Littoral annelid polychaetes inhabiting soft bottoms of the Barcelonès (Catalonia, NE Spain)

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Littoral annelid polychaetes inhabiting soft bottoms of the Barcelonès (Catalonia, NE Spain).- The distribution of polychaetes inhabiting littoral soft bottoms from five to 75 m depth in front of the Barcelonès Region (NE Spain) is presented here. The study includes 202 species indicating depth, type of sediment, and season in which each one was collected, and also the environment in which they most frequently were found. New records for the Mediterranean Sea, the Iberian peninsula, the Spanish Mediterranean coast, and Catalonia are listed.

Key words: Polychaeta, Catalogue, Soft bottoms, Barcelonès, Catalonia, Western Mediterranean.

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Introduction

Studies on polychaete systematics were initiated at the beginning of this century in Spain by Alaejos (1905), Cabrera (1909) and Cendrero (1910). Between 1916 and 1935, surveys by Rioja established the basis of future studies. Significant catalogues of species from the Iberian peninsula have been carried out by Ibáñez (1973a), Campoy (1979) and Ariño (1987). San Martín & Viéitez (1991) elaborated a catalogue of the polychaetes deposited in the National Museum of Natural History (Madrid) throughout Spain. The most complete identification keys of Iberian polychaetes were carried out by Rioja (1931), Ibáñez (1973b), Campoy (1982), San Martín (1982a) and Sardà (1984).

The most relevant studies of systematics of polychaetes from soft bottoms in the Spanish Mediterranean area, which sometimes include identification keys are: Rioja (1920) in Valencia, San Martín (1982a) in Baleares, Capaccioni-Azzati (1983) and Pérez-Ruzafa (1989) in Murcia, and Sardà (1984) in Gibraltar. Surveys from the Catalonian coast are those performed in Los Alfaques Bay (Ebro Delta) (Capaccioni-Azzati, 1987; Capaccioni-Azzati et al., 1990; Martín, 1990), in the Gulf of Rosas (Desbruyères et al., 1972), in the Catalonian-French coast (Guille, 1970, 1971), in Premià and Vilanova i la Geltrú (Maresme and Baix Penedès regions) (Sardà, 1986), and in the Maresme region (Romero et al., 1989). Nevertheless, studies carried out in the Barcelonès region are scarce: Cuadras & Pereira (1977) reported the presence of *Laeonereis glauca*, *Neanthes caudata*, *Polydora ciliata*, and *Dodecaceria concharum* associated to shells inhabited by the anomuran *Dardanus arrosor*, at 50 m of depth. Ecological research was later performed in soft bottoms in front of the Barcelonès littoral (Ros et al., 1988, 1990; Corbera & Cardell, 1991; Ros & Cardell, 1992; Flos et al., 1992; Méndez, 1993, 1994). These studies reveal the high diversity and abundance of the group in the study area suggesting that a complete and detailed catalogue of polychaete species is required.

The paper presents the distribution of species inhabiting littoral soft bottoms in the Barcelonès region.

Material and Methods

Study area

The study area (fig. 1) is located in the North-western Spanish coast along the Barcelonès region. Sampling sites were located in soft bottoms from 5 to 75 m depth, between 41°28'N, 2°19'E and 41°20'N, 2°10'E. The area comprises a coastal extension of 17.5 km and presents a high demographic density where Barcelona and Badalona are the most important cities. The littoral zone receives a high influence of domestic and industrial residuals. The main disturbance focus was the Sant Adrià del Besòs wastewater treatment plant, which provide a massive input of wastewater about 500 m off the shoreline, and of organic sludge coming from the submarine pipeline 4 km off the shoreline and 54 m depth (Parés, 1989). The Besòs River itself is also an important disturbance focus. Residuals produce eutrophication and incorporation of toxic pollutants in sediments which have damaged benthic macrofaunal communities (Ros et al., 1990; Ros & Cardell, 1992; Méndez, 1993, 1994).

Data from Checa et al. (1988), Corbera & Cardell (1991) and Flos et al. (1992) referring to size grain of sediments reveal a general distribution pattern according to bathymetry (fig. 1). Sand bottoms are located between 5 and 25 m depth along the whole coastline. Detritic sand bottoms containing shell fragments are situated between 70 and 75 m depth at the south of the study area. Silty sand bottoms are located between 25 and 30 m depth, at the north of the mouth of the Besòs River, and between 60 and 65 m depth through the whole study area. Clayey sand has

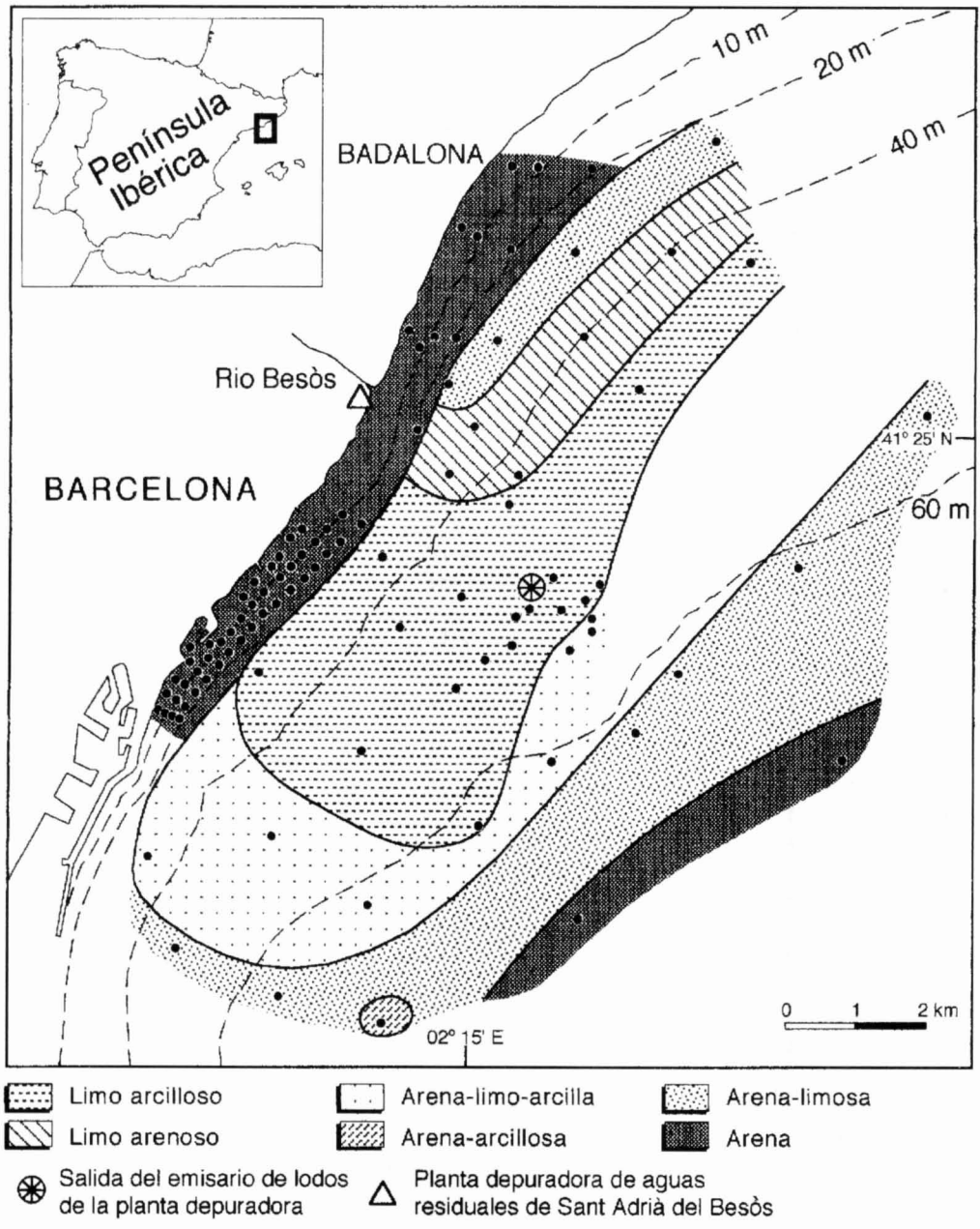


Fig. 1. Location of sampling sites and distribution of the different types of sediment in the study area.

Localización de las estaciones de muestreo y distribución de los distintos tipos de sedimento en el área de estudio.

only been registered in a small area at 70 m depth. Sandy silt bottoms correspond to a small zone between 36 and 55 m depth, in front of the mouth of the Besòs River. Clayey silt bottoms take up an extension of about 6 km between 30 and 63 m depth, at the SW of the mouth of the Besòs River and the sludge pipeline. These bottoms are also located between 45 and 48 m depth, at 3 km from the same river in a NE direction. The group of sand-silt-clay contains sediments of transition grain sizes and is situated at the south of the study area, between 30 and 65 m depth.

Sampling and processing of samples

Samples of sediments were collected in front of Barcelona between 10 and 75 m depth during July and November, 1987, and February and May, 1988 (SPIO Project; Ros & Cardell, 1992), and also between 5 and 15 m depth during March, May, July and October, 1990 and 1991 (VOSA Project; Méndez, 1994). In front of Badalona, sampling was performed between 5 and 40 m depth in September, 1990 (Corbera & Cardell, 1991). Collection of samples was carried out with a van Veen grab (30 x 30 cm) and sediments were sieved through a 0.5 mm mesh. The retained fraction was fixed with 4% formaldehyde. Organisms were sorted and preserved in 70% ethyl alcohol. Additional samples of sediments were collected to determine grain size of sediments.

Polychaete specimens were identified using a stereoscopic microscope (40x) and a light microscope (1000x). The most general key of polychaetes identification from Fauchald (1977) was followed to determine families and genera, and that from Fauvel (1923, 1927) for genera and species. The keys for the Iberian peninsula's polychaetes utilized were those from Rioja (1931), Campoy (1982) and Sardà (1984). In some cases, literature referring to specific families was required: Laubier(1967), Laubier & Ramos (1973) and Castelli (1985) for Paraonidae; Giordanella (1966), Ramos (1976) and Light (1978) for Spionidae; Glémarec (1966) for Magelonidae; Bhaud (1972) for Chaetopteridae; Laubier (1960) and Blake (1991) for Cirratulidae; Capaccioni-Azzati (1985), Torres-Gavila et al. (1989), Gravina & Somaschini (1990) and Warren (1991) for Capitellidae; Hartmann-Schröder (1960, 1963) for Phyllodocidae; Gravina & Giangrande (1988) for Hesionidae; Katzmann et al. (1974) for Pilargiidae; San Martín (1982a) and Alós (1988) for Syllidae; San Martín (1982b) and Rainer & Kaly (1988) for Nephtyidae; Parenti (1961) for Dorvilleidae; Martín (1989) for Oweniidae and Giangrande & Castelli (1986) for Sabellidae.

The biological material included in this catalogue was collected to perform ecological studies. Almost all the specimens were dried to determine their biomass. Only specimens with systematic problems were conserved in order to make a more detailed analysis of their structures. Due to this, a collection of the polychaetes conforming this catalogue does not exist.

Characteristics of the data

This catalogue has been elaborated according to the systematic ordenation proposed by Fauchald (1977). All the catalogued species contain the following data related to their distribution:

a. Depth.

b. Type of sediment. According to data obtained by Checa et al. (1988), Corbera & Cardell (1991) and Flos et al. (1992) in the same area, granulometry of sediments was expressed as the percentage (dry weight) of the fractions of clay (< 0.002 mm), silt (0.002 to 0.062 mm) and sand (0.062 to 2 mm), following the granulometric nomenclature of Shepard (1954) . This method classifies sediments according to a triangular graph which relates the proportions of each fraction resulting ten different types. Only the following categories have

been found in the study area: CSI. Clayey silt; SSI. Sandy silt; SSIC. Sand-silt-clay; CS. Clayey sand; SIS. Silty sand; and sand. Moreover, sand samples (more than 75% of sand), were classified according to WENTHWORTH (1922), in function of the median of the diameter of all the particles. Four groups were found in the study area: VFS. Very fine sand (0.0625 to 0.125 mm); FS. Fine sand (0.125 to 0.250 mm); MS. Median sand (0.250 to 0.500 mm); COS. Coarse sand (0.500 to 1.0 mm).

c. Season: SP. Spring; S. Summer; A. Autumn; W. Winter.

d. Most frequent environment. The type of sediment and depth in which each species was found with the highest frequency is given. To synthesize this information, the different types of sediment and depth have been grouped according to the general distribution pattern of sediments in the study area (fig. 1). The following categories have been distinguished: mud (M), in which silt and clay materials are predominant (CSI, SSI, and SSIC). Muddy sand, which includes sediments containing 65 to 75% of sand (CS and SIS); this category has been subdivided in shallow muddy sand (SMS) from 25 to 45 m depth, and deep muddy sand (DMS) from 50 to 70 m depth. Sand (VFS, FS, MS, and COS) where two groups have been distinguished: shallow sand (SHS), located between 5 and 20 m depth, and detritic sand (DS), situated at 70 and 75 m depth.

Results

A total of 202 species distributed in 133 genera and 39 families are listed (table 1).

Table 1 also presents depth, type of sediment and season, and the most frequent environment where they were found.

Discussion

Specimens belonging to genera *Aglaophamus*, *Commensodorum*, *Eunoe*, *Microphthalmus*, *Ophelia*, *Polycirrus*, *Polymnia* and *Potamilla* have not been classified until specific level due to the loss of some systematicly important body structures during treatment and handling of samples. Some complete and well preserved specimens of *Chaetozone* sp. 1, *Chaetozone* sp. 2 and *Chone* sp. have not been assigned to any species described in the literature. These are presently being revised under light microscope and scanning electron microscope. The Pilargid *Sigambra* cf *tentaculata* is similar to *Sigambra tentaculata*, described in Virginia, U.S.A., but Mediterranean specimens lack ventral smooth setae (KATZMANN et al., 1974).

In relation to their geographic distribution, all the species have been reported previously in the Mediterranean Sea and the Iberian peninsula, except for *Hesionura serrata* and *Spiophanes berkeleyorum*, which are reported for the first time in the Mediterranean Sea and Spain. *Aonides paucibranchiata*, *Axiothella constricta* and *Ophryotrocha hartmanni* have previously been found in the Mediterranean, but not in Spain. The following species have been reported previously in the Iberian peninsula, but not in its Mediterranean coasts:

Goniada emerita: Atlantic (Spain, CAMPOY, 1974, 1979, 1982; IBÁÑEZ, 1973a; SAN MARTÍN & VIÉITEZ, 1991. Portugal, FAUVEL, 1914; AMOUREUX, 1974 ; AMOUREUX & CALVARIO, 1981).

Goniada norvegica : Cantabric Sea and Atlantic (AMOUREUX, 1972, 1973, 1974; IBÁÑEZ, 1973a; CAMPOY, 1974, 1979, 1982).

Jasmineira caudata: Atlantic (CAMPOY, 1974, 1979, 1982; AMOUREUX, 1974; LÓPEZ-JAMAR & GONZÁLEZ, 1987).

Neanthes succinea: Atlantic (Spain, IBÁÑEZ, 1972, 1973a; CAMPOY, 1979; LÓPEZ-JAMAR, 1981. Portugal, AMOUREUX & CALVARIO, 1981; SALDANHA, 1984; CALVARIO, 1984). Cantabric Sea (RIOJA, 1918).

Nereis lamellosa: Atlantic (RIOJA, 1918; BELLAN, 1960; IBÁÑEZ, 1973a; CAMPOY, 1979; LÓPEZ-JAMAR, 1982; LÓPEZ-JAMAR & MEJUTO, 1986).

Table 1. Recorded species including depth, type of sediment and season of the year and the most frequent environment where they were found: CSI. Clayey silt; SSI. Sandy silt; SSIC. Sand.silt clay; CS. Cayey sand: SIS. Silty sand; VFS. Very fine sand; FS. Fine sand; MS. Median sand; COS. Coarse sand; SP. Spring; S. Summer; A. Autumn; W. Winter; M. Mud; SMS. Shallow muddy sand; DMS. Deep muddy sand; SHS. Shallow sand; DS. Detritic sand; * Environments in which species have not been reported for the catalonian coast.

Code	Phyllum Annelida Class Polychaeta	Depth (m) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
	Order Orbiniida	
	Family Orbiniidae Hartman, 1942	
1	*Scoloplos armiger* (Müller, 1776)	
	Family Paraonidae Cerruti, 1909	
2	*Aricidea annae* Laubier, 1967	
3	*Aricidea assimilis* Tebble, 1967	
4	*Aricidea catherinae* Laubier, 1967	
5	*Aricidea cerrutii* Laubier, 1967	
6	*Aricidea claudiae* Laubier, 1967	
7	*Aricidea fragilis* Laubier & Ramos, 1973	
8	*Cirrophorus branchiatus* Ehlers, 1908	
9	*Cirrophorus furcatus* (Hartman, 1957)	
10	*Paradoneis harpagonea* (Storch, 1967)	
11	*Paradoneis lyra* (Southern, 1914)	
12	*Paraonis gracilis* (Tauber, 1879)	
	Order Cossurida	
	Family Cossuridae Day, 1963	
13	*Cossura soyeri* Laubier, 1963	
	Order Spionida	
	Family Spionidae Grube, 1850	
14	*Aonides oxycephala* (Sars, 1862)	
15	*Aonides paucibranchiata* Southern, 1914	
16	*Malacoceros ciliata* (Keferstein, 1862)	

*Especies registradas incluyendo profundidad, tipo de sedimento, estación del año y ambiente en el cual fueron encontradas con mayor frecuencia: CSI. Limo arcilloso; SSI. Limo arenoso; SSIC. Arena-limo-arcilla; CS. Arena arcillosa; SIS. Arena limosa; VFS. Arena muy fina; FS. Arena fina; MS. Arena mediana; COS. Arena gruesa; SP. Primavera; S. Verano; A. Otoño; W. Invierno; M. Lodo; SMS. Arenas lodosas someras; DMS. Arenas lodosas profundas; SHS. Arenas someras; DS. Arenas detríticas; * Ambientes de la costa catalana en los cuales no habían sido citadas.*

Code	Type of sediment									Season				Most frequent environment
	CSI	SSI	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
1					■		■	■	■	■			■	SMS
2	■	■			■					■				M
3	■		■	■	■		■		■	■	■	■		DMS
4		■			■					■	■	■		SMS *
5	■	■			■		■	■	■	■			■	M *
6	■	■	■		■					■	■	■		M
7	■		■		■				■	■	■	■		M, DMS
8	■	■	■		■				■	■	■	■		M
9	■				■				■		■			DMS, DS
10			■		■	■	■	■	■	■	■	■		DS
11	■	■	■	■	■		■	■	■	■	■	■		M *, DMS, DS
12	■	■	■	■	■		■		■	■	■	■		M, DMS, DS
13	■	■	■		■					■	■	■		M *
14			■		■	■	■	■	■	■	■	■		SHS
15					■		■	■			■			SHS *
16					■	■	■	■	■	■	■	■		SHS

Table 1. (Cont.)

Code	Phyllum Annelida Class Polychaeta	Depth (m) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
17	*Malacoceros fuliginosus* (Claparède, 1870)	
18	*Microspio mecznikowianus* (Claparède, 1868)	
19	*Polydora caeca* (Oersted, 1843)	
20	*Polydora ciliata* (Johnson, 1838)	
21	*Polydora hoplura* Claparède, 1870	
22	*Prionospio caspersi* Laubier, 1962	
23	*Prionospio cirrifera* Wiren, 1883	
24	*Prionospio malmgreni* Claparède, 1870	
25	*Prionospio pinnata* Ehlers, 1901	
26	*Pseudomalacoceros tridentata* (Southern, 1914)	
27	*Pseudopolydora antennata* (Claparède, 1868)	
28	*Scolelepis squamata* (Müller, 1806)	
29	*Spio decoratus* Bobretzky, 1870	
30	*Spiophanes berkeleyorum* Pettibone, 1962	
31	*Spiophanes bombyx* (Claparède, 1896)	
	Family Magelonidae Cunningham & Ramage, 1888	
32	*Magelona alleni* Wilson, 1958	
33	*Magelona filiformis* Wilson, 1959	
34	*Magelona minuta* Eliason, 1962	
35	*Magelona papillicornis* Müller, 1858	
36	*Magelona wilsoni* Glémarec, 1966	
	Family Poecilochaetidae Hannerz, 1956	
37	*Poecilochaetus serpens* Allen, 1904	
	Family Chaetopteridae Malmgren, 1867	
38	*Spiochaetopterus costarum* (Claparède, 1870)	
39	*Spiochaetopterus typicus* Sars, 1856	
	Family Cirratulidae Carus, 1863	
40	*Aphelochaeta (Tharyx) marioni* (Saint-Joseph, 1894)	
41	*Caulleriella alata* (Southern, 1914)	

Code	Type of sediment									Season				Most frequent environment
	CSI	SSI	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
17	■		■			■	■	■	■	■	■	■	■	SHS *
18							■	■		■	■			SHS
19	■		■		■		■			■	■	■	■	SMS, DMS *
20					■	■	■	■		■	■	■		SHS *
21							■	■			■			SHS *
22			■				■	■		■	■			M *
23	■	■	■	■	■	■	■	■	■	■	■	■	■	M, SMS, DMS, DS
24	■	■	■	■	■	■	■	■	■	■	■	■	■	M, SMS, DMS
25	■	■	■	■	■				■	■	■	■	■	M, DMS
26	■	■	■		■		■		■	■	■		■	M, DMS
27	■	■	■	■	■	■	■	■	■	■	■	■	■	M, SHS *
28							■	■		■	■			SHS
29	■		■		■	■	■	■	■	■	■	■		SHS
30	■				■			■	■	■	■	■		SMS *, DMS *
31			■		■		■	■	■	■	■	■		DS
32					■				■	■				DS
33	■		■		■			■	■	■	■	■	■	DMS
34	■	■	■	■	■		■		■	■	■	■	■	M, DMS, DS
35							■	■	■		■	■		SHS
36					■					■				DMS
37	■	■	■	■	■	■	■	■	■	■	■	■	■	M
38	■	■	■		■		■	■		■	■	■	■	M
39							■				■	■		SHS *
40	■	■	■	■	■		■		■	■	■	■	■	M, DMS, DS
41			■			■	■	■	■	■	■	■		SHS

Table 1. (Cont.)

Code	Phyllum Annelida Class Polychaeta	Depth (m) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
42	*Caulleriella bioculata* (Keferstein, 1862)	
43	*Chaetozone setosa* Malmgren, 1867	
44	*Chaetozone* sp. 1	
45	*Chaetozone* sp.2	
46	*Cirratulus cirratus* (Müller, 1776)	
47	*Cirratulus filiformis* Keferstein, 1862	
48	*Cirriformia tentaculata* (Montagu, 1808)	
49	*Dodecaceria concharum* Oersted, 1843	
50	*Monticellina (Tharyx) heterochaeta* Laubier, 1961	
	Order Capitellida	
	Family Capitellidae Grube, 1862	
51	*Capitella capitata* (Fabricius, 1780)	
52	*Dasybranchus gajolae* Eisig, 1887	
53	*Heteromastus filiformis* (Claparède, 1868)	
54	*Leiocapitella dollfusi* (Fauvel, 1936)	
55	*Mastobranchus trinchesii* Eisig, 1887	
56	*Mediomastus fragilis* Rasmussen, 1973	
57	*Notomastus latericeus* Sars, 1851	
58	*Notomastus lineatus* Claparède, 1870	
59	*Peresiella clymenoides* Harmelin, 1968	
60	*Pseudomastus deltaicus* Capaccioni-A. & Martín, 1992	
	Family Maldanidae Malmgren, 1867	
61	*Axiothella constricta* (Claparède, 1868)	
62	*Euclymene collaris* (Claparède, 1870)	
63	*Euclymene oerstedii* (Claparède, 1863)	
64	*Praxillella affinis* (Sars, 1872)	
	Order Opheliida	
	Family Opheliidae Malmgren, 1867	
65	*Armandia cirrosa* Filippi, 1861	

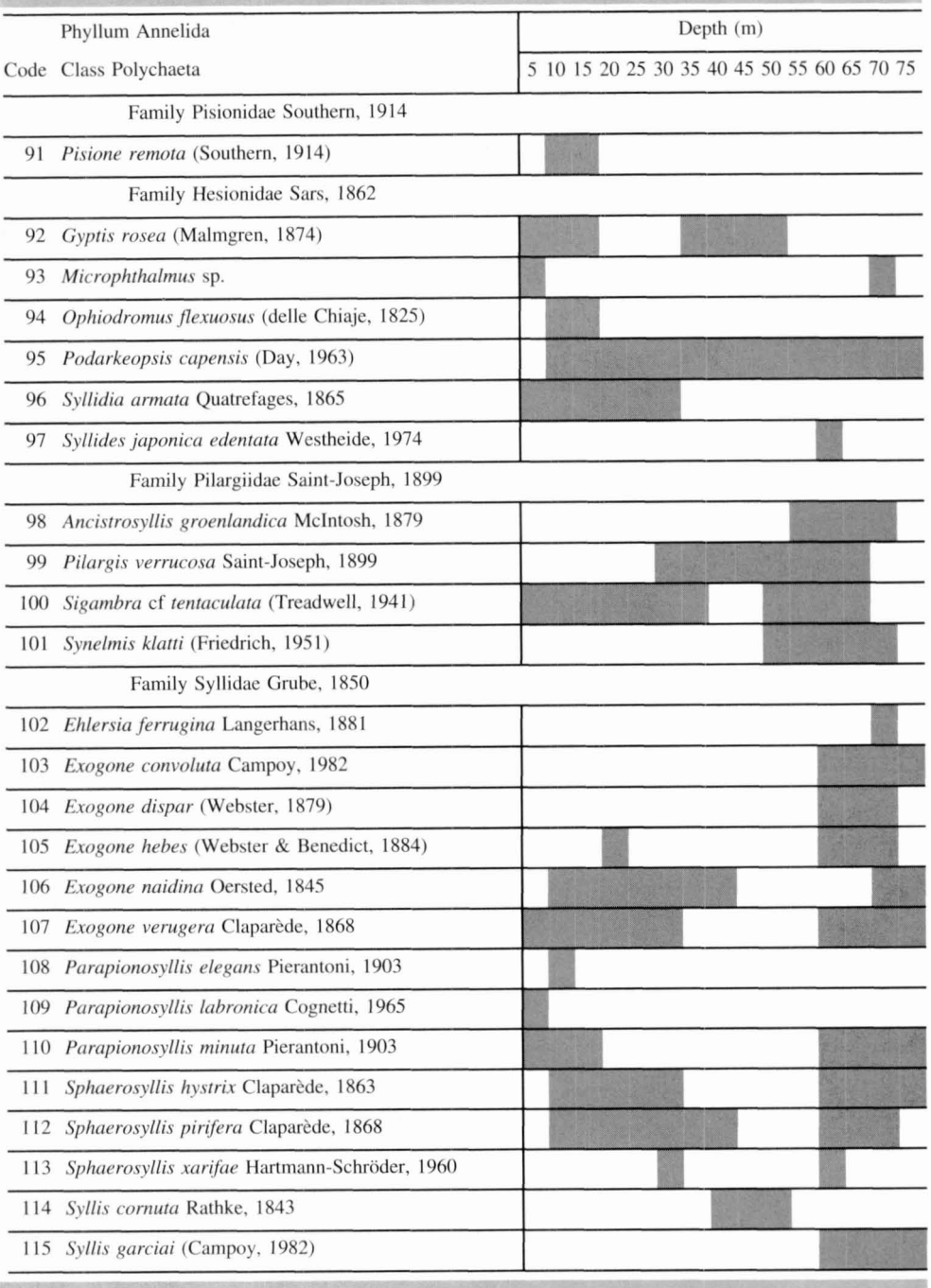
Code	Type of sediment									Season				Most frequent environment
	CSI	SSI	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
42							■	■			■			SHS
43	■	■	■	■	■		■	■	■	■	■	■		M, DMS, DS
44	■	■	■		■		■		■	■	■	■		M, DMS
45	■	■	■		■			■		■	■	■		M
46						■	■	■	■	■	■	■		SHS
47	■	■	■							■	■			M
48	■		■							■				M *
49						■	■	■	■	■	■	■		SHS *
50	■	■	■	■	■				■	■	■	■		M, DMS
51	■		■		■	■	■	■	■	■	■	■		M *, SHS *
52			■		■								■	M, SMS *
53	■	■	■	■	■				■	■	■	■		M, SMS *, DMS
54					■				■	■	■		■	DS
55				■							■			DMS
56	■	■	■		■	■	■	■	■	■	■	■		M *
57	■	■	■	■	■	■	■	■	■	■	■	■		M
58						■						■		SHS
59		■			■	■	■		■	■	■	■		DMS *, DS
60		■	■				■	■		■	■			M
61			■										■	M *
62						■	■		■		■	■		SHS *
63					■					■				DMS
64			■	■	■			■	■	■	■	■		DMS *
65	■		■		■	■	■	■	■	■	■	■		M *, DMS *

Table 1. (Cont.)

Code	Phyllum Annelida Class Polychaeta	Depth (m) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
66	*Armandia polyophtalma* Kukenthal, 1887	
67	*Ophelia* sp.	
	Order Phyllodocida	
	Family Phyllodocidae Williams, 1851	
68	*Anaitides madeirensis* (Langerhans, 1880)	
69	*Anaitides mucosa* (Oersted, 1843)	
70	*Eteone longa* (Fabricius, 1780)	
71	*Eulalia viridis aurea* Gravier, 1896	
72	*Eumida sanguinea* (Oersted, 1843)	
73	*Genetyllis nana* (Saint-Joseph, 1908)	
74	*Genetyllis rubiginosa* (Saint-Joseph, 1888)	
75	*Hesionura serrata* (Hartmann-Schröder, 1963)	
76	*Mystides limbata* Saint-Joseph, 1888	
77	*Mysta picta* Quatrefages, 1865	
78	*Nereiphylla paretti* Blainville, 1828	
79	*Paranaitis kosteriensis* (Malmgren, 1867)	
80	*Pterocirrus limbata* Claparède, 1868	
	Family Polynoidae Malmgren, 1867	
81	*Eunoe* sp.	
82	*Harmothoe antilopes* (McIntosh, 1876)	
83	*Harmothoe lunulata* (delle Chiaje, 1841)	
84	*Harmothoe reticulata* (Claparède, 1870)	
	Family Sigalionidae Malmgren, 1867	
85	*Pholoe minuta* (Fabricius, 1780)	
86	*Sigalion mathildae* Audouin & Edwards, 1832	
87	*Sigalion squamatum* (delle Chiaje, 1839)	
88	*Sthenelais boa* (Johnson, 1839)	
89	*Sthenelais minor* Pruvot & Rakovitza, 1895	
90	*Sthenolepis yhleni* (Malmgren, 1867)	

Code	Type of sediment									Season				Most frequent environment
	CSI	SSI.	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
66					■					■				DMS *
67							■	■			■			SHS
68					■	■	■	■		■	■			SHS *
69	■		■		■		■	■		■	■			M *, SHS *, DS *
70						■	■	■		■	■			SHS
71					■	■	■			■	■			SHS *
72	■		■		■		■	■		■	■			M *,SMS *,DMS *
73						■	■	■		■	■			SHS
74							■	■			■			SHS
75						■		■		■	■			SHS *
76					■			■			■		■	DMS *
77							■	■			■			SHS *
78					■	■	■		■	■	■			SHS *
79	■		■		■			■	■		■	■		M
80							■	■			■			SHS *
81						■				■				SHS
82			■							■				M *
83	■		■		■			■	■	■	■	■		DMS *
84									■	■				DS
85			■					■			■		■	M *
86								■				■		SHS
87							■	■			■	■		SHS
88							■	■			■			SHS
89							■	■	■		■			SHS
90	■	■	■		■				■	■	■	■		M

Table 1. (Cont.)


Phyllum Annelida
Code Class Polychaeta
Depth (m)
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
Family Pisionidae Southern, 1914
91 Pisione remota (Southern, 1914)
Family Hesionidae Sars, 1862
92 Gyptis rosea (Malmgren, 1874)
93 Microphthalmus sp.
94 Ophiodromus flexuosus (delle Chiaje, 1825)
95 Podarkeopsis capensis (Day, 1963)
96 Syllidia armata Quatrefages, 1865
97 Syllides japonica edentata Westheide, 1974
Family Pilargiidae Saint-Joseph, 1899
98 Ancistrosyllis groenlandica McIntosh, 1879
99 Pilargis verrucosa Saint-Joseph, 1899
100 Sigambra cf tentaculata (Treadwell, 1941)
101 Synelmis klatti (Friedrich, 1951)
Family Syllidae Grube, 1850
102 Ehlersia ferrugina Langerhans, 1881
103 Exogone convoluta Campoy, 1982
104 Exogone dispar (Webster, 1879)
105 Exogone hebes (Webster & Benedict, 1884)
106 Exogone naidina Oersted, 1845
107 Exogone verugera Claparède, 1868
108 Parapionosyllis elegans Pierantoni, 1903
109 Parapionosyllis labronica Cognetti, 1965
110 Parapionosyllis minuta Pierantoni, 1903
111 Sphaerosyllis hystrix Claparède, 1863
112 Sphaerosyllis pirifera Claparède, 1868
113 Sphaerosyllis xarifae Hartmann-Schröder, 1960
114 Syllis cornuta Rathke, 1843
115 Syllis garciai (Campoy, 1982)

Code	Type of sediment									Season				Most frequent environment
	CSI	SSI	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
91								■			■	■		SHS
92	■	■	■			■	■	■	■	■	■	■		M *
93									■	■	■			DS
94						■	■		■		■	■		SHS
95	■	■	■	■	■		■	■	■	■	■	■	■	M *
96					■	■	■	■	■	■	■			SHS
97					■					■				DMS *
98	■				■				■		■	■	■	M, DMS
99	■	■	■		■						■		■	M *
100	■		■		■	■	■	■	■	■	■	■	■	M
101	■		■	■	■				■	■		■	■	DMS *
102									■	■				DS *
103				■	■				■	■	■	■	■	DMS *
104					■				■	■			■	DS *
105					■		■	■	■	■	■		■	SHS *
106		■			■		■	■	■		■	■	■	M *
107	■		■		■	■	■	■	■	■	■	■	■	SHS
108							■				■			SHS *
109									■	■				SHS
110					■		■	■	■	■	■	■	■	DS *
111					■		■	■	■	■	■	■	■	SMS *, DMS *
112	■	■	■		■			■	■	■	■	■	■	M *
113					■					■	■			SMS *
114	■	■									■		■	M
115					■				■	■	■		■	DS *

Table 1. (Cont.)

Code	Phyllum Annelida Class Polychaeta	Depth (m) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
116	*Syllis gracilis* Grube, 1840	
117	*Syllis hyalina* Grube, 1863	
118	*Syllis variegata* Grube, 1860	
	Family Nereidae Johnston, 1845	
119	*Laeonereis glauca* (Claparède, 1870)	
120	*Neanthes caudata* (delle Chiaje, 1828)	
121	*Neanthes succinea* (Frey y Leuckart, 1847)	
122	*Nereis lamellosa* Ehlers, 1868	
123	*Nereis zonata* Malmgren, 1867	
	Family Glyceridae Grube, 1850	
124	*Glycera alba* (Müller, 1776)	
125	*Glycera capitata* Oersted, 1843	
126	*Glycera gigantea* Quatrefages, 1865	
127	*Glycera lapidum* Quatrefages, 1865	
128	*Glycera rouxii* Audouin & Edwards, 1833	
129	*Glycera tridactyla* Schmarda, 1861	
130	*Glycera unicornis* Savigni, 1818	
	Family Goniadidae Kinberg, 1866	
131	*Glycinde nordmanni* (Malmgren, 1865)	
132	*Goniada emerita* Audouin & Edwards, 1833	
133	*Goniada maculata* Oersted, 1843	
134	*Goniada norvegica* Oersted, 1844	
	Family Lacydoniidae Bergstrom, 1914	
135	*Paralacydonia paradoxa* Fauvel, 1913	
	Family Nephtyidae Grube, 1850	
136	*Aglaophamus* sp.	
137	*Micronephtys mariae* San Martín, 1982	
138	*Nephtys cirrosa* Ehlers, 1868	
139	*Nephtys hombergii* Savigni, 1818	

Code	Type of sediment									Season				Most frequent environment
	CSI	SSI	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
116			■					■		■	■		■	M *
117							■	■			■			SHS
118			■										■	M *
119	■		■				■			■	■	■	■	M
120	■		■		■	■	■	■	■	■	■	■	■	SHS
121			■										■	M *
122			■							■				M *
123	■		■		■					■	■			M
124	■	■	■		■		■	■	■	■	■	■	■	M
125	■	■			■		■			■	■	■		M
126						■				■				SHS *
127			■		■			■	■		■			DS
128	■	■	■	■	■	■	■	■	■	■	■	■	■	M, DMS
129			■			■	■	■	■		■	■		SHS
130	■		■		■	■	■	■	■	■	■	■		M
131						■		■		■	■			SHS *
132									■	■		■		SHS *
133	■	■	■		■	■	■	■	■	■	■	■	■	M
134						■	■	■		■				SHS *
135	■	■	■	■	■			■		■	■	■	■	M
136							■	■			■			SHS
137	■	■	■		■	■	■	■	■	■	■	■	■	M *, SMS *
138							■	■			■			SHS
139	■	■	■		■	■	■	■	■	■	■	■	■	M, SMS

Table 1. (Cont.)

Code	Phyllum Annelida Class Polychaeta	Depth (m) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
140	*Nephtys hystricis* McIntosh, 1900	
141	*Nephtys paradoxa* Malmgren, 1874	
	Family Sphaerodoridae Malmgren, 1867	
142	*Commensodorum* sp.	
143	*Sphaerodoridium claparedii* (Greeff, 1866)	
144	*Sphaerodoropsis minutum* (Webster & Benedict, 1887)	
	Order Eunicida	
	Family Onuphidae Kinberg, 1865	
145	*Diopatra neapolitana* delle Chiaje, 1841	
146	*Hyalinoecia bilineata* Baird, 1870	
147	*Hyalinoecia fauveli* Rioja, 1918	
148	*Onuphis eremita* Audouin & Edwards, 1833	
	Family Eunicidae Savigni, 1818	
149	*Eunice harassi* Audouin & Edwards, 1833	
150	*Eunice vittata* (delle Chiaje, 1828)	
151	*Marphysa belli* (Audouin & Edwards, 1833)	
152	*Nematonereis unicornis* (Grube, 1840)	
	Family Lumbrineridae Malmgren, 1867	
153	*Lumbrineris coccinea* (Rainer, 1804)	
154	*Lumbrineris funchalensis* (Kinberg, 1865)	
155	*Lumbrineris gracilis* (Ehlers, 1868)	
156	*Lumbrineris impatiens* (Claparède, 1868)	
157	*Lumbrineris latreilli* Audouin & Edwards, 1834	
158	*Lumbrineris nonatoi* Ramos, 1976	
159	*Lumbrineriopsis paradoxa* (Saint-Joseph, 1888)	
160	*Ninoe armoricana* Glèmarec, 1968	
	Family Arabellidae Hartman, 1944	
161	*Arabella iricolor* (Montagu, 1804)	
162	*Drilonereis filum* (Claparède, 1868)	

Code	Type of sediment									Season				Most frequent environment
	CSI	SSI	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
140	■	■	■	■	■			■	■	■	■	■	■	M
141							■				■			SHS *
142									■				■	DS
143			■		■					■	■			DMS *
144							■	■			■			SHS
145						■		■		■		■		SHS *
146			■		■		■		■	■	■	■	■	M *
147			■	■	■		■	■	■	■	■	■	■	SMS
148						■	■	■		■	■	■		SHS *
149					■					■			■	DMS *
150					■	■	■	■	■	■	■	■	■	SHS *, DS
151			■		■		■	■	■	■	■	■		M, DMS
152					■		■	■	■	■	■		■	DMS
153	■		■	■	■		■	■	■	■	■	■	■	DMS, DS *
154			■										■	M *
155	■	■	■		■		■	■		■	■	■	■	M
156	■	■	■	■	■	■	■	■	■	■	■	■	■	M
157	■	■	■		■	■	■	■	■	■	■	■	■	M, SMS
158	■	■	■		■		■	■	■	■	■	■	■	M, DMS *
159							■				■			SHS *
160	■				■					■	■	■	■	DMS *
161					■								■	DMS *
162					■				■	■	■			DMS

Table 1. (Cont.)

Code	Phyllum Annelida Class Polychaeta	Depth (m) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
	Family Dorvilleidae Chamberlin, 1919	
163	*Dorvillea rubrovittata* (Grube, 1855)	
164	*Ophryotrocha hartmanni* Huth, 1933	
165	*Protodorvillea kefersteini* (McIntosh, 1869)	
166	*Schistomeringos neglecta* (Fauvel, 1923)	
167	*Schistomeringos rudolphii* (delle Chiaje, 1828)	
	Order Sternaspida	
	Family Sternaspidae Carus, 1863	
168	*Sternaspis scutata* (Reiner, 1807)	
	Order Oweniida	
	Family Oweiniidae Rioja, 1917	
169	*Galathowenia oculata* (Zaks, 1922)	
170	*Owenia fusiformis* delle Chiaje, 1841	
	Order Flabelligerida	
	Family Flabelligeridae Saint-Joseph, 1894	
171	*Diplocirrus glaucus* (Malmgren, 1867)	
	Order Terebellida	
	Family Sabellariidae Johnston, 1865	
172	*Sabellaria spinulosa* Leuckart, 1849	
	Family Pectinariidae Quatrefages, 1865	
173	*Amphicteme auricoma* (Müller, 1776)	
174	*Lagis koreni* Malmgren, 1866	
175	*Petta pusilla* Malmgren 1865	
	Family Ampharetidae Malmgren, 1867	
176	*Amage adspersa* (Grube, 1863)	
177	*Ampharete acutifrons* (Grube, 1860)	
178	*Amphicteis gunneri* (Sars, 1835)	
179	*Melinna palmata* Grube, 1870	
180	*Sabellides octocirrata* (Sars, 1835)	

Code	Type of sediment									Season				Most frequent environment
	CSI	SSI	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
163	■	■			■						■	■		M *
164	■	■	■		■	■	■	■	■	■	■	■	■	M *
165					■	■	■	■	■	■	■	■		SHS *
166			■		■				■	■			■	M
167						■						■		SHS
168	■	■	■		■				■	■	■	■	■	M
169					■		■	■	■	■	■	■		DMS
170			■			■	■	■	■	■	■	■		SHS
171		■									■			M
172	■		■										■	M *
173	■	■							■	■	■	■		M
174			■		■		■			■	■			SMS *
175						■	■	■		■	■	■		SHS *
176	■				■		■				■			SMS
177	■	■	■	■	■		■	■	■	■	■	■	■	M, DMS
178					■				■	■	■	■		DS
179	■			■	■				■	■	■	■	■	DMS
180					■				■	■	■			DS

Table 1. (Cont.)

Code	Phyllum Annelida Class Polychaeta	Depth (m) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
	Family Terebellidae Malmgren, 1867	
181	*Amphitrite gracilis* (Grube, 1860)	
182	*Lanice conchylega* (Palles, 1766)	
183	*Nicolea venustula* (Montagu, 1818)	
184	*Polycirrus* sp.	
185	*Polymnia* sp.	
186	*Sosane sulcata* Malmgren, 1866	
187	*Thelepus cincinnatus* (Fabricius, 1780)	
	Family Trichobranchidae Malmgren, 1867	
188	*Terebellides stroemi* Sars, 1835	
	Order Sabellida	
	Family Sabellidae Johnston, 1865	
189	*Amphiglena mediterranea* (Leydig, 1851)	
190	*Chone collaris* Langerhans, 1880	
191	*Chone duneri* Malmgren, 1867	
192	*Chone* sp.	
193	*Euchone rosea* Langerhans, 1884	
194	*Fabricia filamentosa* Day, 1963	
195	*Jasmineira caudata* Langerhans, 1880	
196	*Megalomma vesiculosum* (Montagu, 1815)	
197	*Potamilla* sp.	
198	*Sabella bipunctata* Baird, 1865	
	Family Serpulidae Johnston, 1865	
199	*Ditrupa arietina* (Müller, 1776)	
200	*Hydroides elegans* (Haswell, 1883)	
201	*Serpula concharum* Linnaeus, 1767	
202	*Serpula vermicularis* Linnaeus, 1767	

Code	Type of sediment									Season				Most frequent environment
	CSI	SSI	SSIC	CS	SIS	VFS	FS	MS	COS	SP	S	A	W	
181						■		■		■				SHS *
182			■						■	■			■	DS *
183	■		■		■		■			■	■	■		DMS
184	■	■	■	■	■				■	■	■	■		M
185	■									■				M
186									■	■				DS
187									■		■			SHS
188			■	■	■				■	■	■	■		DMS
189				■							■			DMS *
190	■								■		■	■		DS *
191	■	■	■	■	■	■	■	■	■	■	■	■		M,SMS *,DMS,DS
192	■	■	■		■					■	■	■		M
193					■		■	■	■	■	■	■		DS
194									■	■	■	■		DS *
195					■			■	■		■	■		DMS *
196							■	■			■			SHS
197									■		■			DS
198					■								■	DMS *
199			■		■		■	■	■	■				SMS
200								■			■			SHS *
201							■	■			■			SHS *
202					■						■			SMS *

Armandia polyophthalma: Atlantic (Spain, Bellan, 1960; Ibáñez, 1973a; Campoy, 1974. Portugal, Marques, 1942). Cantabric Sea (Rioja, 1931).

Podarkeopsis capensis: Atlantic (Spain, López-Jamar, 1982; López-Jamar & Mejuto, 1986, 1988; López-Jamar & González, 1987, as *Gyptis capensis*).

Six species previously reported in the Mediterranean Spanish coast have not been found before in Catalonia. These are: *Glycera gigantea,* Valencia (Rioja, 1920); *Onuphis eremita,* Málaga (Ibáñez, 1973b); *Exogone dispar,* Gibraltar (Sardà, 1984), Murcia and Levante (Campoy, 1982), Andalucía (Baratech, 1984), Alborán (Templado et al., 1986) and Baleares (San Martín, 1982a; San Martín & Viéitez, 1991); *Sphaerosyllis xarifae,* Murcia (Campoy & Alquezar, 1982), Andalucía (Baratech, 1984), Levante (Campoy, 1982), Baleares (San Martín, 1982a, 1984; San Martín & Viéitez, 1979, 1991); *Petta pusilla,* Valencia (Campoy, 1982; Capaccioni-Azzati, 1983) and Murcia (Pérez-Ruzafa, 1989); *Fabricia filamentosa,* Murcia (Pérez-Ruzafa, 1989).

Referring to seasons, 33.7% of the species were collected during the four seasons of the year, and 40.3% in two or three seasons, while 6.1% were reported only in spring, 13.8% in summer, 1.5% in autumn, and 4.6% in winter.

Most of the species included in this catalogue present a wide range of distribution inside the study area (ie. *Chone duneri, Glycera rouxii, Lumbrineris impatiens, Nephtys hombergii, Notomastus latericeus, Poecilochaetus serpens, Prionospio cirrifera, Prionospio malmgreni* and *Pseudopolydora antennata*). Nevertheless, it was evident that most of the reported species (82.7%) showed a higher frequency in only one of the five defined environments in function to depth and granulometry of sediment: 31% of the species were found more frequently in shallow sand, 25.6% in mud, 12.3% in deep muddy sand, 9.9% in detritic sand, and 3.9% in shallow muddy sand. Only 17.3% were found more frequently in more than one environment.

The distribution of species obtained here is compared with the faunistic composition in soft bottoms subjected to similar environmental conditions (depth and granulometry) from the Catalonian coast (Guille, 1970, 1971; Desbruyères et al., 1972; Sardà, 1986; Romero et al., 1989).

Since most of the species reported here present a wide range of distribution, only the most frequent environment in which they were found was compared with the bibliographic data. Almost half of the catalogued species have previously been found in the same environment as in the present study (table 1). The revision of the general distribution of the remaining species taking into account data from the Spanish Mediterranean coast (Campoy, 1982; Capaccioni-Azzati, 1983, 1987; Sardà, 1984; Capaccioni-Azzati et al., 1987; Pérez-Ruzafa, 1989; Martín, 1991) confirms the presence of most of the species in the indicated environment. Nevertheless, it is important to point out the presence of other species which most frequent environment was not reported previously by such authors in the Spanish Mediterranean coast. They are: *Malacoceros fuliginosus, Polydora ciliata, P. hoplura, Pseudopolydora antennata, Dodecaceria concharum, Capitella capitata, Euclymene collaris, Anaitides mucosa, Eulalia viridis, Nereiphylla paretti, Glycinde nordmanni, Nephtys paradoxa, Amphitrite gracilis, Hydroides elegans* and *Serpula concharum* in shallow sand; *Aricidea catherinae, Polydora caeca, Lagis koreni* and *Serpula vermicularis* in shallow muddy sand; *Polydora caeca, Armandia cirrosa, Harmothoe lunulata, Synelmis klatti, Eunice harassi* and *Sabella bipunctata* in deep muddy sand; *Aricidea cerrutii, Pseudopolydora antennata, Cirriformia tentaculata, Capitella capitata, Armandia cirrosa, Anaitides mucosa, Harmothoe antilopes, Pholoe minuta, Pilargis verrucosa, Exogone naidina, Syllis gracilis, Lumbrineris coccinea, L. funchalensis, Dorvillea rubrovittata* and *Sabellaria spinulosa* in mud; *Anaitides mucosa, Syllis garciai, Ehlersia ferrugina, Parapionosyllis minuta* and *Chone collaris* in detritic sand.

Four of these species (*Polydora hoplura,*

Nereiphylla paretti, Ehlersia ferrugina and *Lumbrineris coccinea*), inhabiting shallow sand and detritic sand have previously been found associated to coraligenous, mussel beds and other biogenic structures. Such habitats provide a protection system comparable to the structure resulting from the mixture of sand and shelly fragments which can be found in these sandy bottoms (Sebens, 1991).

Some species such as *Aricidea catherinae, Euclymene collaris, Armandia cirrosa, Synelmis klatti, Glycinde nordmanni* and *Amphitrite gracilis* present a wide range of distribution on soft bottoms and are absent in other substrates. Others (*Pholoe minuta, Harmothoe lunulata, Amphiglena mediterranea, Exogone naidina, Syllis garciai, S. gracilis* and *Lumbrineris funchalensis*) show a wider range of distribution since they can be found in soft bottoms and also associated to algae, *Posidonia* beds, rocks and biogenic structures. Their new environment reported here confirms the ubiquitous character of these species.

Serpulids normally live associated to hard substrates such as rocks, stones and shells. The presence of *Hydroides elegans, Serpula concharum* and *S. vermicularis* in soft bottoms is explained by their attachment to small fragments of stones and shells in the sediment.

Malacoceros fuliginosus, Polydora ciliata, Pseudopolydora antennata and *Capitella capitata* have been mentioned as typical pollution indicators in marine soft bottoms (Pearson & Rosenberg, 1978). Their presence in shallow sand and mud in the Barcelonès region is not surprising due to the organic enrichment of sediments by the wastewater treatment plant.

Resumen

Anélidos poliquetos de fondos blandos litorales del Barcelonès (Cataluña, NE España)

Se ha estudiado la distribución de anélidos poliquetos de los fondos blandos litorales entre 5 y 75 m de profundidad frente a la comarca del Barcelonès (NE España). La relación que se presenta comprende un total de 202 especies para las que se indica la profundidad, el tipo de sedimento y estación del año en que fueron encontradas, así como el ambiente en el cual fueron registradas con mayor frecuencia. Estos datos se presentan en forma de tabla (tabla 1) en la que las especies aparecen siguiendo un orden sistemático. Por otra parte, se incluyen los nuevos registros para el mar Mediterráneo, la península ibérica, las costas mediterráneas españolas y para Cataluña.

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