

**EPIZOIC POLYCHAETES (ANNELIDA: POLYCHAETA)
ON *CRASSOSTREA RHIZHOPHORAE* (GUILDING, 1828)
FROM LA RESTINGA LAGOON, MARGARITA ISLAND, VENEZUELA**

POLIQUETOS (ANNELIDA: POLYCHAETA) EPIZOICOS
DE *CRASSOSTREA RHIZHOPHORAE* (GUILDING, 1828)
DE LA LAGUNA LA RESTINGA, ISLA MARGARITA, VENEZUELA

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ABSTRACT

Species richness of epizoic polychaetes on the mangrove oyster, *Crassostrea rhizophorae* (Guilding 1828), was studied. Monthly collections (January-August, 2001) were made. Oysters were separated from mangroves roots by hand in La Restinga lagoon and put into plastic bags with seawater, taken to the laboratory and placed in aquaria. Two hundred and forty five oysters were examined, having 1229 polychaetes belonging to 56 species. The biogeographic composition of the species allows some grouping as cosmopolitan (32.3%), Atlantic Ocean (23.3%), amphiamericans (18.6%), pantropical (9.3%) and disjunct species (2.3%).

Key words: annelida, *Crassostrea rhizophorae*, epizoans, La Restinga lagoon, polychaetes

RESUMEN

Se analizó la riqueza de especies de poliquetos epizoicos de la ostra de mangle, *Crassostrea rhizophorae* (Guilding 1828). Los muestreos fueron realizados mensualmente (enero-agosto, 2001) en la laguna La Restinga. Los ostiones fueron separados manualmente de las raíces de mangles y colocados en bolsas plásticas con agua de mar, llevados al laboratorio y colocados en acuarios. Se estudiaron 245 ostiones que tenían 1229 poliquetos de 56 especies. El estudio biogeográfico permite la distinción de varios grupos de especies: cosmopolita (32.3%), Atlántico (23.3 %), anfiamericanas (18.6%), pantropicales (9.3%) y disjuntas (2.3%).

Palabras clave: annelida, *Crassostrea rhizophorae*, epizoicos, laguna La Restinga, poliquetos

INTRODUCTION

The mangrove oyster *Crassostrea rhizophorae* (Guilding 1828) is widely distributed in the Caribbean Sea (Abbott 1974, Díaz and Puyana 1994). It is found in shallow water, mainly associated with hard substrates, especially mangrove roots (Abbott 1974). This oyster is greatly sought after commercially due to the high quality of its flesh. In Venezuela, the production of *C. rhizophorae* between 1990 and 1995 was 50 ton, and La

Restinga lagoon only produced 5 ton during this period (Gómez 1999). The surface of the valves of *C. rhizophorae* is irregular, providing a substrate for the fixation of epibionts that might complete their life cycle there. Numerous mollusks are closely grouped together, forming microhabitats available for the colonization by other species, besides offering protection against predators. In the Grand Caribbean region few studies has been done on the associated fauna of bivalve mollusks of commercial interest, except for those on polychaetes associated

with *Perna viridis* (Linné 1758) by (Liñero-Arana (1999a), on *Pinctada imbricata* Röding 1798 and *Isognomon alatus* (Gmelin 1791) by Díaz and Liñero-Arana (2003a, 2003b) respectively, and on *Spondylus americanus* Hermann 1781 by Liñero-Arana and Díaz (2006). In this study we investigate the richness of polychaete worms associated with the mangrove oyster *C. rhizophorae* from La Restinga lagoon, and made a biogeographic analysis of these polychaete species.

MATERIALS AND METHODS

The study was carried out in La Restinga, Margarita Island, Venezuela (11°00'00" N, 64°10'00" W). Monthly collections were made between January and August 2001. Oyster specimens were removed from mangrove roots, placed in plastic bags and taken to the laboratory in containers with seawater, where they were maintained in aquaria. Polychaete specimens were separated and fixed in a formaldehyde solution (8%) in seawater, and identified following Díaz and Liñero-Arana (2003a). *Polydora cf. websteri* Hartman 1943 specimens were removed of the shell using the technique described by Díaz and Liñero-Arana (2009).

Polychaetes are deposited in the polychaete collection of the Laboratorio de Biología de Poliquetos, Instituto Oceanográfico de Venezuela.

RESULTS AND DISCUSSION

From the 245 bivalves examined, 1229 polychaetes were collected, and 56 species, belonging to 16 families were identified (Table 1). Syllidae, Serpulidae, Sabellidae and Eunicidae were the best represented families with 10, 9, 6 and 6 species, respectively. The most abundant species were the serpulids *Pileolaria militaris* Claparède 1868 and *Hydroides dirampha* Mörch 1863, the sabellids *Branchiommia nigromaculata* (Baird 1865), *B. conspersum* (Ehlers, 1887) and the spionid *P. cf. websteri* Hartman 1943.

Twenty-four species of sedentary polychaetes were identified, representing 44.6% of the species richness and 87.47% of the abundance, showing the importance of bivalves as a stable substrate for the colonization and development of this group, as well as for the refuge of errant species (55.4%), thus constituting true ecological islands

(De León-González *et al.* 1993). The number of species obtained in this study is higher than those recorded for similar studies. Liñero-Arana (1999a) recorded 11 species associated with *Perna viridis*, Díaz and Liñero-Arana (2003a) recorded 26 with *P. imbricata*, Díaz and Liñero-Arana (2003b) 38 with *I. alatus* and Díaz and Liñero-Arana (2006) 48 with *Spondylus americanus*. From the species lists from those studies we found 3, 21, 25 and 28 species common to our study, respectively. Such differences could be related to shell morphology, variation of sediment particles and organic matter. Thus, the irregular surface of *C. rhizophorae* provides a greater area of available microhabitat, the crowding of oysters in large groups, and the accumulation of sediment would explain the presence of some sedentary species (Sabellidae, Terebellidae, Flabelligeridae and Maldanidae) that normally live in sediments, with the exception of *Notaulax nudicollis* (Sabellidae) which is associated with hard substrates (Díaz and Liñero-Arana 2003a). In other studies done in the Eastern Pacific Ocean, the number of identified species was also low; Keough (1984) recorded three species of spirorbids associated with *Pinna bicolor* Gmelin 1791, de León-González *et al.* (1993) reported 31 polychaete species on *Spondylus princeps unicolor* Sowerby, 1847. In contrast with these studies, in which the Syllidae was poorly represented, this family had the highest number of species (10) in our study, even though their abundance barely represented 2.77% of the total.

The families best represented, as regards both species richness and abundance, were Serpulidae (34.01%) and Sabellidae (31.57%), whereas Spionidae represented 17.01% of the abundance with two species. *Polydora cf. websteri* Hartman 1943, polydorids are commensal with bivalves including oysters, and have been regarded as pests in bivalve mollusk cultures, because they often bore the shells, (Blake and Evans 1973; Widman and Rhodes 1991, Ciocco 1990, Cáceres-Martínez 1991, Martin and Britayev 1998, Calvo *et al.* 2001). This suspension-feeding species causes a mechanical irritation that induces the oyster to produce more conchiolin in an attempt to prevent the tube from perforating the shell completely. The abundance of *P. cf. websteri* is considerably high (16.92%), with 76% of bivalves examined found to be infected.

A biogeographic study (Table 1) indicated the

Table 1. Epizoic polychaetes from mangrove oysters, *C. rhizophorae*, from La Restinga Lagoon.

Species	N*	Type Locality/Distribution	Source?
Polynoidae			
<i>Halosydna leucohyba</i> Webster, 1884	9	Antilles/West Indies, Bermuda, Gulf of Mexico, Venezuela	5, 10, 12, 45
Spionidae			
<i>Polydora</i> cf. <i>websteri</i> Hartman, 1943	102	New England/Gulf of California, Hawai, Chile, Quebec, New Foundland to Florida, Gulf of Mexico, Brazil, Argentina, Venezuela	1, 2, 3, 4, 5
<i>Scolelepis lighti</i> Delgado-Blas, 2006	1	Caribbean Sea/New Jersey, North Carolina, Gulf of México, Venezuela.	44
Cirratulidae			
<i>Timarete tentaculata</i> (Montagu, 1808)	20	Devon (England)/English Channel, Morocco, West-coast of Africa, Persian Gulf, Japan, New Caledonia, New Zeland, Campbell Island, Gulf of México, Venezuela.	6, 41
<i>Timarete punctata</i> (Grube, 1859)	2	Mediterranean Sea/Circuntropical	6, 41
<i>Timarete filigera</i> (delle Chiaje, 1828)	1	Naples/Warm and tropical Atlantic: Morocco, San Thome, North Carolina, Gulf of Mexico, Venezuela, Mediterranean, Persian Gulf; tropical Indian Ocean.	7
Phyllodocidae			
<i>Eumida sanguinea</i> Örsted, 1843	11	North Sea/Mediterranean, France, Norway, Iceland, West and East coast of North-America, Gulf of Mexico, Venezuela, Japan, Indian Ocean, New Zeland and Sudafrica.	5, 7, 8, 10
<i>Nereiphylla fragilis</i> Webster, 1879	2	Caribbean Sea/Virginia to Florida, Gulf of Mexico, Venezuela	7, 8
<i>Anaitides (Phyllodoce) madeirensis</i> Langerhans, 1880	4	Madeira Is./Cosmopolitan	7,8,9,10,16
Hesionidae			
<i>Podarke obscura</i> Verrill, 1873	12	Caribbean Sea/Great Caribbean	7,10,11,12
<i>Hesione splendida</i> Savigny in Lamarck, 1818	2	Red Sea/Mediterranean, Persian Gulf, Red Sea, Venezuela.	5, 10, 12, 42
<i>Gyptis vittata</i> Webster and Benedict, 1887.	1	Caribbean Sea/Maine, North Carolina, Florida	11

N* = specimens number

Cont. Table 1. Epizoic polychaetes from mangrove oysters, *C. rhizophorae*, from La Restinga Lagoon.

Species	N*	Type Locality/Distribution	Source?
Syllidae			
<i>Syllis gracilis</i> Grube, 1840	9	Mediterranean Sea/Cosmopolitan	7,13,14
<i>S. corallicola</i> Verrill, 1900	2	Bermuda/ Antilles, Cuba, Mediterranean Sea, Baleares Is.	14,38
<i>Syllis</i> sp.	3		
<i>Elhersia cornuta</i> (Rathke, 1843)	2	Norway/Cosmopolitan	7,13,14
<i>Trypanosyllis zebra</i> (Grube, 1860)	1	Adriatic Sea/France. Red Sea, Australia, Gulf of Mexico, Venezuela	5,13
<i>Odontosyllis enopla</i> Verrill, 1900	1	Caribbean Sea/Great Caribbean Sea	13, 14
<i>Odontosyllis</i> sp.	3		
<i>Exogone dispar</i> (Webster, 1879)	9	Virginia/Artic, Galapagos Island, Japan, Sudfrica, North Atlantic (from Maine to Florida), Gulf of Mexico, Venezuela	5, 13, 14
Syllidae spA	1		
<i>Myrianida convolutus</i> (Cognetti, 1953)	3	Mediterranean Sea/Mediterranean Sea, Naples, Suez Channel, Japan, Cuba, Venezuela	5, 38, 39, 54
Nereididae			
<i>Nereis</i> sp.	2		
<i>N. falsa</i> de Quatrefages, 1865	6	Mediterranean Sea/Cosmopolitan	5, 15
<i>Perinereis anderssoni</i> Kinberg, 1866	2	Rio de Janeiro (Brazil)/Cosmopolitan	5, 15
Amphinomidae			
<i>Eurythoe complanata</i> (Pallas, 1766)	3	Caribbean Sea/Circuntropical	47
Onuphidae			
<i>Diopatra tridentata</i> Hartman, 1944	1	California/From South of California to Colombia; North Carolina, Antilles, Brazil, Venezuela	46

N* = specimens number

Cont. Table 1. Epizoic polychaetes from mangrove oysters, *C. rhizophorae*, from La Restinga Lagoon.

Species	N*	Type Locality/Distribution	Source?
Eunicidae			
<i>Eunice vittata</i> (delle Chiaje, 1828)	5	Naples/Cosmopolitan	17, 18, 21
<i>E. antennata</i> (Savigny, 1820)	3	Gulf of Suez/Cosmopolitan	17, 18, 19, 21
<i>Marphysa sanguinea</i> (Montagu, 1815)	5	Devon (England)/Cosmopolitan	17,18, 19, 20, 51
<i>Lysidice ninetta</i> Audouin and Milne-Edwards, 1833	6	Chancey Is. (France)/Cosmopolitan	17,18, 19, 20, 21, 22, 24, 51
<i>Palola siciliensis</i> (Grube 1840)	2	Sicily/Gulf of Mexico, Venezuela, Mediterranean, west coast Africa, and tropical coast Indian and Pacific oceans.	17, 18, 19, 21, 51
<i>Nematonereis hebes</i> Verrill, 1900	5	Adriatic Sea/Cosmopolitan	19, 20,22, 51
Dorvilleidae			
<i>Dorvillea cerasina</i> Ehlers, 1901	39	Chile/Amphiamerican	22
Maldanidae			
Maldanidae spA.	1		
Flabelligeridae			
<i>Piromis</i> sp.	1		
Terebellidae			
<i>Amphitridides bruneocomata</i> (Ehlers, 1887)	9	Caribbean Sea/Florida, Gulf of Mexico, West Indies, Venezuela	40
<i>Streblosoma hartmanae</i> Kritzler, 1971	18	Caribbean Sea/Great Caribbean Sea	25, 40, 43, 53
<i>Polycirrus holthei</i> Londoño-Mesa & Carrera-Parra, 2005	3	Cancun/Gulf of Mexico, Venezuela.	25, 43, 53
<i>Eupolymnia nebulosa</i> (Montagu, 1818)	5	North Sea/From Scotland to tropical western Africa and Falkland Islands, Gulf of Mexico, Venezuela, Mediterranean, Red Sea, Persian Gulf, Tropical Indian Ocean, Japan	19, 40, 43, 53

N* = specimens number

Cont. Table 1. Epizoic polychaetes from mangrove oysters, *C. rhizophorae*, from La Restinga Lagoon.

Species	N*	Type Locality/Distribution	Source?
Sabellidae			
<i>Sabella melanostigma</i> Schmarda, 1861	2	Caribbean Sea/Circuntropical	4, 26, 48
<i>Branchiomma nigromaculata</i> (Baird, 1865)	287	Antilles/Florida Cays; Gulf of México, Jamaica; Bermuda; Bahamas; Puerto Rico; Barbados; Curaçao; North Carolina, Sudafrica; Red Sea, Japan, Indian Ocean, Cuba, Venezuela.	5, 23, 48
<i>Branchiomma conspersum</i> (Ehlers, 1887)	62	Key West (Florida)/ Gulf of Mexico, Florida, Antilles, Venezuela.	55
<i>Notaulax nudicollis</i> Schmarda, 1861	35	Caribbean Sea/Great Caribbean Sea	22, 48, 49
<i>Demonax flecatus</i> (Hoagland, 1919)	1	Caribbean Sea/Great Caribbean Sea	48, 49
<i>Amphicorina anneae</i> (Rouse, 1994)	1	Caribbean Sea/Great Caribbean Sea	7, 50
Serpulidae			
<i>Spirobranchus giganteus giganteus</i> (Pallas, 1766)	9	Antilles/Great Caribbean	27,28,29,30
<i>Hydroides sanctaerucis</i> Krøyer [in] Mörch, 1863	12	Saint Croix/Amphiamerican	30, 32, 52
<i>H. dirampha</i> Mörch, 1863	58	Antilles/Circuntropical	29,30,31, 32,33, 52
<i>H. bispinosa</i> Bush, 1910	21	Bermuda/Great Caribbean Sea	29,30,32, 33,34, 52
<i>H. elegans</i> (Haswell, 1883)	8	Port Jackson (Australia)/Cosmopolitan	29,30,32, 33,34, 52
<i>Vermiliopsis annulata</i> (Schmarda, 1861)	28	Jamaica/Amphiamerican	29,30,31,34
<i>Pseudovermilia occidentalis</i> (McIntosh, 1885)	15	Bermuda/Amphiamerican	29, 30, 31, 34
<i>Pileolaria militaris</i> Claparède, 1868	251	France/Cosmopolitan	30, 35, 36, 37
Spirorbidae spA	16		
Total de individuos	1229		

N* = specimens number

1 Blake (1971), 2 Basilio *et al.* (1995), 3 Blake and Evans (1973), 4 Bolivar and de Cunha-Lana (1987), 5 Díaz (1999), 6 Wolf (1984), 7 Salazar-Vallejo and Carrera-Parra (1997a), 8 Gathof (1984a), 9 Liñero-Arana (1993), 10 Díaz and Liñero-Arana (2002b), 11 Uebelacker (1984a), 12 Liñero-Arana (1999b), 13 Uebelacker (1984b), 14 San Martín and Bone (2001), 15 Liñero and Reyes-Vásquez (1979), 16 Díaz and Liñero-Arana (2002a), 17 Liñero-Arana (1985), 18 Day (1973), 19 De León-González and Díaz-Castañeda (2006), 20 Gathof (1984b), 21 Fauchald (1992), 22 Ibarzábal (1986), 23 Jones (1962), 24 Day (1967), 25 Liñero-Arana and Díaz (2006), 26 Uebelacker (1984c), 27 Zibrowius (1966), 28 Hove (1970), 29 Liñero-Arana (1999a), 30 Díaz and Liñero-Arana (2001), 31 Zibrowius (1970), 32 Bastida-Zavala and Salazar-Vallejo (2000), 33 Zibrowius (1971), 34 Hove and Wolf (1984), 35 Knight-Jones and Knight-Jones. (1991), 36 Knight-Jones and col. (1979), 37 Liñero-Arana (1998), 38 San Martín (2003), 39 Amaral and Nonato (1975), 40 Londoño-Mesa and Carrera-Parra (2005), 41 Díaz and Liñero-Arana (2004), 42 Liñero-Arana (1996), 43 Kritzler (1984), 44 Delgado-Blas (2004), 45 Liñero-Arana (1991), 46 Liñero-Arana (1994), Liñero-Arana (1999b), 48 Tovar-Hernández and Salazar-Vallejo (2006), 49 Perkins (1984), 50 Rouse (1994), 51 Salazar-Vallejo and Carrera-Parra (1997b). 52 Bastida-Zabala and Hove (2002), 53 Díaz and Liñero-Arana (2000), 54 Nygren, (2004), 55 Tovar-Hernández & Knight-Jones (2006).

presence of 14 cosmopolitan species (32.3%), 10 species from the Atlantic Ocean (23.3%), 8 amphiamericans (18.6), 4 circumtropicals (9.3%), 1 recorded from the Indian and Atlantic Oceans (2.3%) and one disjunct species (amphiamericantropical). In this analysis the dominant species (51.3%) came from the tropical and subtropical Atlantic, followed by the cosmopolitan ones (28.2%). Endemic species were not recorded. This represents the first study of epibiont polychaetes on *C. rhizophorae* in the Atlantic region.

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