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Holoplanktonic polychaetes (Annelida: Polychaeta) from Venezuela

BRIGHTDOOM MÁRQUEZ-ROJAS[1*], OSCAR DÍAZ-DÍAZ[1] & MARÍA ALEJANDRA BALZA[2]

[1] *Universidad de Oriente, Instituto Oceanográfico de Venezuela. *Corresponding author: bmarquez2001@gmail.com*
[2] *Universidad de Oriente, Departamento de Biología, Escuela de Ciencias.*

Abstract. A taxonomic characterization of holoplanktonic polychaetes from 107 sites around the Paria Peninsula and Atlantic coast of Venezuela was made. Samples were obtained using a modified Bongo. Eleven species of holoplanktonic polychaetes were identified: *Alciopina parasitica*, *Plotohelmis tenuis*, *P. capitata*, *Vanadis minuta*, *Lopadorhynchus uncinatus*, *Tomopteris nationalis*, *T. planktonis*, *Sagitella kowalewski*, *Travisiopsis dubia*, *Typhoscolex muelleri* and *Phalacrophorus uniformis*. Of these, *T. muelleri* is a new record for Venezuela.

Key words: holoplanktonic polychaetes, Paria Peninsula, Gulf of Paria, Venezuela, Tropical Atlantic

Resumen. **Poliquetos holoplanctónicos (Annelida: Polychaeta) de Venezuela**. Se realizó una caracterización taxonómica de los poliquetos holoplanctónicos, recolectados en 107 estaciones, entre la plataforma norte de la Península de Paria y la Fachada Atlántica Venezolana. Las muestras se obtuvieron mediante una red de arrastre tipo Bongo modificada. Se identificaron once especies: *Alciopina parasitica*, *Plotohelmis tenuis*, *P. capitata*, *Vanadis minuta*, *Lopadorhynchus uncinatus*, *Tomopteris nationalis*, *T. planktonis*, *Sagitella kowalewski*, *Travisiopsis dubia*, *Typhoscolex muelleri* y *Phalacrophorus uniformis*. *T. muelleri* se cita por primera vez para Venezuela.

Palabras clave: poliquetos holoplanctónicos, Península de Paria, Golfo de Paria, Venezuela, Atlántico Tropical

Introduction

Pelagic polychaetes form a distinctive group of marine zooplankton, although they are less important in terms of species richness, abundance and biomass than other zooplanktonic groups (Orensanz & Ramírez 1973). They can be divided into two groups according to their permanence in the water column: meroplanktonic polychaetes that form part of the pelagic community during the larval, postlarval and reproductive stages (Suárez-Morales *et al*. 2005) and holoplanktonic polychaetes that complete their entire life cycle in the water column.

Most species are epipelagic, inhabiting mainly the upper 50 m of the water column. Some however, are mesopelagic or even bathypelagic. As expected, meroplanktonic species are more abundant in neritic or coastal waters (Suárez-Morales *et al*. 2005). Pelagic polychaetes are widely distributed in all the seas and oceans of the world and are thus considered a cosmopolitan group (Orensanz & Ramirez 1973, Bilbao *et al*. 2008). Globally, pelagic polychaetes have been traditionally grouped into seven families: Alciopidae, Lopadorhynchidae, Pontodoridae, Iospilidae, Tomopteridae, Poeobiidae and Typhloscolecidae (Fauchald 1977, Rouse & Fauchald 1997). Recently, however, Suarez-Morales *et al*. (2005) recognized a total of nine families including Yndolacidae and Flotidae, two families that are generally excluded due to their uncertain phylogenetic relationships with other pelagic

polychaete taxa (Rouse & Fauchald 1997, Rouse & Pleijel 2001).

Holoplanktonic polychaetes have been relatively poorly studied because although they are common, they are rarely abundant in plankton samples. Nevertheless, recent investigations have provided valuable information about their taxonomy, biology and ecology. Fernández-Alamo (2000, 2004) mapped the distribution of the Typhloscolecidae and Tomopteridae in the eastern tropical Pacific Ocean; Buzhinskaja (2004) recorded two new genera of the Yndolacidae in the Arctic Ocean; Rozbaczylo *et al*. (2004) reported the presence of *Lopadorhynchus uncinatus* Fauvel 1915, *Pelagobia longicirrata* Greeff 1879, *Vanadis minuta* Treadwell 1906, *V. crystallina* Greeff 1876 and *Watelio gravieri* (Benham 1929) for the first time from waters off Chile and oceanic islands in the Southeast Pacific; Burnette *et al*. (2005) explored the phylogenetic relationships between *Poeobius meseres* (Heath 1930) and the Flabelligeridae; Suarez-Morales *et al*. (2005) provided us with a first step towards an understanding of the pelagic polychaete fauna in the tropical western Atlantic region, with emphasis on species found in Mexican waters in the Gulf of Mexico and the Caribbean Sea; Jimenez-Cueto *et al*. (2006) registered three of the four known species of the Iospilidae for the first time from the Caribbean Sea and made some observations on their reproductive structures; Jimenez-Cueto and Suarez-Morales (2008) identified seven species of Alciopidae in the western Caribbean Sea, five of which were first records for this region; Bilbao *et al*. (2008) made a first record of pelagic polychaetes in the inland waters of southern Chile, observing *Maupasia caeca* Viguier 1886, *Typhloscolex muelleri* Busch 1915 and *Lopadorhynchus krohnii* (Claparède 1870) for the first time in waters of the eastern South Pacific and extending the southerly distribution limit of *Phalacrophorus pictus* Greeff 1879 to the coast of Chile. In Venezuela, two studies on planktonic polychaetes have been undertaken to date with eleven species recorded (Díaz-Díaz *et al*. 2009, Cardenas-Oliva *et al*. 2010). Of these, *V. minuta*, *Sagitella kowalewski* Wagner 1872 and *Phalacrophorus uniformis* Reibisch 1895 were recorded for the first time for Venezuela and *Plotohelmis tenuis* (Apstein 1900) and *P. capitata* (Greeff 1876) for the Caribbean Sea. Both studies indicated that the most common families were Alciopidae and Tomopteridae with four and two species, respectively, representing more than 75% of the total abundance of polychaetes collected.

Studies of pelagic polychaetes in the Caribbean are scarce, in spite of their species richness in this region and they have never been collected along the continental shelf of Venezuela, which forms an important part of both the Caribbean Sea and the Tropical Atlantic. In this paper we characterize taxonomically the community of holoplanktonic polychaetes along the Atlantic continental shelf off the Venezuelan coast.

Materials and methods

Holoplanktonic polychaetes were obtained along with other zooplankton samples collected during two environmental impact studies undertaken at proposed sites for oil extraction; financed by Petróleos de Venezuela (PDVSA). The first of these was the Delta Platform Environmental Baseline study (LBAPD) in which 57 field stations were surveyed from aboard the R/V Hermano Ginés. The stations were sampled twice; firstly in October 2004 (LBAPD-01) during the rainy season and secondly in May and June 2005 (LBAPD-02) during the dry season.The second study formed part of the Mariscal Sucre Project (MSP) and included 50 stations. Sampling was done from aboard the R/V Guaiqueri II during two periods: the first in March 2005 (MSP1) (dry season) and the second in October 2005 (MSP2) (rainy season). The field stations were distributed to the north of the Paria Peninsula (28 stations) and in the Gulf of Paria (22 stations) (Figure 1).

Samples were taken using a modified Bongo trawl with a mesh size of 333 microns and a Rigosha flowmeter to estimate the volume of water filtered. Zooplankton densities were then calculated based on these data. Oblique hauls were made from the maximum depth to the surface at a speed of two knots during 10 minutes. Samples were fixed in a solution of sea water with 5% formalin, neutralized with borax. The polychaetes contained in each of the samples were removed under a stereomicroscope and transferred to a 70% ethanol solution for preservation. Polychaetes were identified using the diagnostic characteristics of each family and the keys and species descriptions given in Dales (1957), Day (1967), Orensanz & Ramirez (1973), Stop-Bowitz (1996), Fernandez-Alamo & Thuesen (1999), Rozbaczylo *et al*. (2004) and Suarez-Morales *et al*. (2005). Drawings were done following Coleman (2006) methodology. The material examined and identified is deposited in the polychaete collection of the Laboratorio de Biología de Poliquetos (LBP) at the Instituto Oceanográfico de Venezuela. A key to the species identified in this study is provided (Table 1).

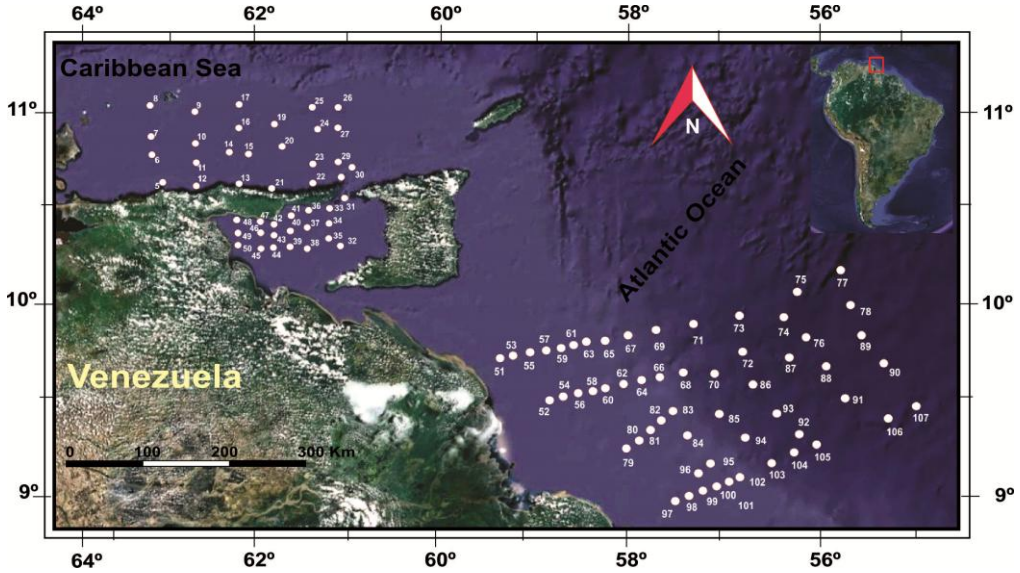

Figure 1. Study area map showing the location of the stations surveyed (white circles).

Results and Discussion

A total of 236 specimens were examined and 11 species belonging to nine genera and five families were identified. The Alciopidae was the best represented family, with four species. *Phalacrophorus uniformis* (26.3%), *Tomopteris planktonis* (17.8%) and *Travisiopsis dubia* (15.1%) were the most abundant species. *Thyphloscolex muelleri* is a new record for Venezuela. This study increases our knowledge of marine biodiversity along the Venezuelan coast, particularly within the area of influence of the Orinoco river.

Table 1. Key to the species identified in this study.

1a.-Prostomium fused to the adjacent segments…..Family Tomopteridae…… 2
1b.- Prostomium differentiated…… 3
2a.-Rosette and hyaline glands absent…….. *Tomopteris planktonis*
2b.-Rosette glands present…….. *Tomopteris nationalis*
3a.- Conical prostomium without antennae or palps, dorsal and ventral cirri foliaceous, few acicular chaetae.....Family Thyphloscolecidae…… 8
3b.-Prostomium well developed, not conical, without antennae or palps…… 4
4a.-Prostomium with a pair of very large globular eyes, 4-6 small antennae, palps absent; parapodia unirameous....Family Alciopidae…… 5
4b.-Prostomium without large globular eyes …….. 10
5a.-All chaetae simple (capillary and acicular) …… *Alciopina parasitica*
5b.- Capillary chaetae composite with long blade, acicular chaetae present or absent……6
6a.-All capillary chaetae composite……. *Vanadis minuta*
6b.- Acicular chaetae present at least in the posterior chaetigers, capillary chaetae composite ……. 7
7a.-Eyes rearward, second dorsal tentacular cirrus longer than the third, median antenna digitiform …….. *Plotohelmis tenuis*
7b.-Eyes lateral, second dorsal tentacular cirrus shorter than the third, median antenna small and conical …… *Plotohelmis capitata*
8a.-Prostomium with dorsal and ventral preoral lobes with marginal cilia belt …… *Thyphloscolex muelleri*
8b.- Prostomium without ciliated cord…… 9
9a.-Body transparent, revealing the internal segmentation: unfree rounded nuchal organs …… *Sagitella kowalewski*
9b.-Dense body, internal segmentation not observed; free nuchal organs …….. *Travisiopsis dubia*
10a.-Body short and robust, composite chaetae present, prostomium with antennae, palps absent ……..... Family Lopadorhynchidae …… *Lopadorhynchus uncinatus*
10b.-Body slender and elongated, composite chaetae absent, prostomium without antennae, pair of ventral peristomial palps present ..... Family Iospilidae …… *Phalacophorus uniformis*

Typhloscolcx muelleri Busch, 1851
Figure 2A-D

Material examined: Five specimens

Characterization. Five specimens up to 8 mm long (5-8 mm), with 12-18 segments. Fusiform body, anterior region relatively wide and posterior region tapered. Prostomium with dorsal and ventral preoral lobes, both about the same width as the body; each lobe with marginal cilia belt. The dorsal lobe with a pair of small rounded lobes on both sides. Prostomium with a palpodium on distal end, divided into a cylindrical basal portion and a thin distal one (Fig. 2A). Conical chaetiger lobes more conspicuous in posterior chaetigers (Fig. 2B), each with 2-3 simple acicular recurved chaetae (Fig. 2C). Cirri from mid-region cordiform, more elongated on posterior segments; short, distally elliptical anal cirri (Fig. 2D).

Remarks**.** Tebble (1962) distinguished two populations of this species in the North Pacific: one with large individuals restricted to the subarctic zone and the other made up of smaller individuals distributed in both the subtropical and subarctic regions. However, neither in Orensanz & Ramírez (1973) nor in this study were significant variations in the size of the specimens collected in relation to latitude observed.

Distribution. *Typhloscolex muelleri* has been collected from all water bodies studied to date. Tebble (1960) recorded this species from several sites in the South Atlantic and indicated the presence of a *T. muelleri* ecotype in the subarctic sector of the Pacific Ocean. *T. muelleri* has also been registered from the West Atlantic Ocean, along the continental shelf bordering Argentina, Uruguay and southern Brazil (Orensanz & Ramírez 1973) and the Gulf of Mexico (Suaréz *et al.* 2005). In this study we collected *T. muelleri* from the continental shelf off the coast of Venezuela.

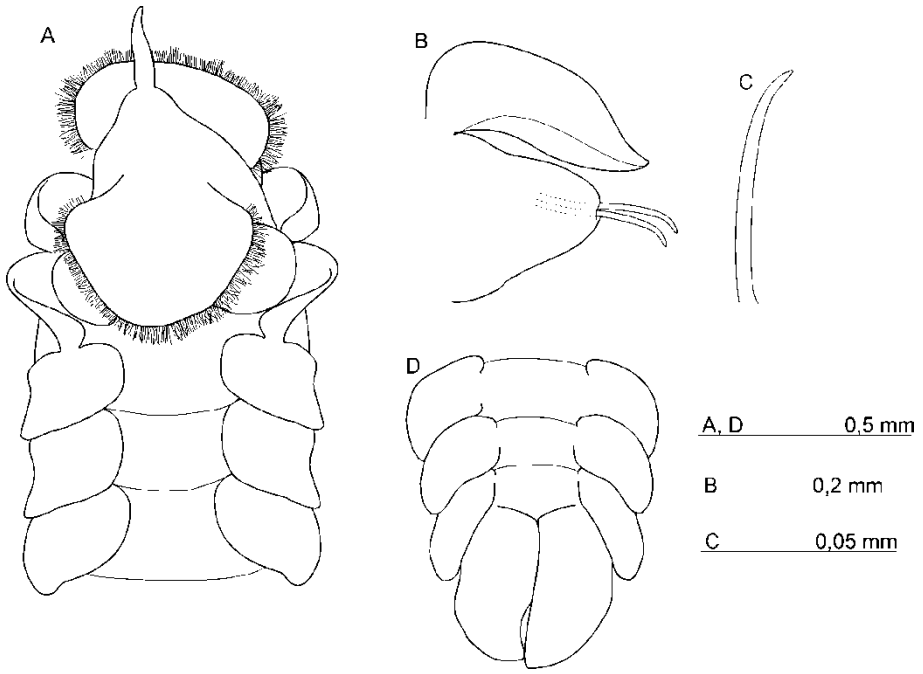

Figure 2. *Typhloscolex muelleri*. A) anterior end, dorsal view; B) chaetiger lobes, C) simple, recurved acicular chaetae, D) posterior end, dorsal view.

Relatively few holoplanktonic species have been described, considering that close to 9.000 polychaete species from 70 families are recognized and that pelagic species comprise over 60 species belonging to nine families (Díaz-Díaz *et al*. 2009). In contrast with benthic species, in which endemism is usually predominant, pelagic forms have a worldwide distribution, or at least are found over large regions. This has led some authors to suggest that they are probably cosmopolitan and that species may be recorded as having restricted distributions more due to a lack of thorough studies than because they are in fact absent from certain waters.

Finally, a proper characterization of the planktonic community depends principally on the correct taxonomic identification of the organisms. This not only increases our knowledge about taxon biodiversity but also facilitates the recognition of interactions and distribution patterns, thus allowing us to make inferences about community structure.

Taxonomy therefore plays an important role in ecological studies. Unfortunately, however, species are often misidentified which generates incongruences and ecological or biogeographical discrepancies, especially when local or regional distributions of zooplankton are analyzed (Márquez *et al*. 2006). In Venezuela, very few studies have reported the presence of planktonic polychaetes and refer to these as being common but poorly represented and scarce (Legaré 1961, Bastardo 1975, Evans 1977). Thus, there are few records of holoplanktonic polychaete species from Venezuelan waters, and the literature on this group is limited (Klein *et al*. 2005). This contrasts with studies done off the coast of Brazil where significantly higher numbers of planktonic species have been reported (Henríquez & Marín 2005). As regards this study, ten of the species identified have been previously registered for Venezuela; only *T. muelleri* represents a new record. Most of these species are widely distributed in tropical and subtropical seas and oceans worldwide.

The presence of some species (*Lopadorynchus* and *Tomopteris*), typically cited as oceanic (Wickstead 1965, Smith 1977), e.g. near the coast of northern Brazil and Guyana, has been explained by Cárdenas-Oliva *et al*. (2010) to be due to the convergence of ocean waters which produces current rings that drag them a shore (Richardson & Cowen 2004). These mixing processes at the edge of the shelf cause nutrients to rise to the surface and promote a general increase in zooplankton species diversity (Richardson & Cowen 2004, Zoppi *et al*. 2008). This study provides a contribution to our knowledge of the distribution of holoplanktonic polychaete fauna, bringing the total number of species described for Venezuela to eleven.

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