral zooid detail with ovicell, vittae, scapular chamber, and lateral avicularium. E. Dorsal side of the colony. Scale bars: A: 1 cm; B, E: 500 μ m; C, D: 100 μ m. MNRJ-136.

Paulo, Brazil; Marcus coll.

Description: Colony small (1.5 cm high), very delicate, forming arborescent tufts, dichotomously branched, translucent to white (Figure 3A). Internodes with one or two autozooids (Figures 3A and B). Autozooids short, longer than wide, 244-336 (294) μm long and 122-173 (146) μm wide, distal median region dilated (Figure 3C). Frontal pores small and scarce. *Vittae* almost frontal, on both sides of the zooids, slightly surpassing the median line of the autozooid without reaching the infra-scapular chamber (Figures 3B-D). Orifice sub-circular with slightly concave sinus. Scapular chamber well developed, elongate, resembling a thick spine on both distal corners.

Avicularia absent (Figure 3B).

Ooecium longer than wide, 163-255 (210) μm long and 132-173 (148) μm wide, occupying more than half of the length of the distal zooid. Border beaded, pores scattered over frontal surface, with a median vertical slit; operculum forming a horizontal line independent from maternal zooid (Figure 3D).

Remarks: In comparison to the species from the North Atlantic, this material is very similar in the size of the zooids (330 x 140 μm) and in most other characteristics, but it differs mainly in the size of the *vittae*, which in the Brazilian material are a little longer than half of the length of the zooid, although they do not reach the scapular chamber. However, Marcus (1937) mentioned a variation in the size of *vittae* and that this variation was also observed in the specimen from São Paulo State. Therefore the material studied is considered to belong to *C. contei*.

Catenicella contei was previously cited with a wide distribution along the state of São Paulo coast (Marcus 1937, 1938, 1939; Migotto et al. 2011). This species was recently reported in Alagoas State (Vieira et al. 2007) and

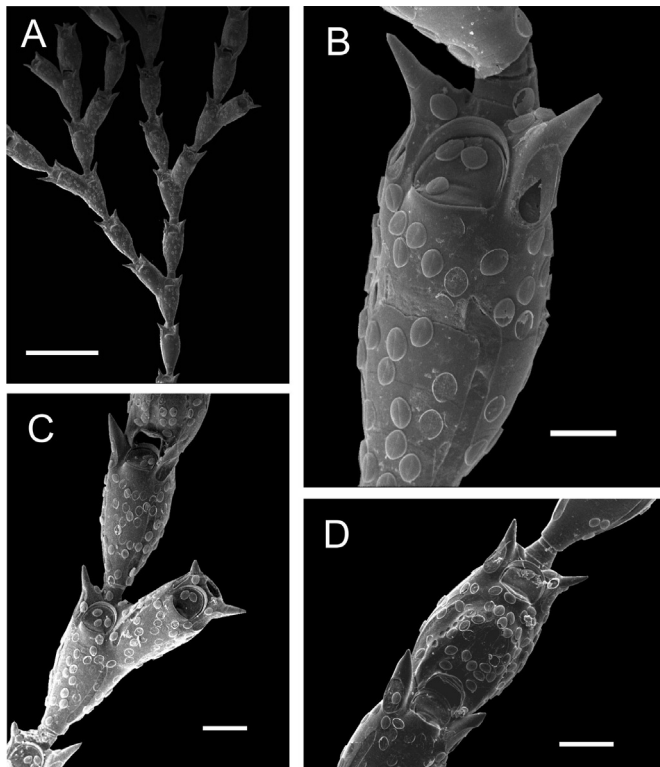


FIGURE 3. *Catenicella contei*. A. Part of the colony, general view. B. Autozooid with zooidal aperture, vittae, and scapular chamber. C. Detail of branched colony. D. Fertile autozooid. Scale bars: A: 500 μm ; B: 50 μm ; C, D: 100 μm . MNRJ-067.

São Pedro e São Paulo Archipelago (Vieira et al. 2012). Yet this is the first record of this species from the state of Rio de Janeiro. As in São Paulo, its distribution is extensive, stretching from the south of the State (Trindade) to the north (Campos). The lack of previous records for this species in the state of Rio de Janeiro may be due to the small size of the colonies and their cryptic habits, which makes sampling difficult, and the lack of works on bryozoan taxonomy in the region. In addition, its distribution may have become enlarged by means of natural dispersal or maritime transportation in recent years, as it is a fouling species (Soule and Soule 1977) and may be transported on artificial structures.

Ecology: Found on artificial substrates (ship hulls) and on algae (*Sargassum* sp.) at a depth of 1 up to 5 metres.

Geographic distribution: World: Red Sea (Audouin 1826) and Atlantic Oceans (Cape Hatteras to Brazil; Caribbean and Gulf of Mexico) (Osburn 1940, Winston 1982). Brazil: São Pedro e São Paulo Archipelago (Vieira et al. 2012), states of Alagoas (Vieira et al. 2007), Pernambuco, São Paulo (Marcus 1937, 1938, 1939; Migotto et al. 2011), and Rio de Janeiro (Trindade Beach, Guanabara Bay, Arraial do Cabo, and Campos Basin - present study).

Catenicella elegans Busk, 1852 (Figure 4)

Catenicella elegans Busk 1852: 361; 1884: 12.

Vittaticella elegans: Osburn 1940: 464; 1952: 286; Gordon 1984: 67; Liu et al. 2001: 527.

Material examined: MNRJ-189, Atafona, state of Rio de Janeiro, Brazil; 12 m depth; IEAPM - Moman Project collector; 26/May/2004. NHM 99.7.1.502, South Africa, Busk coll., NHM 99.7.1.494, Algoa Bay, Busk coll., NHM 91.3.24.34, Albany Passage, A.C.H.

Description: Colonies small, delicate, dichotomously branched, forming arborescent tufts (Figures 4A-B). Each internode is formed by one or two zooids (Figures 4B-C). Transparent to white in colour. Autozooids short, a little longer than wide, 500-625 (569) μm long, very dilated distally. *Vittae* frontal, narrow, one on each side of the frontal surface; usually long, originating near the joint and frequently extending distally to below the orifice. Orifice circular, sometimes sub-circular with a stronger calcification on the proximal rim (Figures 4C-D). Scapular chamber well developed, forming a large protuberance on each of the distal corners, supra-scapular chamber horizontally elongated, distally located; infra-scapular chamber smaller, oval, frontally located at the side of the orifice (Figures 4C-D).

Avicularia small with triangular mandible, rounded tip, strongly curved, located between the infra and supra-scapular chambers (Figures 4C-D).

Ovicells not observed.

Remarks: The species *C. elegans* is very similar to *C. uberrima*, but they differ in the position and length of the *vittae* and in the presence of a giant avicularium placed horizontally above the orifice in *C. uberrima*.

This material is very similar to *C. elegans* as described by Busk (1852) from Australia and to those specimens from South Africa (see material examined above), mainly in the scapular chamber shape. However, comparing our specimen to the one described by Osburn (1952) and those from Albany Passage (see material examined above),

it was observed that the robust scapular chamber of the Rio de Janeiro material was not described by Osburn, but other characteristics were very similar, including zooidal dimensions. The Chinese specimen described by Liu *et al.*

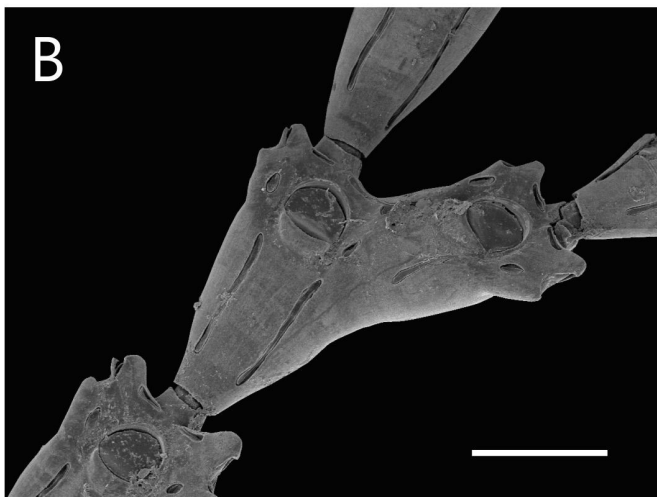
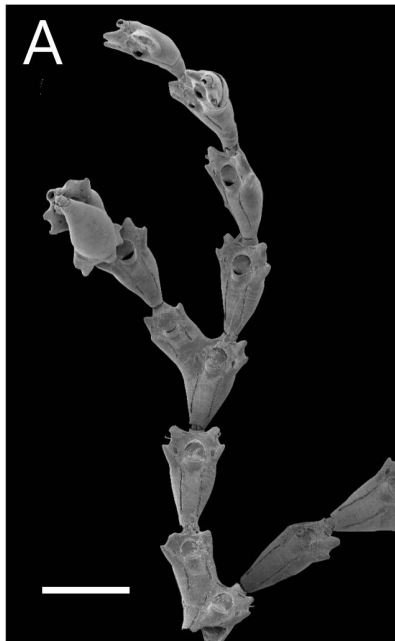


FIGURE 4. *Catenicella elegans*. A. General view of the colony showing bifurcated branches. B. Autozooids forming a bifurcation. C. Zooid detail showing zooidal aperture, vittae, scapular chamber, and avicularium. Scale bars: A: 0.5 mm; B: 200 μ m; C: 100 μ m. MNRJ-189.

(2001) showed zooids with both small and large scapular chambers, as occurs in Brazilian material and also in that of Busk (1852). Therefore, we consider that the material from the state of Rio de Janeiro belongs to *C. elegans*. The first Brazilian record of this species was made by Busk (1884) from the state of Alagoas (09°5' S, 34°50' W). Correa (1947) found the species in the state of São Paulo (Guarujá Inlet). Vieira *et al.* (2007) included the Busk's (1884) and Correa's (1947) *C. elegans* under *C. uberrima*, but these materials need to be reexamined as mentioned above (see Remarks for *Catenicella uberrima*). This is the first record of *C. elegans* in the state of Rio de Janeiro coast.

Ecology: Found on natural substrates at a depth of 12 metres.

Geographic distribution: World: Pacific (North America, South Africa, Australia, and New Zealand) and Atlantic Oceans (Porto Rico), and Chinese Sea (Busk 1852, 1884; Osburn 1940, 1952; Gordon 1984; Liu *et al.* 2001). Brazil: Rio de Janeiro (Atafona - present study); specimens from Alagoas (Busk 1884) and São Paulo (Correa 1947) require reexamination.

The three species described here are new records for the coast of the state of Rio de Janeiro. Two possibilities are suggested in explanation: 1. Cryptic habit and small size of colonies. Some studies were made on this coast before 2000 (for more details see Ramalho *et al.* 2008, 2011) and these species were not reported, maybe due to the small size of the colonies of this family and/or to their cryptic habits. 2. Recent artificial introduction. Catenicellids are not usually considered fouling species, except *C. contei* as mentioned by Soule and Soule (1977). However, the three species here identified were sampled on artificial substrates, principally on ship hulls. This information suggests that they could have been transported by artificial substrates, colonized new habitats on their arrival, enlarging their distributions along the Brazilian coast.

We believe that the number of bryozoan species in the state of Rio de Janeiro coast is not yet completely known [82 species now described; see also Ramalho *et al.* (2005, 2008, 2009, 2010, 2011)]. New studies with efforts directed toward collection of bryozoans will certainly increase this number.

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