



## Polychaetes associated to calcareous sediments from Venezuela: Scolecida

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**Abstract.** One hundred eighty-eight (188) polychaete specimens were examined, being collected in calcareous sediments from coral reefs at the National Park Archipiélago Los Roques, Venezuela. The samples were obtained in seven stations, between 2009 and 2012, using a PVC corer. A total of 9 species were identified, belonging to the clade Scolecida: 4 species of Capitellidae, 2 species of Orbiniidae, and 1 species for Maldanidae, Paraonidae and Opheliidae; from these 9 species, 3 are considered as new records for Venezuela. These results increase our knowledge about the marine biodiversity at the continental shelf in Venezuela and the southern Caribbean Sea, which is poorly known, especially in this group.

**Key words:** Polychaetes, Scolecida, south Caribbean, Los Roques, biodiversity

**Resumen.** Poliquetos asociados a sedimentos calcáreos de Venezuela: Scolecida. Se examinaron 188 ejemplares de poliquetos recolectados en sedimentos calcáreos cercanos a los arrecifes coralinos en el Parque Nacional Archipiélago de Los Roques, Venezuela. Las muestras fueron tomadas en siete estaciones, entre 2009 y 2012, empleando un nucleador de PVC. Se identificaron un total de 9 especies pertenecientes al clado Scolecida: 4 especies de Capitellidae, 2 especies de Orbiniidae y 1 especie de Maldanidae, Paraonidae, y Ophelliidae; siendo 3 de éstas nuevos registros para Venezuela. Estos resultados contribuyen al incremento en el conocimiento sobre la biodiversidad marina en la plataforma continental de Venezuela y sur del Mar Caribe, de la cual se tiene poco conocimiento, especialmente en este grupo.

**Palabras claves:** Poliquetos, Scolecida, Caribe sur, Los Roques, biodiversidad

### Introduction

Venezuela is one of the ten countries with highest biological diversity in the world (Conde & Carmona-Suárez 2003, Miloslavich *et al.* 2003). However, our understanding of the marine biodiversity is limited, particularly concerning the invertebrate groups. This lack of knowledge is consequence of low number of taxonomists working with marine invertebrates, which has resulted in erroneous identification of many species, making even harder to formulate bio-geographical and

benthic community biodiversity studies. In this study we concentrate in polychaetes associated to calcareous sediments, a poorly understood environment for this group of invertebrates.

Polychaetes are extremely important from the ecological point of view (Randall 1967, Reish 1980, Uebelacker & Johnson 1984), but they are also important in the aquaculture, pharmaceutical industry (Rousselot *et al.* 2006) and recreational area (Liñero-Arana & Díaz-Díaz 2011). Nevertheless, the taxonomic knowledge of this group is very scarce in

Venezuela, with 406 species reported, belonging to 253 genera included in 46 families. Particularly, Scolecida group has been poorly studied, having some reports such as Liñero-Arana (1996) with capitellids; Díaz-Díaz *et al.* (2009) with paraonids; Díaz-Díaz *et al.* (2012) with orbinids and Díaz-Díaz & Cárdenas-Oliva (2012) with the first arenicolid record for Venezuela. There are also some vagrant reports in Fernández *et al.* (2012), Balza *et al.* (2013) and Díaz-Díaz *et al.* (2013b), specifically for the continental northeast region of Venezuela; while the insular regions has barely a few reports, such as Hartman (1944), Liñero-Arana & Díaz-Díaz (2010), Fernández *et al.* (2012) and Díaz-Díaz *et al.* (2013a).

In the present study, we conducted a taxonomical analysis of the polychaete fauna (Scolecida) associated with coral sand sediments in the National Park Archipiélago Los Roques (NPALR), contributing to the biodiversity knowledge in this important region of the southern Caribbean Sea.

## Materials and methods

### Study Site

The National Park Archipiélago Los Roques (NPALR) (Fig.1) is located south of the Caribbean Sea, between 11° 58' 36" - 11° 44' 26" N and 66° 57' 26" - 66° 36' 25" W. This archipelago is part of the Venezuelan insular region, and is situated 130 km from the continental coast. The NPALR is an extensive coralline atoll of 36 km from west to east and 24.6 km from north to south, with an area of approximately 800 km<sup>2</sup>. The national park is composed by 50 islands and 292 keys, defining a very shallow lagoon (3-5 m) in the middle of the archipelago.

This region is affected by the upwelling phenomenon, showing temperatures between 21 and 24°C, providing nutrient rich waters with high primary and secondary productivity (Miloslavich *et al.* 2003). The annual precipitation is 250 mm (Ramírez-Villarreal 2001) and the annual relative humidity is 80%. The granulometric characteristics are typified by calcareous sediments derived from coral erosion and remains of marine flora and fauna. At the south of the park, depths may reach up to 1.700 m, with lower depth range to the north, where the average values do not exceed 15 m (Bonilla *et al.*, 2004). The surveys were made between 2009 and 2012, with two annual field trips (Feb-Apr and Sep-Oct) at seven stations: Gran Roque, Madrisquí,

Boca del Medio, Rabusquí, Boca de Sebastopol, Cayo de Agua y Dos Mosquises Sur (Fig. 1).

### Field and Laboratory Methods

Five sediment samples (10 cm deep) were taken from the sediments with a PVC corer pushed side-wise in the sediments (0.01 m<sup>2</sup>) at each station, being bagged and fixed with formalin solution (10%). In the laboratory, samples were sieved through a 1 mm mesh, and the retained organisms were stained with Rose Bengal and preserved in Ethanol at 70%. The organisms were sorted under a stereo microscope for counting and identification. The identification was done following the methodology described by Díaz-Díaz & Liñero-Arana (2000), while the schemes and drawings were done using the Coleman (2006) methodology. The specimens are currently placed at the reference collection of Laboratorio de Bentos Marinos (LBM) from the Universidad Simón Bolívar. In each case, the number of specimens is reported in parentheses after the station reference, represented by the acronym of each station followed by the period and year of collection (DMS-2-2009 = Dos Mosquises, 2<sup>nd</sup> period, year). The acronyms used for each station are described as: GR= Gran Roque, MQ=Madrisquí, BM=Boca del Medio, RQ=Rabusquí, SB=Boca de Sebastopol, CA= Cayo de Agua y DMS=Dos Mosquises Sur. The species organization was conducted following the Rouse & Fauchald (1997) proposition.

## Results and Discussion

A total of 188 polychaete specimens were examined. The identification was represented by 9 species (Table I), with 3 of them being new records for Venezuela.

Genus: *Capitella* Blainville, 1828

*Capitella giardi* (Mesnil, 1897)

Figure 2a

*Capitella giardi* Mesnil, 1897: 442. Fig 56a-g; Davoult *et al.* 1999:121-127 Carrera-Parra & Salazar-Vallejo 1997; García-Garza 2009: 107.

Material examined. Four specimens: BM-2-2009 (4).

Description. Specimens with 9 mm long and 0.2 mm wide, having two body regions clearly differentiated. Thoracic segments with nine chaetigers (Fig. 2a). First six chaetigers with only capillary chaetae, and after the seventh chaetiger they present capillary

chaetae and hooks that are very similar to those present on the abdominal region. Simple genital pore found in the dorsal part between segment 8 and 9. No gills or gill lobes.

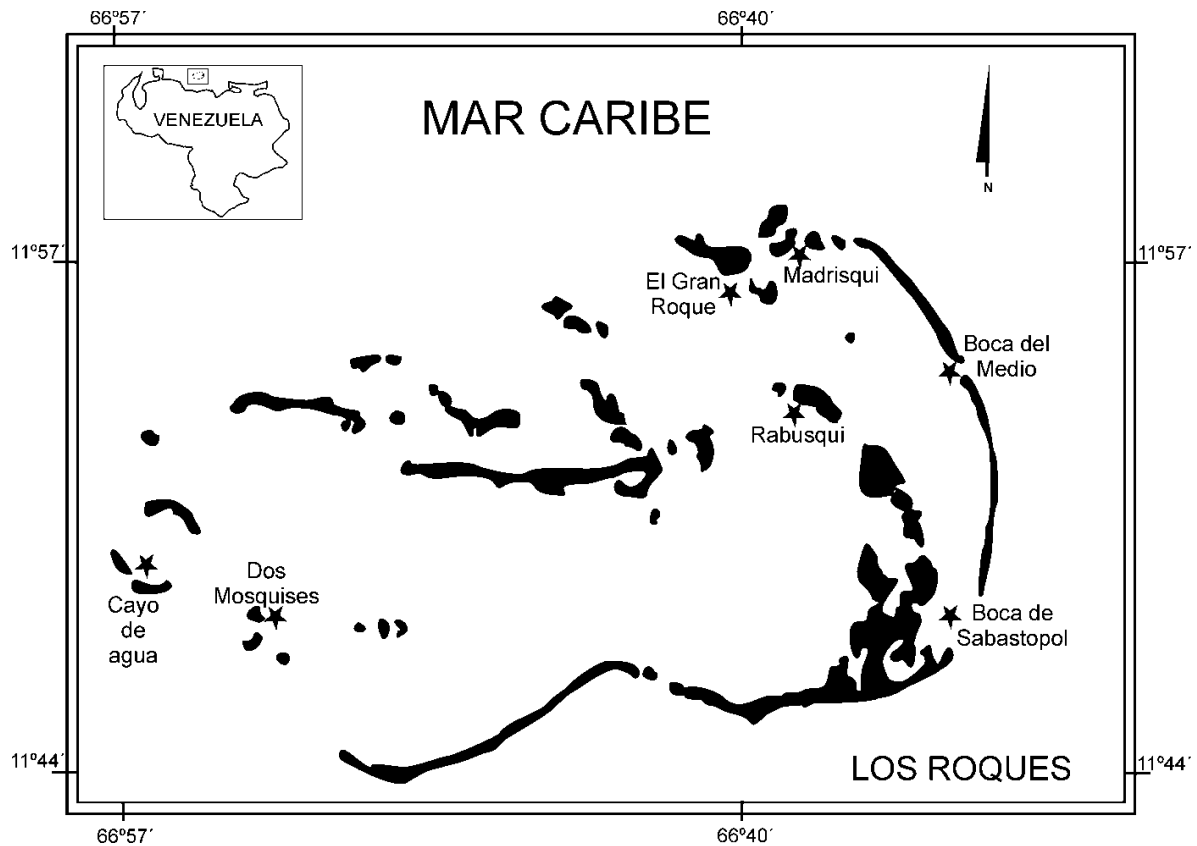


Figure 1. National Park Archipiélago Los Roques, sampling sites (\*) stations.

Table I.- List of Orders, Families and Species of Polychaeta, Clade Scolecida, reported in this study.

Subclass	Order	Suborder	Family	Species	
Scolecida	*Capitellida		Capitellidae	<i>Capitella giardi</i> (Mesnil, 1897)**	
				<i>Scyphoproctus guadalupensis</i> Gillet, 1986**	
				<i>Dasybranchus cf. lumbricoides</i> Grube, 1878	
	*Orbiniida		Maldanidae	<i>Rashgua lobatus</i> (Hartman, 1947)	
				<i>Axiothella brasiliensis</i> Mangun, 1966**	
			Orbiniidae	<i>Naineris setosa</i> (Verrill, 1900)	
	*Opheliida		Paraonidae	<i>Orbinia americana</i> Day, 1973	
			Opheliidae	<i>Aricidea (Acmira) simplex</i> Day, 1963	
					<i>Armandia maculata</i> (Webster, 1884)

\* Read & Arvanitidis (2013) consider these orders superfluous (*nomen dubium*).

\*\* New records for Venezuela.

Comments. The characteristics are consistent with the *Capitella giardi* description, which is one of the few "*Capitella*" having genital spines in both male and female. This species represents a new record for the country, extending the species distribution in the south Caribbean.

Distribution. English Channel, Aegean Sea, Mediterranean Sea and Venezuela.

Genus: *Dasybranchus* Grube 1850

*Dasybranchus* cf. *lumbricoides* Grube 1878

*Dasybranchus lumbricoides* Grube 1878:190, Lám.10, Fig. 4; Hartman 1947:431, Lám.56, Figs. 3-4; Fauchald 1972: 241; 1977: 52; Ewing 1984:14.39, Figs. 14.34a-f; 94, Lám. 12d; Laverde-Castillo 1986: 125; Molina-Lara & Vargas-Zamora 1995: 198; Liñero-Arana 1996:51-57. Pl 6.figs 1-5; López *et al.* 1997: 66; Dean 2001: 73; García-Garza 2009: 108, Fig. 3D; García-Garza & de León-González, 2011: 23-24.

*Dasybranchus caducus* var. *lumbricoides* Monro 1933:1059; Berkeley & Berkeley 1942:49.

Material examined. Thirteen specimens: CA-2-2009 (1); CA-1-2010 (3); DMS-1-2010 (1); MQ-1-2010 (1); RQ-1-2010 (1); CA-2-2011 (1); DMS-2-2011 (1); BM-2-2012 (2); GR-2-2012 (1); SB-2-2012 (1).

Comments. Previous records have indicated that this species has a wide distribution, from the intertidal zone to 78 m deep, being associated to different types of substrate (coral fragments, mud, sandy mud, silt and sand). *Dasybranchus lumbricoides* was originally described from the Philippines; however, has been recorded in the Pacific and Atlantic region, including the Great Caribbean (Ewing 1984; Liñero-Arana 1996). García-Garza & de León-González (2011) re-examined the recorded material for Corona del Mar, Newport Harbor by Hartman (1947) and Isla El Carmen at the Gulf of California by Fauchald (1972), concluding that the sampled material corresponds to *Notodasus harrisae* instead of *D. lumbricoides*, and they considered that a revision of the genus should be done. Although the characteristics of the material examined are very similar to those mentioned by several authors, the retractable gills over the post abdominal segments were absent.

Distribution. South California, Western Mexico, Atlantic and Pacific Coast of Panamá, Galápagos Islands, Coiba Island, Gorgona Island in Colombia, El Salvador, Gulf of Nicoya in Costa Rica, Philippines, from North Carolina to Florida USA, Gulf of Mexico and Venezuela.

Genus: *Rashgua* Wesenberg-Lund 1949.

*Rashgua lobatus* (Hartman 1947)

*Notomastus lobatus* Hartman 1947:415, Lám. 51, Figs. 1-5; 1969:399, Figs. 1-5; Ewing 1984:14.22, Figs. 14.16a-e; Granados-Barba 1994: 98, Lám. 12j; Liñero-Arana 1996: 55, Pl. V, Fig. 1-4. García-Garza & de León-González 2011: 45.

*Rashgua* nr. *lobatus* Green, 2002: 309, Fig. 22 a-g.

Material examined. Eight specimens: SB-4-2009 (2); MQ-2-2011 (1); DMS-1-2012 (1); GR-2-2012 (1); RQ-2-2012 (2); SB-2-2012 (1).

Comments. This species has been recorded in all oceans; Green (2002) for the Indian Ocean (Thailand), for the Pacific Ocean (García-Garza & de León-González 2011) and Atlantic Ocean (Ewing 1984; Liñero-Arana 1996). It has been recorded in Venezuela associated to soft-bottoms (Liñero-Arana 1996, Liñero-Arana & Díaz-Díaz 2006). *R. lobatus* is a widespread species found from intertidal to 644 m deep in all types of sediments, from fine to coarse sands, and gravel.

Distribution. Baja California Sur, Sonora in México, Thailand (Green 2002 as *Rashgua* nr. *lobatus*), Mississippi, North Carolina USA, Gulf of México and Venezuela.

Genus: *Scyphoproctus* Gravier 1904.

*Scyphoproctus guadalupensis* Gillet 1986

Figure 2b-e

*Scyphoproctus guadalupensis* Gillet 1986: 809-812, Fig. 3a-e; García-Garza 2009: 113, Fig. 4O.

Material examined. Five specimens. CA-1-2009 (1); DMS-1-2009 (1); SB-1-2009 (2); DMS-2-2011 (1).

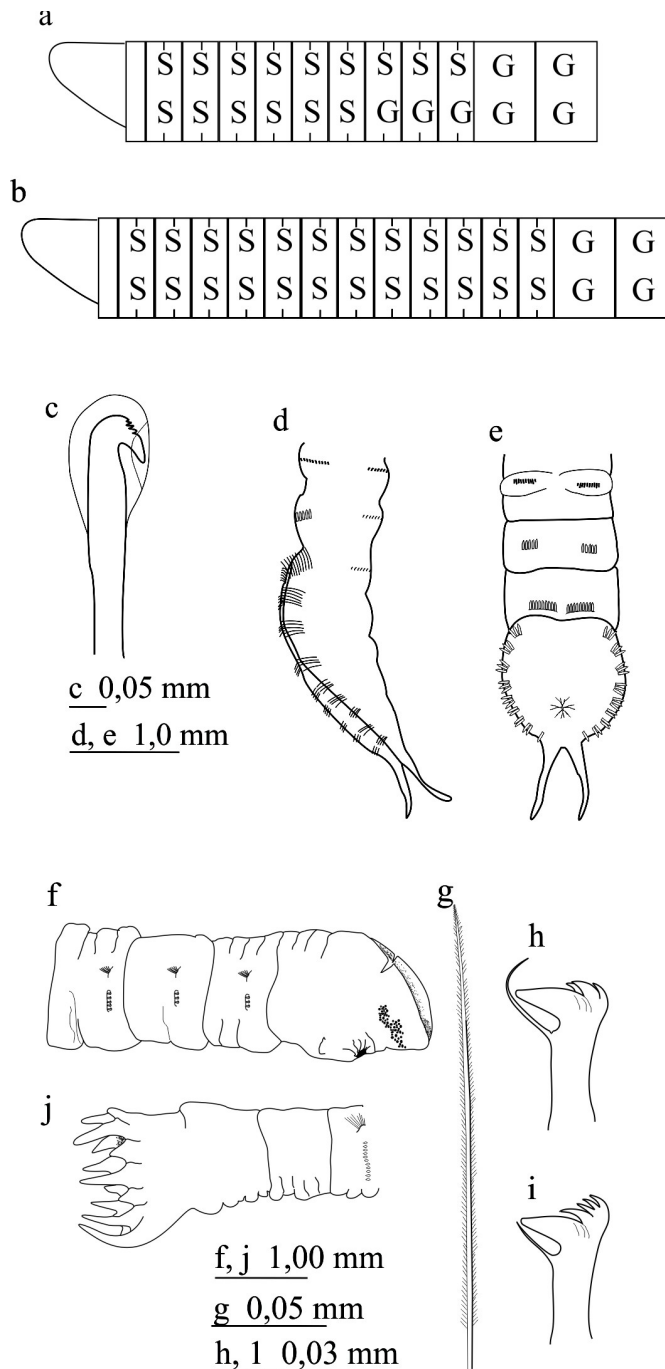
Description. Specimen with 13 mm long and 0.6 mm wide. Prostomium is conical with dark eyespots. The first segment is achaetiger. Thorax with 12 biannulate chaetigers (Fig. 2b), capillary chaetae on both rami. Transition from thorax to abdomen is moderately marked. Thorax with enlarged neuropodial tori. Abdomen with multidentate

hooded hooks (Fig. 2c) in both parapodial rami. Two last chaetigers with acicular spines in notopodia (Fig. 2d). Anal plaque with acicular spines distributed in 8-10 groups of 1-5 aciculae (Fig. 2e) and a pair of digitiform cirri.

Comments. From 14 recognized species only two have been recorded for the Caribbean region, *Scyphoproctus guadalupensis* and *S. platyproctus*

Jones 1961. The difference between these two species is the fact that *S. platyproctus* has acicular spines distributed from five to seven groups with 1-6 aciculae (6-3-2-2-1-1), also presenting aciculae in the last six abdominal segments. This species had not been recorded since the original description.

Distribution. Guadalupe and Venezuela.



**Figure 2.-** a) *Capitella giardi*, anterior region; b-e) *Scyphoproctus guadalupensis* b) anterior region, c) hooded hook, d) posterior end in lateral view, e) posterior end in ventral view; f-j) *Axiothella brasiliensis* f) anterior end in lateral view, g) plumose chaetae, h) anterior rostrate hook, i) posterior rostrate hook, j) posterior end in lateral view.

Familia Maldanidae

Genus *Axiothella* Verrill 1900

*Axiothella brasiliensis* Mangum 1966

Figure 2f-j

*Axiothella brasiliensis* Mangum 1966: 5-8, Fig. 2A-D; Salazar-Vallejo & Díaz-Díaz 2009: 303, Fig. 1H.

Material examined. Thirty four specimens. BM-2-2009 (3); BM-1-2009 (1); CA-1-2009 (1); DMS-1-2009 (1); DMS-2-2009 (1); MQ-2-2009 (2); MQ-1-2010 (4); GR-1-2010 (1); MQ-2-2011 (3); GR-2-2012 (4); MQ-2-2012 (13).

Description. All the specimens were fragmented (only four posterior fragments were found). Prostomium slightly longer than wide, elliptical cephalic plaque well developed with a lateral incision. Presence of short palpode. Nuchal slits long, parallel, slightly curved outwards in the anterior region. Numerous dark eyespots over the ventral portion of the prostomium (Fig. 2f). No achaetigerous segments. Biramous parapodia. Notopodia with three kinds of chaetae, including for each parapodium, 1-2 thin capillary chaetae, 1-3 bilimbate chaetae and 1-2 hispid chaetae (Fig. 2g). Neuropodia with 1-2 rostrate acicular uncini present in the first two chaetigers, followed by 3-4 uncini in the third chaetiger with two rows of teeth over the principal tooth (Fig. 2h). After the fourth chaetiger, 7-14 uncini with four rows of teeth over the principal tooth from a lateral view (Fig. 2i). Two preanal achaetigerous segments. Pygidium as an anal plaque, rimmed with 20 cirri alternated in length, terminal anus (Fig. 2j).

Comments. *Axiothella* species have been defined by some morphological characters, such as the number of chaetigers, presence and number of rostrate hooks and/or rudimentary hooks in the first neuropodium, types of ornamentation in the cephalic plaque, types and distribution of anal cirri (Salazar-Vallejo 1991; Jiménez-Cueto & Salazar-Vallejo 1997). However, the specimens examined showed some variations in the number of hooks per neuropodia and the absence of dark eyespots in some individuals. Nonetheless, the presence of lateral notches over the prostomium, two preanal achaetigerous segments and pygidium with alternated cirri, defines this species. In the original description, Mangum (1966) describes the species as *Clymenella* (= *Axiothella*) *brasiliensis*,

based on the arguments proposed by Verrill (1900), confining *Axiothella* to a subgenus status. Nevertheless, the genus *Clymenella* has some particular characteristics that are not present in the genus *Axiothella*, such as the presence of an anterior collar well developed in the fourth chaetiger and also an anterior neuropodia with acicular spines. For these reasons, Read (2013) indicates that Mangum description is actually an *Axiothella*.

Distribution. Caribbean, Brazil and Venezuela.

Family Opheliidae Malmgren 1867

Genus *Armandia* Filippi 1861

*Armandia maculata* (Webster 1884)

*Ophelina maculata* Webster, 1884: 322, Pl. 11, Fig. 54-55.

*Armandia maculata* Hartman 1944: 22; Day 1973: 95; Uebelacker 1984: 3(17)/9-11, Fig. 17/6 A-E; Carrera-Parra & Salazar-Vallejo 1997: 42; Vanegas-Espinosa 2008: 62, Fig. 34 a-c.

Material examined. Twenty eight specimens: BM-2-2009 (1); SB-1-2009 (1); BM-1-2010 (1); CA-1-2010 (1); CA-2-2010 (1); DMS-1-2010 (3); MQ-1-2010 (1); MQ-2-2010 (1); RQ-1-2010 (2); SB-1-2010 (1); SB-2-2011 (1); GR-2-2011 (1); MQ-2-2011 (4); MQ-2-2012 (6); GR-2-2012 (3).

Comments. The species has been reported for Venezuela by Hartman (1944), in Coche and Cubagua Islands, and also by Vanegas-Espinosa (2008), for the west continental region. The specimen's characteristics are consistent with Uebelacker (1984) description.

Distribution. North Carolina, Gulf of México, Bermudas and Venezuela.

Family Orbiniidae

Genus: *Orbinia* de Quatrefages 1865

*Orbinia americana* Day 1973

*Orbinia americana* Day 1973: 89, Figs. 12 c-g; Taylor 1984: 1.26, Figs. 1.26 a-e; Granados-Barba 1994: 30, Lám. 3h; Solís-Weiss *et al.* 2009: 386, Fig 3 A-B; Díaz-Díaz *et al.* 2012: 10-12, Fig. 3A-E.

Material examined. Fifty six specimens: MQ-2-2009 (6); DMS-2-2010 (2); MQ-2-2010 (2); SB-1-2010 (1); CA-2-2011 (2); DMS-2-2011 (9); GR-2-2011

(1); MQ-2-2011 (20); RQ-2-2011 (6); BM-2-2012 (1); DMS-2-2012 (3); GR-1-2012 (1); MQ-2-2012 (2).

Comments. *Orbinia americana* was one of the most abundant species in the present study. Díaz-Díaz *et al.* (2012) indicate a high variability of substrates where the species has been collected, from muddy clay substrate (Gulf of Paria) to coarse (Araya Peninsula) and fine sand (Gulf of Cariaco).

Distribution. North Carolina, Gulf of México and Venezuela.

Genus: *Naineris* de Blainville, 1828.

*Naineris setosa* (Verrill, 1900)

*Aricia setosa* Verrill 1900:651-653.

*Anthostomalata capitata* Treadwell 1911: 203-205, Figs. 61-65.

*Naineris setosa* Hartman 1942: 61, Figs. 116-118; Hartman 1951: 67-70, Pl. 17, Figs. 1-6; Hartman 1957: 305, Pl. 41, Figs. 1-6; Solís-Weiss & Fauchald 1989: 774- 778, Fig. 2 a-j; Díaz-Díaz *et al.* (2012): 14-16, Fig. 4-I.

Material examined. Six specimens: GR-2-2011 (1); MQ-2-2011 (1); RQ-2-2011 (2); BM-2-2012 (1); DMS-2-2012 (1).

Comments. Solís-Weiss & Fauchald (1989) mention that the main characteristics of this species are found in the shape and function of the prostomium, and also in the distribution and number of eyes. The species has been recorded in shallow waters, being mostly associated to *Thalassia testudinum* meadows, macroalgae, *Rhizophora mangle* roots, sandy and muddy sand substrates (Díaz-Díaz *et al.* 2012).

Distribution. Gulf of México, Belize, Puerto Rico, Bermuda and Venezuela.

Family Paraonidae

Genus *Aricidea* Webster, 1879.

Subgenus: *Acmira* Hartley, 1981

*Aricidea (Acmira) simplex* Day, 1963

*Aricidea suecica simplex* Day 1963: 364, fig. 3a,b: 1967: 558, fig. 24.l.f-1.

*Aricidea (Acesta) simplex* Strelzov 1973: 99, fig. 12, 5. 44A,B.

*Aricidea (Acmira) simplex* Gaston 1984: 2-41/43, fig. 2-39; de León-González *et al.* 2006: 256; Díaz-Díaz *et al.* 2009: 445-446, Fig. 2F-H.

Material examined. Thirty six specimens: BM-1-2009 (2); CA-2-2009 (1); DMS-1-2009 (6); DMS-2-2009 (2); MQ-2-2009 (1); SB-1- 2009 (3); CA-1-2010 (1); CA-2-2011 (2); DMS-2-2011 (9); GR-2-2012 (3); MQ-2-2011 (1); SB-2- 2011 (1); BM-2-2012 (1); CA-2-2012 (1); MQ-2-2012 (1); RQ-2-2012 (1).

Comments. The species presents a wide geographic and bathymetric distribution, being recorded between 35 and 1072 m deep. The species has been reported for North Carolina and the Gulf of México, being also recorded for Venezuela in the Delta del Orinoco, National Park Mochima (Sucre), Castillete (Zulia) and Cabo San Román (Falcón) (Díaz-Díaz *et al.* 2009).

Distribution. New Zealand, Bering Sea, Kuril Bay, Sea of Japan, South Africa, Scotia Sea, North Carolina, Gulf of México, Venezuela, Uruguay, Patagonia and the Antarctica.

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