

Two new species of *Caulleriella* (Polychaeta, Cirratulidae) from Argentina

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ABSTRACT. *Caulleriella bremecae* and *C. galeanoi* (Polychaeta: Cirratulidae) are newly described from Mar del Plata, Argentina (38°S, 57°W). Both species have small, red-pigmented nuchal organs (lateral “eyes”) on the prostomium. *Caulleriella bremecae* sp. nov. is further characterized by a peristomium without annulations except for a narrow anterior dorsal fold, posterior part of peristomium extending posterodorsally over chaetiger 1, latter extending posterodorsally over chaetiger 2 and with slightly separated grooved palps arising middorsally; notochaetae of chaetigers 1-23 all smooth capillaries, thereafter with six bidentate sigmoid hooks and 3-4 capillaries, both types fewer on last 4-5 chaetigers; neurochaetae of chaetigers 1-2 comprised of 8 bidentate hooks and 1-2 capillaries, thereafter only bidentate hooks, decreasing in number posteriorly. The species is frequent and abundant throughout the year in the intertidal mussel beds situated 200-700m from the sewage outfall of Mar del Plata city. *Caulleriella galeanoi* sp. nov. is characterized by a peristomium with three annulations dorsally, with grooved palps arising from annulus 3, and by smooth capillary chaetae in noto- and neuropodia of chaetigers 1-2. Bidentate hooks are present in neuropodia from chaetiger 3, numbering 5-6 in anterior and middle chaetigers, 1-3 in posterior ones. Notopodia have 3-6 pairs of smooth capillary chaetae, decreasing in number posteriorly. From chaetiger 13-20, notopodia with 1-2 capillary chaetae and 1-2 bidentate hooks. Specimens held in aquaria supplied with water and the green alga *Vaucheria* sp. (Vaucheriaceae) from the intertidal zone reproduced asexually by fission. Gametes were not observed in any specimens.

KEYWORDS. Polychaeta, Cirratulidae, *Caulleriella* new species, Mar del Plata, Argentina.

RESUMO. Duas novas espécies de *Caulleriella* (Polychaeta, Cirratulidae) da Argentina. As espécies novas *Caulleriella bremecae* e *C. galeanoi* (Polychaeta: Cirratulidae) são descritas para a região de Mar del Plata, Argentina (38°S, 57°W). Ambas têm pequenos órgãos nucais prostomiais de cor vermelha. *Caulleriella bremecae* sp. nov. é diagnosticada pela presença de peristômio sem anelações, com exceção de uma estreita dobra antero-dorsal; parte posterior do peristômio projetando-se posterodorsalmente sobre o setígero 1, que por sua vez se estende sobre a metade antero-dorsal do setígero 2; setígero 1 com palpos sulcados, em posição médio-dorsal, ligeiramente separados entre si; notocerdas dos setígeros 1-23 todas capilares lisas, substituídas a seguir por 6 ganchos sigmóides bidentados e 3-4 capilares, em menor número nos 4-5 últimos setígeros; neurocerdas dos setígeros 1-2 incluem 8 ganchos bidentados e 1-2 capilares, a seguir apenas ganchos bidentados, cujo número decresce posteriormente. A espécie é constante (?) e abundante ao longo de todo o ano em bancos de mexilhões na região entre marés, a 200-700 metros do ponto de despejo do duto de esgotos de Mar del Plata. *Caulleriella galeanoi* sp. nov. é diagnosticada por um peristômio com 3 anelações dorsais, com palpos sulcados inseridos na terceira anelação; cerdas capilares lisas nos notopódios e neuropódios dos setígeros 1-2; 5-6 ganchos bidentados neuropodiais a partir do setígero 3, diminuindo para 1-3 nos setígeros posteriores; notopódios anteriores com 3-6 pares de cerdas capilares lisas, presentes em menor número nos notopódios posteriores. A partir dos setígeros 13-20, notopódios com 1-2 cerdas capilares e 1-2 ganchos bidentados. Exemplares mantidos em aquários com a clorófitica *Vaucheria* sp reproduziram-se assexuadamente por fissão. Não foram observados gametas.

PALAVRAS-CHAVE. Polychaeta, Cirratulidae, *Caulleriella* novas espécies, Mar del Plata, Argentina.

Although several faunistic and other studies on polychaetes have been published during the last half century, many regions still lack taxonomic knowledge about the local fauna. This is particularly true for Argentina, whose extensive coastline spans more than 4,000km. The first characterization of macrobenthic communities from the extensive Argentine shelf did not include polychaetes due to “insufficient taxonomic knowledge, although [Polychaeta] is a relatively abundant group” (BASTIDA *et al.*, 1992). Among Argentine polychaetes, members of Cirratulidae Ryckholt, 1851 are particularly undocumented.

Cirratulids belong to the subclass Palpata, order Canalipalpata, suborder Terebellida. The family includes organisms with cylindrical body, with a blunt or conical prostomium, and reduced parapodia. Feeding palps arise dorsally in many species, but others have only tentacular cirri. Slender filiform branchiae are present on at least some chaetigers. Chaetae are mostly capillary, but curved or excavate hooks are characteristic of some genera

(FAUCHALD, 1977). Chaetal morphology is the main diagnostic character at the generic and specific levels (HARTMAN, 1961; BLAKE, 1996), but chaetal morphology may vary throughout ontogeny, requiring special care in taxonomic identification (GEORGE & PETERSEN, 1991).

This is the first of a planned series of contributions destined to elucidate the taxonomic status and diversity of Argentine cirratulids. Starting in 1996, and at the request of the Mar del Plata city water management authority (Obras Sanitarias Sociedad de Estado, OSSE), a series of benthic studies were conducted in intertidal and subtidal areas affected by sewage discharge. These studies were performed in order to obtain baseline information before the construction of a new sewer that will discharge wastes up to 3km offshore (11m depth), replacing the current one that discharges in the intertidal zone. These ecological studies have improved the knowledge of the regional polychaete fauna (e. g., ELÍAS & BREMEC, 1997, 2003; ELÍAS *et al.*, 2001, 2003a, b; ELÍAS, 2002; VALLARINO *et al.*, 2002; RIVERO *et al.*, 2005).

We describe herein two new species of the genus *Caulleriella* Chamberlin, 1919, one of which was previously identified as *Caulleriella alata* (Southern, 1914).

MATERIAL AND METHODS

The study area, around Mar del Plata (Buenos Aires Province, 38°S, 57°W), is located within the boundaries of the Argentine Biogeographic Province (warm-temperate region of the southwestern Atlantic) (BOSCHI, 2000).

Samples were obtained from intertidal beds of the small mytilid *Brachidontes rodriguezii* (d'Orbigny, 1846), around the sewage outfall. Several stations were sampled since 1997 by means of replicate 78cm² corers; materials were sieved through 1mm mesh (VALLARINO *et al.*, 2002; ELÍAS *et al.*, 2003a, 2006).

During a series of laboratory experiments, one aquarium, supplied with seawater from the intertidal zone, developed an algal cover of *Vaucheria* sp. Associated with the latter we observed specimens of *Caulleriella*. Observations with light microscopes and scanning electron microscope (SEM) showed it to be different from the one collected in the mussel beds.

Specimens of both species were examined with a JEOL (JSM – 6460 LV) scanning electron microscope. Materials for SEM were fixed for 24h with glutaraldehyde 3% in a buffer solution of sodium cacodylate 0.1 mol, pH between 7.2-7.4, then dehydrated in ETOH (50, 70, 80, 90, 95 and 100%). Samples were dried in hexamethyldisilazane (HMDS), mounted on aluminum discs and coated with Au-Pd (Gold-Palladium). Small specimens were mounted on slides with a Grey & Wess Medium (PVA: polyvinyl alcohol) for optical observation.

All materials were deposited in the Museo de Ciencias Naturales de La Plata (MCNLP), Argentina.

The genus *Caulleriella* is characterized by an elongated prostomium, and a short or long peristomium; two grooved tentacles anterior to chaetiger 1; middle segments not beaded; noto- and neuropodia widely separated, with a large gap between them. Chaetae include capillaries and bidentate, crotchetlike hooks, not arranged in cinctures (BLAKE, 1996).

The species of *Caulleriella* are still very incompletely known. *Caulleriella alata*, originally described from Ireland, has been reported from southern Argentina (ORENSANZ, 1974), southeast Brazil (BOLIVAR, 1990), Chile (including a subspecies *C. alata chilensis* Carrasco, 1977) to Gulf of Mexico and Florida (WOLF, 1984), Massachusetts (HARTMAN, 1965) and California (HARTMAN, 1961) in USA. This distribution is not coherent, and further studies will very likely show that this “group” consists of several species. Most Southern Hemisphere cirratulid species should be reviewed.

Caulleriella bremecae sp. nov.

(Figs. 1-6)

Caulleriella alata: ELÍAS, 2002; ELÍAS *et al.*, 2003a: table 1; RIVERO *et al.*, 2005: table 1 (non Southern, 1914).

Etymology. The species is dedicated to Dr. Claudia S. Bremec, polychaetologist who shares our passion for the study of worms from the Argentine sea.

Description. A moderate-size species. Body elliptical; chaetigers widest at mid-body, roughly square in cross section throughout; ventral surface concave to pygidium (Fig. 1). Color in alcohol yellowish-tan.

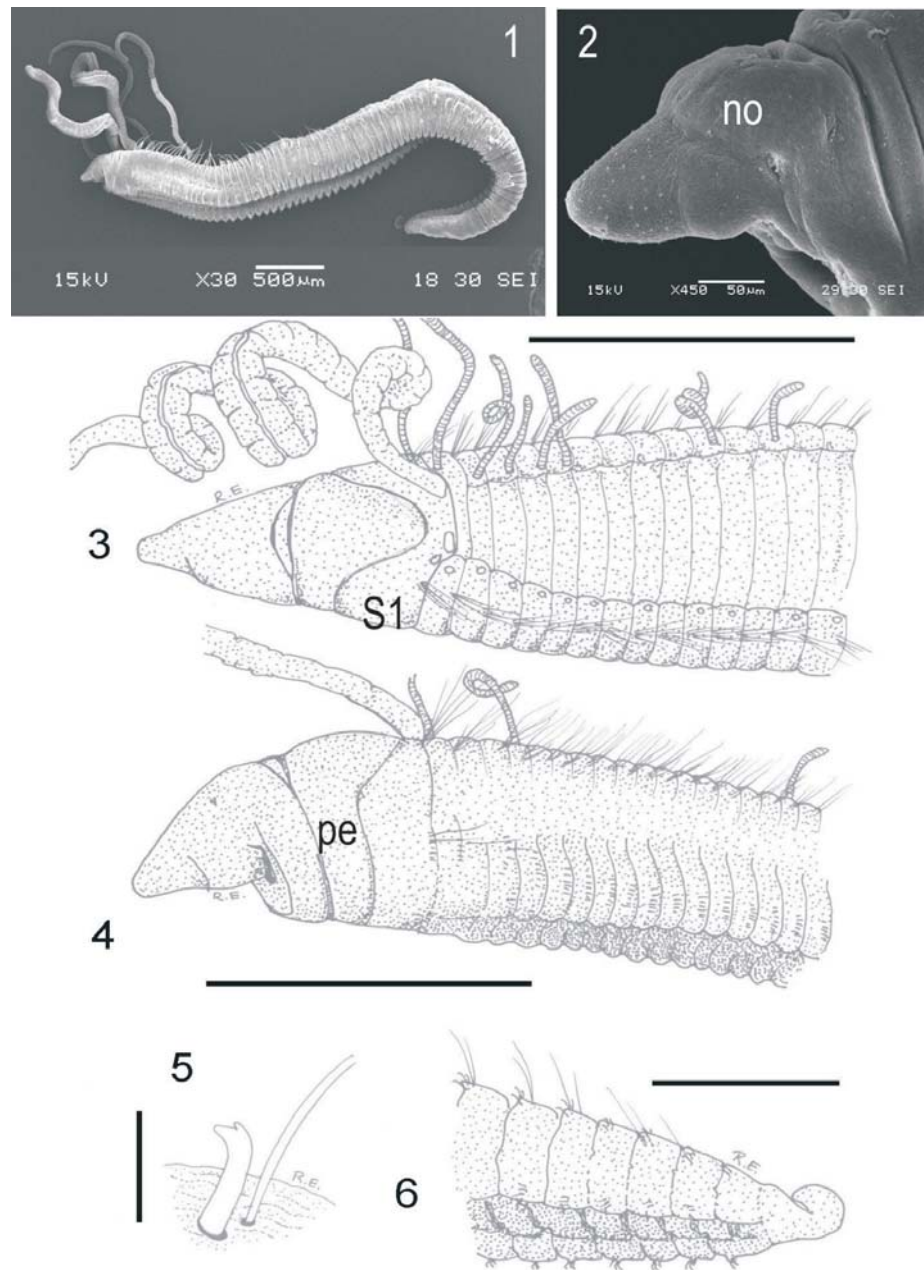
Prostomium triangular in dorsal and lateral views, as wide as long and with very irregular epidermis, appearing glandular. Prostomium with lateral “red eyespots”, which under SEM look like vertical depressions; these are in fact ciliated nuchal organs (Fig. 2) (DONER & BLAKE, 2006). Peristomium achaetous, lacking annulations, except for a narrow dorsal annulus. Dorsal part of peristomium extending over half of chaetiger 1 and forming slightly raised crest (Figs. 1, 4); grooved palps slightly separated, arising medially from posterior part of chaetiger 1; latter overlapping anterior half of chaetiger 2. First pair of filiform branchiae present on chaetiger 1, anterior and lateral to palps; subsequent pairs of branchiae on each following segment slightly dorsal to notochaetae (Fig. 3), frequent and long in anterior segments, shorter and less frequent in middle ones, absent on posterior ones.

Notopodia with 8-10 long and short capillary chaetae on first 23 chaetigers; subsequent chaetigers with six bidentate sigmoid hooks and with 3-4 capillary chaetae; last 4-5 chaetigers with fewer hooks and some capillary chaetae. Hooks without hood or wing, with unequal teeth (Fig. 5). Neuropodia of chaetigers 1-2 (exceptionally 1-3) with 6-9 bidentate hooks and 1-2 capillary chaetae; hooks decreasing in number (down to 3) posteriorly. Pygidium rounded, with dorsal anus (Fig. 6).

Methyl Green Staining Pattern. Prostomium, palps and branchiae well stained. Staining darker ventrally, mostly on anterior neuropodia.

Remarks. *Caulleriella bremecae* differs from *C. alata* in the position of the eyespots, which are dorsal, versus lateral in our material. *Caulleriella alata* has a simple peristomium not overlapping chaetiger 1, and with first pair of branchiae lateral to palps and on posterior part of peristomium, while in *C. bremecae* the peristomium forms a slight crest and overlaps chaetiger 1; the first pair of branchiae arises anterolaterally with respect to the palps, with both arising from posterior part of chaetiger 1. *Caulleriella alata* has long and short capillaries to the last notopodium, with the shorter capillaries being distinctly flattened, while *C. bremecae* lacks notochaetae in posteriormost chaetigers. Neuropodia bear hooks and capillaries on all segments in *C. alata*, while only a few capillaries are present on the first two (rarely three) neuropodia in *C. bremecae*. *Caulleriella alata* has bidentate hooks with a distinct wing on the convex side of the shaft above the constriction and only a slight bend distally; whereas hooks of *C. bremecae* have no wing (or hood), lack the constriction and are bent at a nearly right angle (Fig. 5).

DEAN & BLAKE (2007) described *C. moralesensis* and also compared it with *C. alata*. The former species is larger and with more segments than *C. bremecae*, and only the anterior region is flattened dorsoventrally, while in *C. bremecae* all the body is flattened dorsoventrally. The peristomium of *C. moralesensis* is triannulated, with



Figs. 1-6. *Caulleriella bremecae* sp. nov. 1, left lateral view of complete specimen (SEM); 2, anterior end of another specimen showing location of ciliated nuchal organ; 3, anterior end in dorsal view; 4, same specimen, left lateral view; 5, drawing of bidentate hook and companion capillary; 6, posterior end and pygidium, left ventrolateral view (no, nuchal organ; pe, peristomium; S1, segment 1). Scale bars: Fig. 3, 400 μ m; Fig. 4, 300 μ m; Fig. 5, 20 μ m; Fig. 6, 100 μ m.

the first annulus covering partially the prostomium, while in *C. bremecae* the peristomium lacks annulations and the crest partially covers chaetiger 1; nuchal organs are rounded in *C. moralesensis* and vertical slits in *C. bremecae*; the pygidium is a rounded lobe in both species, but the anus is ventral in *C. moralesensis* and dorsal in *C. bremecae*; notopodial hooks starting in the same chaetiger (23), but the neurochaetal pattern differs.

Distribution. *Caulleriella bremecae* is only known from off Mar del Plata.

Ecology. The species has been observed in the intertidal zone. It is associated with the sediments retained by the beds of the small mussel *B. rodriguezii* in areas

moderately enriched by sewage discharge around Mar del Plata. Control sites and most impacted areas had only occasional records and low abundance.

Material examined. Mar del Plata, near the intertidal sewage discharge: 37° 55.591'S, 57° 31.701'W; station 2 (230m from outfall; November 1997, 6 specimens; March 1998, 2 specimens; August 1998, 3 specimens); station 3 (450m from outfall, November 1997, 3 specimens); station 4 (700m from outfall, November 1997, 7 specimens). Additional material: 20 specimens examined with SEM and 7 slides.

Type material. ARGENTINA, **Mar del Plata: intertidal.** Holotype (MCNLP 6338) - 8.1mm long and 0.62mm across thoracic region for approximately 70 chaetigers. Paratypes: (MCNLP 6339, 10 specimens).

***Caulleriella galeanoi* sp. nov.**

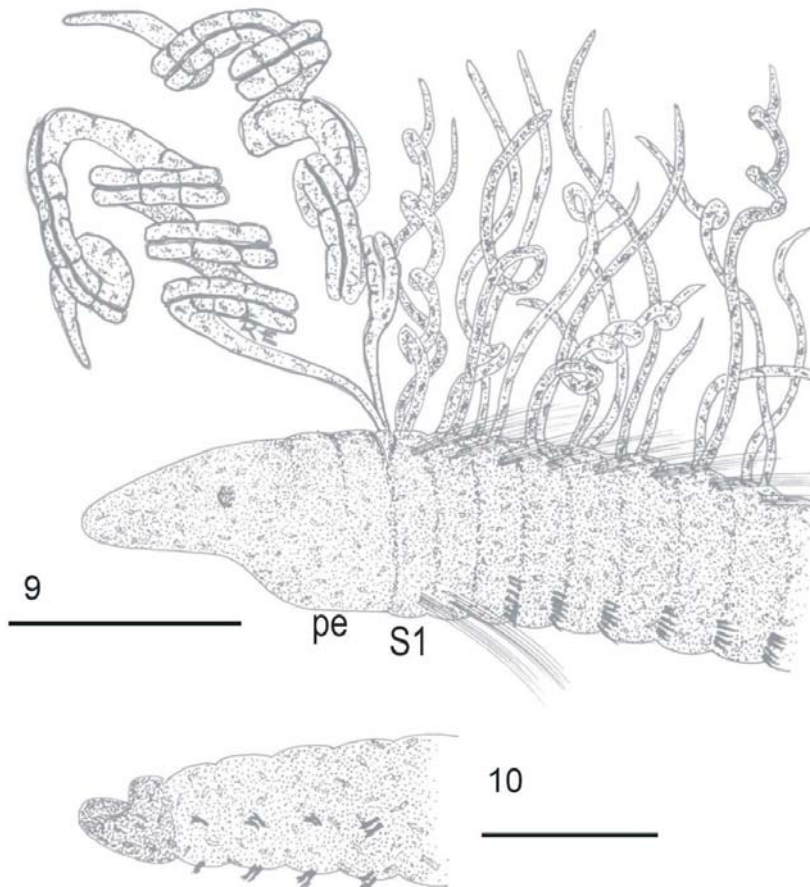
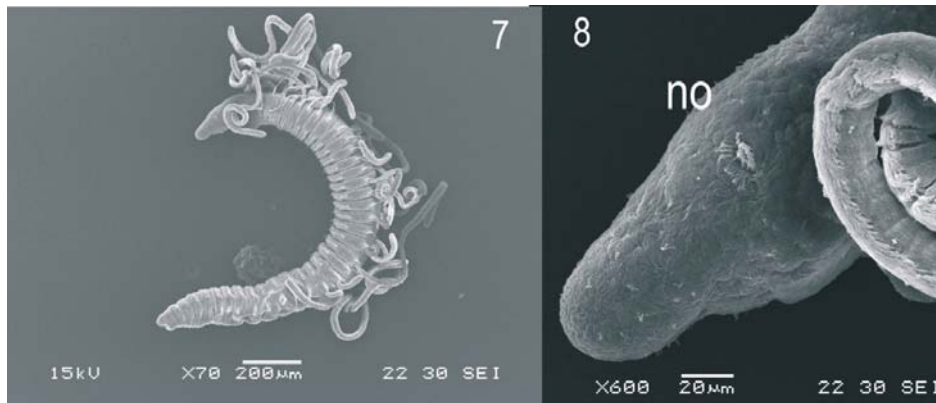
(Figs. 7-10)

Etymology. This species is named in honor of Eduardo Galeano, Uruguayan author.

Description. Very small species (Fig. 7). Body short; noto- and neuropodia widely separated (Fig. 9); ventral surface grooved from chaetiger 1, dorsum grooved from chaetiger 4-5. Color in life yellowish-tan with brown dots, latter denser on the dorsal surface, palps and some branchiae; pygidium densely pigmented, almost black. Color pattern remains after organisms are fixed in

formaldehyde solution and transferred to ETOH. Specimens fixed in ETOH turn green, becoming gray shortly after.

Prostomium short and rounded, with irregular epidermis; laterally, with a pair of rounded red spots resembling eyes (Fig. 9). Close SEM examination revealed that those structures are nuchal organs (Fig. 8). Peristomium slightly annulated dorsally; first two annuli wide, but third annulus narrow and bearing a pair of long, grooved palps; first pair of branchiae lateral to dorsal tentacles and anterior to chaetiger 1; branchiae long and thin, present through most of body length, only absent



Figs. 7-10. *Caulleriella galeanoi* sp. nov.: 7, left lateral view of complete specimen (SEM); 8, left lateral view of prostomium showing ciliated nuchal organ (SEM); 9, left lateral view of anterior end showing pigmentation pattern on body, palps and branchiae; 10, right dorsolateral view of posterior end and pygidium (no, nuchal organ; per, peristomium; S1, segment 1). Scale bars: Fig. 9, 150 μ m; Fig. 10, 150 μ m.

on posteriormost chaetigers; dorsal tentacles thick and grooved.

Notopodia with simple capillaries, arranged in fascicles of 2-4 pairs; bidentate hooks first present from chaetigers 21 in holotype, and between 8 to 22 in paratypes; 2-3 hooks at first, with 1-2 capillaries between hooks. Neuropodia with 1-2 simple capillaries in chaetigers 1-2; bidentate hooks starting on chaetiger 3, numbering 5-6 per neuropodium on anterior and middle chaetigers, dropping to 1-4 on posterior ones. No accompanying capillary chaetae. Hooks with apical tooth curved, varying from one-third to same length as main fang; no hood. Pygidium rounded, with dorsal anus (Fig. 10).

Methyl Green Staining Pattern. There is no clear staining pattern. Only palps and some branchiae stained slightly. Parts that are in the process of schizometamery stained darker, as well as the pygidium.

Remarks. *Caulleriella galeanoi* is closely similar to *C. bioculata* (Keferstein, 1862) but differs markedly in having a simple pygidium instead of the bilobed pygidium present in *C. bioculata*. Since the two lobes are not anal cirri, which may be lost, they will be present on any but incomplete specimens. Both species have a rounded prostomium, and are similar in the shape of the peristomium and position of palps and branchiae; they have notopodial capillaries all along the body, notopodial bidentate hooks are absent from a variable number of anterior chaetigers, neuropodial capillaries are present on chaetigers 1-2, and neuropodial bidentate hooks from chaetiger 3 to the posterior end. The two species differ in that the capillaries are simple in *C. galeanoi* but limbate and pectinate in *C. bioculata*; the peristomium is slightly triannulate dorsally in *C. galeanoi* but not in *C. bioculata*; notopodial hooks start on chaetiger 8-22 in *C. galeanoi* and in chaetiger 6-9 in *C. bioculata*. Complete specimens of *C. galeanoi* are quite short, 5mm long for about 50 chaetigers, while *C. bioculata* can have more than 140 chaetigers and reach a length of 40mm. Pigmentation in *C. galeanoi* is clearly different due to the presence of granules of dark pigment.

Another similar species is *C. minuta* Dean & Blake, 2007 (also confused with *C. bioculata*). *Caulleriella galeanoi* is similar to *C. minuta* in having small body size, small number of chaetigers, triannulate peristomium, neuropodium with capillaries in first chaetigers and hooks with no accompanying capillaries. However, in *C. galeanoi* the peristomium has a different annulation shape; neuropodia 1-2 have capillaries (three in *C. minuta*); and hooks have no capillaries; they are accompanied by capillaries in the anterior 4-9 chaetigers in *C. minuta*. Capillaries are laterally fimbriated in *C. minuta* and smooth in *C. galeanoi*, and the pattern of notopodial capillaries and hooks differs, as does the pigmentation.

An interesting feature of *C. galeanoi* and *C. bremecae* is the presence of nuchal organs resembling red eyespots. According to DONER & BLAKE (2006), in *Caulleriella* species the nuchal organs are a longitudinal slit, whereas in examined *Chaetozone* species it is circular. These authors suggest that location and shape of nuchal organs may be important generic-level characters in some cirratulids. This generalization is not valid for the South

American *C. bremecae*, as nuchal organs here are as vertical slits. A comparative SEM study of cirratulid "eyes" is needed to reveal the real nature of these red- or black-pigmented structures (DONER & BLAKE, 2006).

Distribution. Only known from the Mar del Plata area, in aquaria.

Ecology. This species was not recorded in natural habitats. Specimens were found in aquaria supplied with seawater from the intertidal zone. The aquaria developed mats of the alga *Vaucheria* sp., and the organisms preferred this habitat rather than the sediment of the bottom. The fact that specimens fixed in ETOH turn green suggests that they can be feeding on the algae, in spite of the deposit-feeding typical of cirratulids (FAUCHALD & JUMARS, 1979). In the course of our study, *C. galeanoi* reproduced only asexually, by schizometamery.

Type material. ARGENTINA, Mar del Plata: from aquaria supplied with water from the intertidal zone. Holotype (MCNLP 6340) - 4.6mm long and 0.05mm wide across thoracic region for approximately 55 chaetigers; Paratypes: (MCNLP 6341, 20 specimens). Additional material examined: 18 specimens for SEM - 3 juveniles of 24-28 chaetigers and 15 adults with about 50 chaetigers, all immature - and 8 on slides. Additional material. Material fixed in 100% ethanol for molecular studies: MLP deposited as MCNLP 6342.

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