

CAULLERIELLA PETERSENAE N. SP. AND TWO NEW RECORDS OF CIRRATULIDAE (ANNELIDA: POLYCHAETA) FROM VENEZUELA

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ABSTRACT

A total of 295 specimens of cirratulids were collected at five localities from the northeastern coast of Venezuela. *Caulleriella petersenae* is described as a species new to science, which is characterized by the absence of eyes and the presence of the first notopodial hooks at the chaetiger 26. On the other hand, *Monticellina* cf. *serratiseta* and *Timarete caribous* were recorded for the first time from Venezuela waters. All these species have been found associated to macro-algae and coral reef.

KEYWORDS: Polychaetes, annelids, biodiversity, cirratulids, Great Caribbean region.

RESUMEN

Caulleriella petersenae n. sp. y dos nuevos registros de Cirratulidae (Annelida: Polychaeta) para Venezuela. Un total de 295 cirratúlidos fueron recolectados en cinco localidades de la costa nororiental de Venezuela. *Caulleriella petersenae*, nueva especie para la ciencia, se caracterizó por la ausencia de ojos y la presencia de ganchos notopodiales a partir del setígero 26. Por otro lado, *Monticellina* cf. *serratiseta* y *Timarete caribous* fueron registradas por primera vez para Venezuela. Todas estas especies fueron encontradas asociadas a macroalgas y formaciones coralinas.

PALABRAS CLAVES: Poliquetos, anélidos, biodiversidad, cirratúlidos, Gran Caribe.

INTRODUCTION

The family Cirratulidae Ryckholt 1851, is an important and common component of intertidal and sub-tidal benthic communities, due to its abundance and frequency. Gibbs (1971) reported that some species from deep waters, such as *Aphelochaeta marioni* (De Saint-Joseph, 1894), may reach densities of up to 1000 ind·m⁻². Although it is a well-studied family in terms of its biology, physiology, and population dynamics, it is considered to be little known taxonomically as there

are still many inconsistencies in its systematics (Rouse and Pleijel, 2001; Dean and Blake, 2007). Some of these arise with regard to the placing of multi-tentacled juveniles, which have different chaetae types and a branchial distribution unlike that observed in adults, thus making their identification difficult (Blake, 1996). Díaz-Díaz and Salazar-Vallejo (2009) have suggested that the low number of taxonomic characteristics used has led researchers to confuse juvenile specimens (or specimens at other stages of development) with adults, which has resulted in the wrong designation of several species and genera. A family revision and reordering is therefore critically necessary.

A total of 12 genera and more than 170 cirratulid species are recognized, although the latter has increased in recent years. Blake (1996) described 20 new species from the continental shelf and intertidal localities of the Western Pacific coasts, mainly from California. The most recent studies include those of Dean and Blake (2007), who described eight new species in *Chaetozone* (3) and *Caulleriella* (5), and Dean and Blake (2009), who described six new species of *Monticellina*, both from the Pacific Central American coast. As regards to the Atlantic Ocean, Cirratulidae have been reported by Chambers (2000) and Chambers and Woodham (2003) from the seas off the northeastern coast of North America; Doner and Blake (2006) reported four new species [*Chaetozone* (3) and *Caulleriella* (1)] from shallow waters off the coast of Massachusetts. In South American waters, Elías and Rivero (2008, 2009a, 2009b) described a total of five new species from the Argentine coast. Whereas in the Great Caribbean, Wolf (1984) recorded 16 species from the Gulf of Mexico and Díaz-Díaz and Liñero-Arana (2004, 2011) recorded ten species from the continental shelf off Venezuela.

Recently, an identification key for genera and species from both the Great Caribbean Sea and Mexican Pacific coasts have been published (Díaz-Díaz and Salazar-Vallejo, 2009). In this paper, three cirratulids species associated with macroalgae and coral reefs, *Caulleriella petersenae* n. sp, *Monticellina* cf. *serratiseta* (Banse and Hobson, 1968), and *Timarete caribous* (Grube, 1856), are described for the first time from the Venezuelan coast.

STUDY AREA

Biological material was collected from five localities along the northeastern coast of Venezuela (Figure 1): 1) Playa Iguana (10°38'10"N-64°04'57"W) is a rocky shore, with a *Phragmatopoma* sp. (Polychaeta: Sabellariidae) reef and *Centroceras clavulatum* population. 2) Garrapata Island (10°23'20"N-64°21'03"W) is also a rocky shore, with a great abundance of *Halimeda opuntia* and *Caulerpa racemosa*.

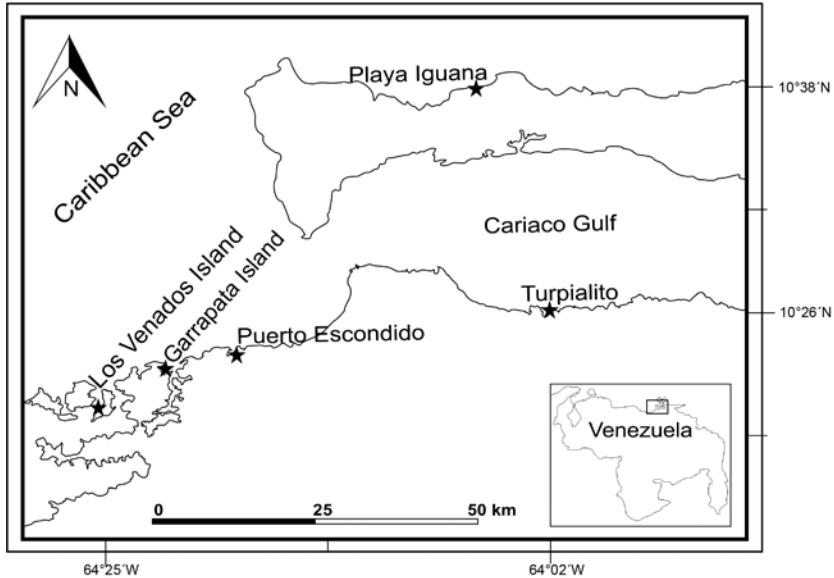


Figure 1. Geographical locations of the sampling stations.

3) Los Venados Island ($10^{\circ}21'34''\text{N}$ - $64^{\circ}25'16''\text{W}$) is made up of coralline sand and a reef dominated by *Millepora alcicornis*, *Halimeda opuntia*, *Padina tetrastomatica* and *Ulva fasciata* Delile, 1813, with associated macroalgae species. 4) Puerto Escondido ($10^{\circ}24'30''\text{N}$ - $64^{\circ}17'42''\text{W}$) is characterized by coralline sand, and coral reef dominated by *M. alcicornis* and *Acropora palmata*. 5) Turpialito-Gulf of Cariaco ($10^{\circ}26'37''\text{N}$ - $64^{\circ}01'58''\text{W}$) has coastal mangrove forests with a great abundance of *Halimeda opuntia*, *C. racemosa*, *Sargassum vulgare* and *U. fasciata*.

MATERIALS AND METHODS

Sampling was done between April 2007 and January 2009. Organisms were collected by hand with the aid of snorkeling equipment, between 0.5 and 3 m deep. Macroalgae were sampled using plastic bags, separating the algae from the substrate and introducing them into the bags carefully to prevent the escape of vagile polychaetes. Collected material was taken to the Polychaete Laboratory at the Instituto Oceanográfico de Venezuela. Polychaetes and algae were separated and fixed with 8 and 5% formaldehyde solution in seawater, respectively. Polychaetes were examined using compound and dissecting microscopes and structures with taxonomic value were extracted and mounted on slides for their study. Drawings of the complete specimens and particular morphological structures were done

following Coleman (2006). Polychaetes were deposited in three collections: the Reference Collection at the Laboratorio de Biología de Poliquetos (LBP-FamilyNo. Cat./No.Specimens), Instituto Oceanográfico de Venezuela; Museo Oceanológico Hermano Benigno Roman, Margarita Island, Venezuela (MOBR-I-1174) 07/09/13 and Museo Marino de Cumaná (Universidad de Oriente) (MMUDO-IP-024) 27/07/13. Macroalgae were deposited in the reference collection of the Laboratorio de Ficología del Instituto Oceanográfico de Venezuela.

RESULTS AND DISCUSSION

In Venezuela, polychaete studies are scarce, most have been made in the northeastern coast (Díaz-Díaz *et al.*, 2013). Currently, four hundred and six species in 40 families are recognized, and only ten cirratulids species are recorded from Venezuelan waters. With these results the knowledge of the family Cirratulidae increase to thirteen species recorded for the country.

Two hundred and ninety five cirratulid worms were examined and three species in three genera were described, *Caulleriella petersenae* n. sp., *Monticellina* cf. *serratiseta* (Banse and Hobson, 1968) and *Timarete caribous* (Grube, 1856). The latter two species are new records for Venezuela.

Caulleriella petersenae n. sp.

Figure 2a-e

Material examined. Nineteen specimens: Garrapata Is. LBP-Ci0100/1 (holotype). Paratype: LBP-Ci0101/1; LBP-Ci0102/1 LBP-Ci0103/1; LBP-Ci0105/1; LBP-Ci0108/1; Los Venados Is., LBP-Ci0106/1; Playa Iguana; LBP-Ci0104/1. Garrapata Is. LBP-Ci0109/8 (only anterior end fragments) LBP-Ci0110/3, Puerto Escondido, associated with *Millepora alcornis*, 18/01/08.

Description. Complete specimen (holotype), 10 mm long, 0.4 mm wide, with 152 chaetigers. Prostomium conical, pointed (Figure 2a-b); eyes absent. The nuchal organs on the posterior margin of prostomium are dark and either semicircular or half-moon shaped, overlapping at the peristomial ridge. Peristomium triannulated; anterior ring covering posterior prostomium, dorsally and laterally; anterior and middle rings of similar length, posterior ring about twice the length of previous ones. Palps arising dorsally from the posterior margin of the peristomium. Branchiae from the first chaetiger emerging dorsally from the notopodial base. Capillaries (Figure 2d) on all notopodia. Bidentate hooks (Figure 2c) alternating with capillary chaetae from chaetiger 24; two hooks on chaetiger 24 and up to five on the mid body and mid-posterior chaetigers. One bidentate hook on posterior chaetigers. Capillaries

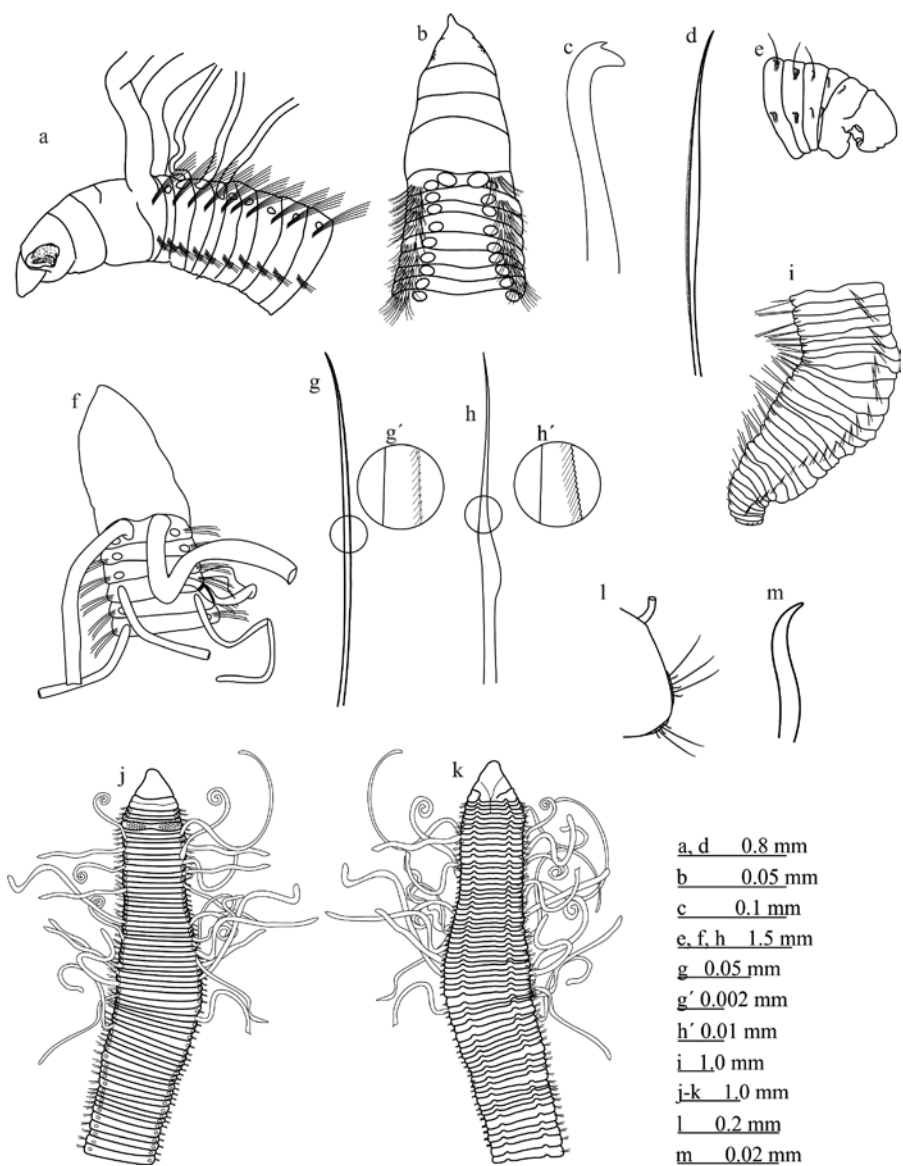


Figure 2. *Caulleriella petersenae* n. sp. **a.** Anterior end, dorsal view. **b.** Same in lateral view. **c.** Bidentate hook. **d.** Capillary chaetae. **e.** Pygidium; *Monticellina* cf. *serratiseta*. **f.** Anterior end, dorsal view. **g.** Capillary chaetae. **g'.** Capillary chaetae detail. **h.** Geniculate chaetae. **h'.** Geniculate chaetae detail. **i.** Posterior end, dorsal view; *Timarete caribous*. **j.** Anterior end, dorsal view. **k.** Anterior end, ventral view. **l.** Parapod 42. **m.** Sigmoid hook.

and bidentate hooks from the first neuropodia. Pygidium rounded with four lobes ventrally, surrounding the anus (Figure 2e). No pattern with methyl green staining was observed, except for the pygidium which stained profusely.

Remarks. *Caulleriella petersenae* n. sp. is close to *C. cucula* Dean and Blake, 2007, and *C. bremecae* Elías and Rivero, 2008. Nevertheless, *C. petersenae* n. sp. is close to *C. cucula* Dean and Blake, 2007, differing in that:

1) The notopodial hooks in *C. cucula* are present between chaetigers 43 and 92 (the latter corresponds to the holotype), while in *C. petersenae* n. sp. they are present between chaetigers 17 and 26 (24 in the holotype).

2) The pygidium in *C. cucula* consists of a conical lobe, whereas in *C. petersenae* n. sp. it is cup-shaped, with a series of ventral lobes.

3) The nuchal organ in *C. cucula* is L-shaped, whereas in *C. petersenae* n. sp. it is semicircular or half-moon-shaped and dark (preserved material without coloration).

4) The type locality of *C. cucula* is the Gulf of Nicoya, Pacific coast of Costa Rica, where it is associated with soft sediments consisting mainly of mud, while *C. petersenae* n. sp. was found associated with macroalgae.

5) Methyl green staining in *C. cucula* gave a uniform green stain over the body but with the prostomium unstained and the peristomial crest and mid-ventral band, extending over the length of the body, weakly stained.

Caulleriella petersenae n. sp. differs from *C. bremecae* in that:

1) The nuchal organs in *C. bremecae*, described as eyespots by Elías and Rivero (2008), are located laterally, whereas in *C. petersenae* n. sp. they are found dorsally.

2) The peristomium is not ringed in *C. bremecae* and the posterior margin is extended, forming a raised ridge that overlaps the mid-anterior portion of the first chaetiger, whereas in *C. petersenae* n. sp., the posterior margin is not extended and does not form a raised ridge.

3) The type locality of *C. bremecae* is Mar del Plata, Argentina, where it is found associated with soft sediments retained by the beds of the mussel *Brachidontes rodriguezii* in areas moderately enriched by sewage discharge, whereas *C. petersenae* n. sp. was found associated with macroalgae.

4) In *C. bremecae* the peristomium, palps, branchiae and the ventral region of the anterior chaetigers stain profusely with methyl green, whereas in *C. petersenae* n. sp. only the pygidium stains.

Three *Caulleriella* species —*C. alata* (Southern, 1914), *C. bioculata* (Keferstein, 1862), and *C. zetlandica* (McIntosh, 1911)—have been recorded for the Great Caribbean but their presence in the region is considered questionable (Díaz-

Díaz and Salazar-Vallejo, 2009), mainly due to the type localities of these species (all in European waters). *Caulleriella petersenae* n. sp. differs from *C. alata* and *C. bioculata* by the absence of eyes and because the notopodial hooks start on chaetiger 24 instead of on chaetigers 20-21 and 12-23, respectively. *Caulleriella petersenae* n. sp. is different from *C. zetlandica* because in the latter the notopodial hooks are absent. Finally, *C. petersenae* n. sp. is the only species of this genus confirmed from the Great Caribbean region to date.

Variation. The paratype from Playa Iguana is 6.5 mm long, 0.3 mm wide and has 102 chaetigers, with notopodial hooks from chaetiger 21. Paratypes from Garrapata Is. are 3.5-9 mm in length, 0.2-0.4 mm in width and with 77-116 chaetigers. One paratype with 77 chaetigers has notopodial hooks from chaetiger 17, a specimen with 108 chaetigers has notopodial hooks from chaetiger 21, a specimen with 112 chaetigers has notopodial hooks from chaetiger 22, and specimens with 114 and 116 chaetigers, have hooks on chaetigers 26 and 24, respectively. Seven incomplete specimens have notopodial hooks on chaetigers 23 or 24. The smallest specimens have an inconspicuous constriction on the anterior peristomial ring, which gives a four-ringed appearance.

Etymology. The species is named in honor of Dr. Mary Petersen, a highly respected polychaete taxonomist, who specializes in the family Cirratullidae.

Distribution. Northeastern coast of Venezuela.

***Monticellina* cf. *serratiseta* (Banse and Hobson, 1968)**

Figure 2f-i

Tharyx serratiseta Banse and Hobson, 1968: 37-39, Figs. 7k, l.

Aphelochaeta serratiseta, Blake, 1991: 28; Díaz-Díaz and Salazar-Vallejo, 2009: 137, Fig. 1G.

Monticellina serratiseta, Blake, 1996: 325, Fig. 8.25A-D; Dean and Blake, 2009: 122; Magalhães and Bailey-Brock, 2013: 96.

Material examined. LBP-Ci0020/1, Garrapata Is. (04/2007), associated with *Caulerpa racemosa* (Chlorophyta), collected by Díaz-Díaz and Cárdena-Oliva at a depth of 1.5 m.

Description. Complete specimen, 10 mm long, 0.4 mm wide with 121 chaetigers. Prostomium conical, pointed, eyes absent. Semicircular nuchal organs present. Peristomium triannulated (Figure 2f). Palps arising dorsally from the anterior margin of chaetiger 1. First pair of branchiae on chaetiger 1, dorsal to notopodial chaetal bundle and posterior to dorsal tentacles, one pair on each segment, continuing on subsequent chaetigers until near the end of the body, all branchiae

longer than body width. Capillary chaetae on all parapodia; notochaetae (Figure 2g) half as long as the width of the segments, with weakly serrated margins (Figure 2g'); neurochaetae capillaries smooth on anterior segments; capillaries shorter, slightly geniculated, with expanded serrated blades, from chaetiger 12 (Figure 2h, h'). Chaetigers 90-111 expanded (Figure 2i). Pygidium is a simple terminal lobe. Anus dorsal.

Remarks. Currently 13 species of *Monticellina* are recognized (Blake, 1991, 1996; Magalhães and Bailey-Brock, 2013); of these, only *M. dorsobranchialis* (Kirkegaard, 1959) has been recorded from the Great Caribbean, but its presence in the region is questionable (Díaz-Díaz and Salazar-Vallejo, 2009) since its type locality is Angola (Africa). *Monticellina dorsobranchialis* differs from the specimen examined in this study in that the capillary chaetae are serrated but not widened subdistally, the prostomium is short, the anterior branchiae are dorsally fused to the notopodia and from chaetiger 20 they are moved to the middle-dorsal region. *Monticellina* cf. *serratiseta* is somewhat similar to *M. secunda* (Banse and Hobson, 1968) and *M. serratiseta* (Banse and Hobson, 1968). However, it differs from the former species in presenting widened neurochaetae; in addition, *M. secunda* has chaetae from chaetiger 25 on both the notopodia and neuropodia, whereas the examined specimen has chaetae from chaetiger 12 but only on the neuropodia. It is, nevertheless, very similar to the original description, and agrees with its figure 7i (Banse and Hobson, 1968). *Monticellina* cf. *serratiseta* is close to *M. serratiseta* in that both show widened capillary neurochaetae with serrated margins; however, these start at chaetiger 12 in the former and between chaetiger 75-100 in the latter. The specimen examined was identified as *M. cf. serratiseta* because 1) the second pair of branchiae emerge dorsally from the chaetal bundle on the second chaetiger; 2) the first chaetiger has no posterior margin (as in *M. serratiseta*); 3) the branchiae are longer than the width of the body; and 4) the type locality for *M. serratiseta* is Puget Sound, Washington. The revision of more specimens is required in order to confirm their identity or consider a new species.

Distribution. Northeastern coast of Venezuela.

***Timarete caribous* (Grube and Ørsted in Grube, 1859)**

Figure 2j-m

Cirrhatulus caribous Grube and Oersted in Grube, 1859: 106; Hartman, 1959: 403.

Timarete caribous, Díaz-Díaz and Salazar-Vallejo, 2009: 145, Fig. 6a.

Material examined. Two hundred and seventy five specimens. LBP-

Ci0001/242, Venado Is. (08/2008), associated with *Centroceras clavulatum*; LBP-Ci0002/23, Turpialito (01/2009), associated with *Padina tetrastomatica*. Material collected by Díaz-Díaz and Cárdena-Oliva, between 1-3 m deep.

Description. Complete specimen with 80 chaetigers (26.7 mm long and 1.6 mm wide). Body elongated, thickened throughout, with short segments, tapering posteriorly (Figure 2j) and with a shallow ventral groove (Figure 2k). No color spots on either the dorsal or ventral body surfaces. Prostomium conical, broad, bluntly pointed on anterior margin, wider than long, without eyes. Peristomium short, about 1.5 times longer than the prostomium, with two distinct annulations. Tentacles cirriform from the fourth chaetiger arranged in two separate groups. Branchiae from chaetiger 1 to posterior segments, with variable positions; near the notopodia base on anterior segments and slightly displaced dorsally on the middle and subsequent chaetigers (Figure 2l). Parapodia poorly developed; notopodia and neuropodia widely separated. All chaetae simple, including the capillary chaetae in noto- and neuropodia all chaetigers. Acicular spines slightly sigmoid and pale brown (Figure 2m), with up to three spines from notopodium 11 and neuropodium 5. Last five neuropodia with 1-2 sigmoid spines, capillary chaetae absent. Pygidium rounded, lobe shaped, with terminal anus. Live specimens pale green.

Remarks. Only three species of the genus *Timarete* have been previously recorded for Venezuela: *Timarete* sp., *T. punctata* (Grube, 1859), and *T. tentaculata* (Montagu, 1808) (Díaz-Díaz and Liñero-Arana, 2004). *Timarete tentaculata*, from South Devon, England, differs from *T. caribous* because the former only has neuropodial hooks. *Timarete caribous* is, however, similar to *T. punctata*, from the Caribbean Sea, in that both species have hooks on both branches, but they differ in that *T. caribous* has a uniform color, while *T. punctata* has irregularly distributed dark spots on the body and branchial and tentacular filaments. It is likely that the material identified as *Timarete* sp. by Díaz-Díaz and Liñero-Arana (2004) corresponds to *T. caribous*.

Variation. Specimens 13.5-28 mm long, 0.7-1.4 mm wide, with 76-159 chaetigers; notopodial hooks from chaetigers 8-13; one specimen with 159 chaetigers has notopodial hooks from chaetiger 13 and one with 112 chaetigers has notopodial hooks from chaetiger 22. Neuropodial hooks from chaetigers 4-7. The smallest specimens have a smooth constriction on the peristomium, giving a four-ringed appearance. Some specimens with very short branchiae on the first four chaetigers.

Distribution. Great Caribbean region.



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