

## Description of a new species of *Sphaerosyllis* Claparède, 1863 (Polychaeta: Syllidae: Exogoninae) from the Alicante coast (W Mediterranean) and first reports of two other species of Syllidae for the Mediterranean Sea and the Iberian Peninsula

Y. DEL-PILAR-RUSO<sup>1</sup> and G. SAN MARTÍN<sup>2</sup>

<sup>1</sup> Departamento de Ciencias del Mar y Biología Aplicada, Universidad de Alicante,  
Campus de San Vicente del Raspeig, Ap. 99. E-03080, Alicante, Spain

<sup>2</sup> Departamento de Biología (Zoología), Facultad de Ciencias, Universidad Autónoma de Madrid, Canto Blanco,  
calle Darwin, 2, E-28049, Spain

Corresponding author: yoana.delpilar@ua.es

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### Abstract

During a study aiming at the evaluation of the distribution of the soft-bottom community at different taxonomic scales, the family Syllidae was analysed to the species level. Among the identified material, one undescribed species belonging to the genus *Sphaerosyllis* Claparède, 1863 was found and two species constitute new reports for the Mediterranean Sea and for the Iberian Peninsula: *Parapionosyllis* cf. *macaronesiensis* Brito, Núñez and San Martín, 2000, and *Syllis* cf. *mauretanica* (Licher, 1999) n. comb., both only previously known from the subtropical Eastern Atlantic Ocean. The new species of *Sphaerosyllis* is mainly distinguished in having bulbous, small antennae, tentacular and dorsal cirri, small parapodial glands, with granular material, and compound chaetae with short blades. In this paper, we describe the new species and the specimens of the new reports.

**Keywords:** *Sphaerosyllis*, *Syllis*, *Parapionosyllis*, Syllidae, Taxonomy, Western Mediterranean Sea.

### Introduction

According to several authors (San Martín & López, 2000; San Martín, 2003; Aguado & San Martín, 2008), the family Syllidae is one of the most complex and diverse families of polychaetes. This family has more than 70 genera and around 700 valid species worldwide (Aguado & San Martín, 2009; Aguado *et al.*, 2012). Moreover, in recent years, this number has rapidly increased with the discovery of new genera and species (San Martín, 2002, 2005; San Martín & López, 2003; San Martín & Hutchings, 2006; San Martín *et al.*, 2007; Aguado & San Martín, 2008; Ding & Westheide, 2008, among many others). Their importance is reflected in a large number of studies dedicated to them (Somaschini & Gravina, 1994; Nygren, 1999; Glasby, 2000; Çinar & Ercan, 2002; Çinar, 2003, among many others).

During a study that was carried out with the aim of evaluating the distribution of soft benthic community at different taxonomic scales, the family Syllidae was analysed to the species level. During the course of this study, 30 species of syllids were identified, including two new reports for the Mediterranean Sea, *Parapionosyllis* cf. *macaronesiensis* Brito, Núñez & San Martín, 2000 and

*Syllis* cf. *mauretanica* (= *Typosyllis mauretanica* Licher, 1999), and an undescribed species. A full list of all species was included in a previous study (unpublished data). The aim of this paper is to describe the new species and the two new reports for the Mediterranean Sea.

### Material and Methods

The study was carried out in the Alicante coast, SE Spain (Fig. 1). In this area, three transects perpendicular to the coast were established (A, B and C). Three stations at 4, 10 and 15 m depths were sampled at each transect, in winter and summer from 2004 to 2009. Sampling was carried out by SCUBA diving. Samples were collected at each station using a square box (22.5 x 22.5 x 5 cm) with a modified net, to make it fit the square. The square box with the net fixed into it is hammered into the sea bottom. Then, a steel plaque is placed below the square so that the sample is collected when turning over the piece. Afterwards, the net is closed. Finally, the sample is sieved through a 0.5 mm mesh screen.

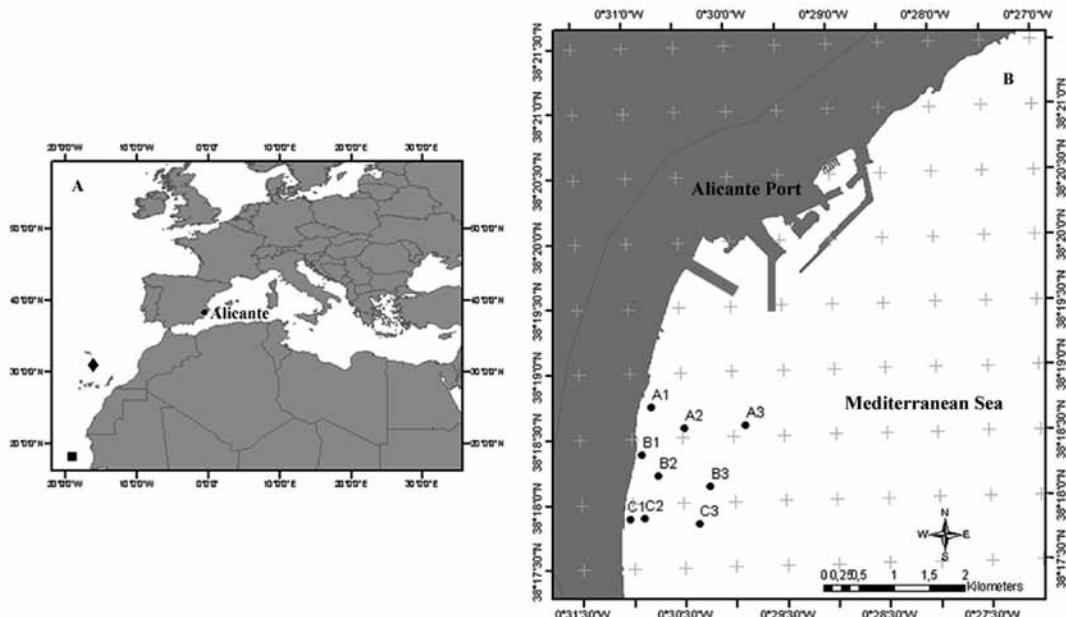
The study habitat was characterized by the heterogeneity of the sediments. The deeper stations were charac-

**Table 1.** Number of total syllid specimens, and *Sphaerosyllis climenti* n. sp., *Parapionosyllis* cf. *macaronesiensis* and *Syllis* cf. *mauretanica* specimens and physical characteristics at each station along Alicante Coast.

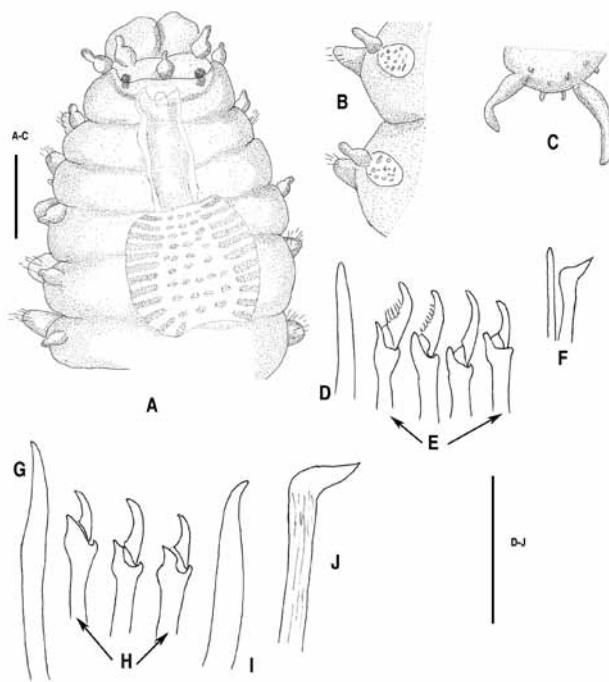
Station	Station								
	A1	A2	A3	B1	B2	B3	C1	C2	C3
Transect	A	A	A	B	B	B	C	C	C
Depth	4	10	15	4	10	15	4	10	15
Total Syllidae	81	247	73	164	152	132	43	75	167
<i>Sphaerosyllis climenti</i> n. sp.	2	1				6			3
<i>P. macaronesiensis</i>					1		2		
<i>S. mauretanica</i>	17	2	1	3	7	4		1	
Salinity	37.9±0.2	37.8±0.1	38.0±0.1	39.2±0.3	38.4±0.2	38.0±0.1	37.6±0.1	37.7±0.1	38.0±0.1
Ph	7.7±0.1	7.5±0.1	7.4±0.1	7.6±0.1	7.5±0.1	7.4±0.1	7.7±0.1	7.6±0.1	7.5±0.1
Organic matter (%)	3.2±0.8	6.5±0.9	5.9±0.4	3.0±0.5	3.8±0.6	8.7±1.3	1.9±0.4	4.5±1	10.1±1.6
Gravels (%)	6±3.9	13.3±2.8	6.2±1.1	8.6±3	10.4±3.7	9.3±1.2	2.5±1.4	4.6±1.5	10.1±2
Coarse sand (%)	5.3±2.2	9.5±1.8	3.9±0.6	9.9±2.2	15.5±4.7	6.5±0.9	3.5±1.5	4.7±1.4	7.7±1.5
Medium sand (%)	5.1±1.3	7.2±1.3	3.9±0.6	24.7±3.5	6.4±1.3	6.0±0.8	6.6±3.3	3.5±0.8	5.4±0.7
Fine sand (%)	68.3±7.9	25.3±2.6	31.0±1.8	38.6±7.4	38.0±6.7	26.6±2.9	75.1±5.7	51.7±7	29.0±2.6
Mud (%)	15.4±5	44.7±5.2	55.0±3.5	18.2±4	29.7±4.4	51.7±3.9	12.3±2.4	35.1±5.7	47.8±4.4

terised as a muddier area with a high coverage of dead *Posidonia oceanica* rhizomes and had also been colonised by algae, mainly *Caulerpa prolifera*, while the sand fraction dominated the shallower ones. These shallower stations may also support a higher hydrodynamics and it probably explains the differences in sediment type and organic matter contents with respect to the deeper stations. Physico-chemical data of stations and number of specimens in each sample are given in Table 1.

All the specimens were fixed in 10% formaldehyde in seawater and preserved in 5% buffered formalin until identification. For the study, a Leica M205 C stereomicroscope and Leica DM 1000 microscope were used. Drawings were made by means of a drawing tube. Confocal laser microscopy (CLM) and Scanning Electron Microscope (SEM) photographs were made at the Servicios Técnicos de Investigación (SSTI) at Alicante University.



**Fig. 1:** Location of the study area. A) ■ indicates the locality type of *Syllis mauretanica* and ♦ indicates the type locality of *Parapionosyllis macaronesiensis* and ● represents the type locality of the new species and the new reports. B) Location of the new species and the new reports in Alicante coast to the south of the port.



**Fig. 2:** *Sphaerosyllis climenti* n. sp. A) Anterior end, dorsal view. Holotype; B) midbody parapodia, dorsal view. Holotype; C) Pygidium, dorsal view; D) dorsal simple chaeta, anterior parapodia; E) Compound chaetae, anterior parapodia; F) aciculae, anterior parapodia; G) dorsal simple chaeta, posterior parapodia; H) Compound chaetae, posterior parapodia. I) ventral simple chaeta, posterior parapodia J) acicula, posterior parapodia. Scale: A, B, C 0.1 mm; D-J 20  $\mu$ m.

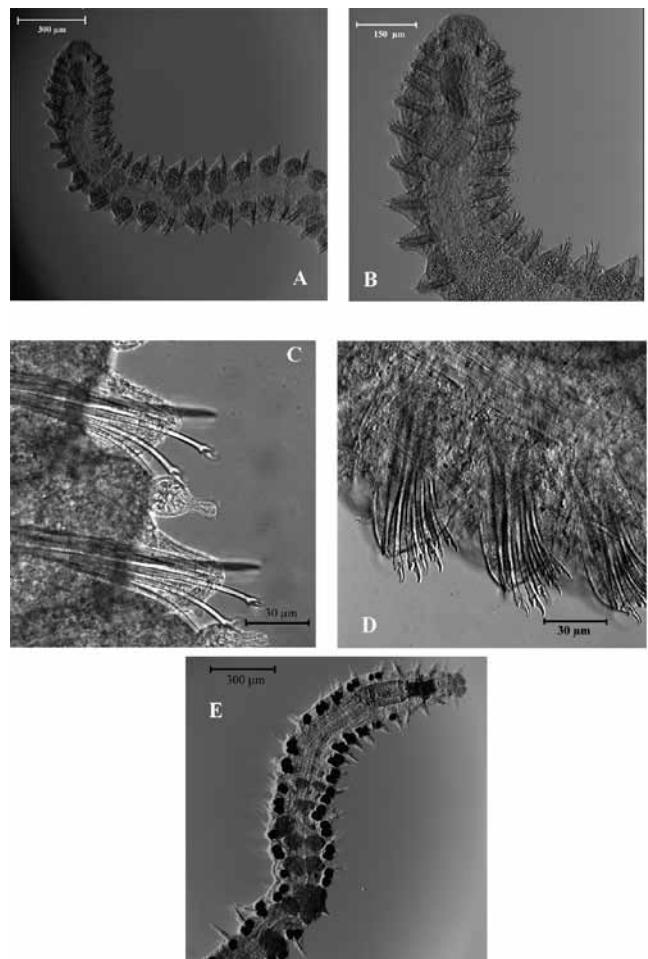
Measurements refer to the holotype. Body length was measured excluded antennae, palps and anal cirri; body width was taken across the proventricle and excludes the parapodial lobes, cirri and chaetae. After identification, the specimens were preserved in 70% ethanol. Type series were deposited at the Museo Nacional de Ciencias Naturales de Madrid (MNCNM), Spain.

## Results

Family Syllidae Grube, 1850  
 Subfamily Exogoninae Langerhans, 1879  
 Genus *Sphaerosyllis* Claparède, 1863  
*Sphaerosyllis* Claparède, 1863: 45  
 Diagnosis. San Martín (2003): 187; (2005): 86.

*Sphaerosyllis climenti* n. sp.  
 Figs. 2A-J and 3A-D

**Material examined:** Holotype (MNCNM 16.01/11367), off Alicante, Spain ( $0^{\circ}30.348'W / 38^{\circ}17.832'N$ ), Winter 2007, muddy sand with some gravels sediments, 15 m depth, station C3. Paratypes: paratype 1 (MNCNM 16.01/11368), off Alicante, Spain ( $0^{\circ}30.348'W / 38^{\circ}17.832'N$ ), Summer 2004, muddy sand with some



**Fig. 3:** Confocal laser microscope images of *Sphaerosyllis climenti* n. sp. A and B) anterior end and midbody, dorsal view. Paratype 3 (MNCNM 16.01/11370); C) dorsal cirri and parapodia on midbody chaetigers D) Anterior compound chaetae on anterior chaetigers E) Confocal laser microscope images of *Parapionosyllis* cf. *macaronesiensis*, anterior end, dorsal view. Scale A and E 300  $\mu$ m; B 150  $\mu$ m; C and D 30  $\mu$ m.

gravels, 15 m depth, station C3; paratype 2 (MNCNM 16.01/11369), off Alicante, Spain ( $0^{\circ}30.234'W / 38^{\circ}18.120'N$ ), Winter 2007, muddy sand, 15 m depth, station B3; paratype 3 (MNCNM 16.01/11370) off Alicante, Spain ( $0^{\circ}30.234'W / 38^{\circ}18.120'N$ ), Winter 2007, muddy sand, 15 m depth, station B3; paratype 4 (MNCNM 16.01/11371) off Alicante, Spain ( $0^{\circ}30.234'W / 38^{\circ}18.120'N$ ), Winter 2007, muddy sand, 15 m depth, station B3; paratype 5 (MNCNM 16.01/11372) off Alicante, Spain ( $0^{\circ}30.234'W / 38^{\circ}18.120'N$ ), Winter 2007, muddy sand, 15 m depth, station B3; paratype 6 (MNCNM 16.01/11373) off Alicante, Spain ( $0^{\circ}30.468'W / 38^{\circ}18.570'N$ ), Winter 2008, sandy mud, 10 m depth, station A2; paratype 7 (MNCNM 16.01/11374) off Alicante, Spain ( $0^{\circ}30.348'W / 38^{\circ}17.832'N$ ), Winter 2007, muddy sand with some gravels, 15 m depth, station C3. Four additional specimens were prepared for photograph and spoiled, one of them off Alicante, Spain, ( $0^{\circ}29.880'W / 38^{\circ}18.582'N$ ), Winter 2005, muddy sand with some

gravels, 15 m depth, station A3, two of them off Alicante, Spain ( $0^{\circ}30.234'W / 38^{\circ}18.120'N$ ), Winter 2007, muddy sand, 15 m depth, station B3, one from off, Alicante, Spain ( $0^{\circ}30.468'W / 38^{\circ}18.570'N$ ), Winter 2007, sandy mud, 10 m depth, station A2. A total of 12 specimens were identified (Table 1). Measurements have been performed on the holotype (MNCNM 16.01/11367).

**Description:** Body small, slender, without colour markings, about 2.56 mm long, 0.256 mm wide, 28 chaetigers. Dorsum covered with scattered, small, rounded papillae. Prostomium rectangular, wider than long, four eyes in rectangular arrangement, close to each other on each side (Fig. 2A). Antennae small, similar in length, shorter than prostomium, pyriform, with bulbous base and narrow, short tip (Fig. 2A). Median antenna (about 35  $\mu m$ ) originating between anterior pair of eyes; lateral antennae (about 37  $\mu m$ ) originating on anterior margin of prostomium, in front of anterior eyes (Fig. 2A). Palps broad, similar in length to prostomium, fused along their length, with distal notch. Peristomium similar in length to subsequent segments, covering posterior part of prostomium. One pair of tentacular cirri, similar to or slightly shorter than antennae (Fig. 2A). Dorsal cirri short, about 36  $\mu m$ , similar to tentacular cirri and antennae, shorter than parapodial lobes, with bulbous bases and short tips, lacking on chaetiger 2 (Figs. 2A and 2B). Parapodial lobes conical, with occasional papillae. Parapodial glands difficult to see, with granular material. One gland on each parapodium mainly from chaetiger 4, a smaller and less developed one on chaetiger 3 in the holotype (Fig. 2B). Ventral cirri digitiform, shorter than parapodia. Anterior parapodia each with 4-6 compound heterogomph chaetae with unidentate blades (Fig. 2E). Blades of two most dorsal compound chaetae with moderate, straight marginal spines; blades of ventral compound chaetae smooth; all blades similar in length, from 10 to 7  $\mu m$ . Number of compound chaetae on each parapodium diminishing to 3 on posterior parapodia, provided with smooth blades, a little shorter than those of anterior parapodia (Fig. 2H). Dorsal simple chaetae from anterior parapodia, straight, unidentate, smooth (Fig. 2D, G). Ventral simple chaetae, present on posterior parapodia, sigmoid, unidentate, smooth (Fig. 2I). Anterior parapodia, each with one slender, straight acicula and another with bent tip, forming right angle (Fig. 2F). Solitary acicula with tip bent at right angle in midbody and posterior parapodia (Fig. 2J). Pygidium small, with papillae and 2 long anal cirri, longer than antennae (about 75-80  $\mu m$ ) (Fig. 2C). Pharynx slender, extending through about three segments; pharyngeal tooth on its anterior rim (Fig. 2A). Proventricle short, barrel-shaped, extending through two segments with about 14 muscle cell rows.

**Distribution:** Only known from the type-locality (Alicante, Spain, Western Mediterranean).

**Habitat:** Muddy fine sand or sandy mud sediments with rest of dead matte of *Posidonia oceanica*; in some cases

covered by algae (*Caulerpa prolifera*). Shallow waters in a depth range of 10-15 meters.

**Remarks:** *Sphaerosyllis climenti* n. sp. is similar to some other species recorded in the Iberian Peninsula, as *S. bulbosa* Southern, 1914, *S. thomasi* San Martín, 1984 and *S. parabulbosa* San Martín & López, 2002 in having very short, strongly bulbous antennae and dorsal cirri, with short tips (San Martín, 2003). *Sphaerosyllis bulbosa* differs from *S. climenti* n. sp. especially in the shape of the aciculae, which are distally bulbous with a short tip, instead of the tip forming a right angle as in *S. climenti* n. sp. Furthermore, *S. bulbosa* has a modified compound chaeta on median (without blades, enlarged shafts), which is absent in the new species. *S. thomasi* has compound chaetae with long spines on blades and shafts, while *S. climenti* n. sp. has smooth shafts and short spines in dorsal blades of anterior parapodia and smooth blades posteriorly. *Sphaerosyllis thomasi* has also parapodial glands with fibrillar material. *Sphaerosyllis parabulbosa* has compound chaetae with longer blades, smooth except for a subapical spine on dorsal chaetae, on some chaetae, smooth or slightly spinulated on remaining margin. Furthermore, the parapodial glands of *S. parabulbosa* have fibrillar material while in the new species it is granular.

*S. claparedei* Ehlers, 1864, described from the Adriatic Sea, is likewise similar, especially concerning the dorsal cirri, but *Sphaerosyllis claparedei* apparently bears dorsal cirri on chaetiger 2 (Fauvel, 1923), has parapodial glands with fibrillar material, median antenna originating on anterior margin, at same level as lateral ones, while in *S. climenti* n. sp. it originates between anterior eyes, posteriorly of the lateral ones. However, *S. claparedei* is only known from its original description (Ehlers, 1864) and from Fauvel (1923).

*Sphaerosyllis glandulata* Perkins, 1981 and *Sphaerosyllis* sp. (San Martín, 2003) also have parapodial glands with granular material, but in both species, the antennae and dorsal cirri are longer and have longer tips, and the blades of compound chaetae have longer spines on margin; *Sphaerosyllis* sp. also has a much longer proventricle, extending through three or four segments, while it extends through two segments in *S. climenti* n. sp.

*Sphaerosyllis tenuis* Ding & Westheide, 2008, from China, is also quite similar to *S. climenti* n. sp., having short, bulbous cirri and parapodial glands with granular material, although the parapodial glands are more evident in the Chinese species. The median antenna is inserted in front of prostomium, at the same level as the lateral ones, and the proventricle is smaller, extending through 1.5 segments (Ding & Westheide, 2008).

*Sphaerosyllis sandrae* Álvarez & San Martín, 2009, from Cuba, have longer blades of compound chaetae, with also longer spines on margin (Álvarez & San Martín, 2009). *Sphaerosyllis piriferopsis* Perkins, 1981, from Florida, Cuba and other Caribbean areas, was described as lacking parapodial glands. However, Uebelacker

(1984) noted that some specimens from the Gulf of México had small, inconspicuous parapodial; *S. piriferopsis* have longer antennae and dorsal cirri than *S. climenti* n. sp., with elongated blades of compound chaetae (see Perkins, 1981; Uebelacker, 1984).

Some species from Australia also have similar parapodial glands (see San Martín, 2005): *S. hirsuta* Ehlers, 1897 and *S. georgeharrisoni* San Martín, 2005, have distinctly longer antennae and the compound chaetae have longer blades, with also longer marginal spines. *Sphaerosyllis voluntariorum* San Martín, 2005, and *S. bifurcata* (Hartmann-Schröder, 1979) have similar blades of chaetae, but the antennae are more elongated, the papillae are very different, with a basal slender stalk and the shafts of compounds chaetae have a distinct subdistal spur. *Sphaerosyllis rotundipapillata* Hartmann-Schröder, 1982 and *S. bifurcatoides* (Hartmann-Schröder, 1979), also have antennae and dorsal cirri similar to *S. climenti* n. sp., but the chaetae are very different, with a subdistal spur on shafts, giving a bifurcate appearance and numerous, distinct, pedunculated papillae. *S. densopapillata* Hartmann-Schröder, 1979, has parapodial glands with granular material, but they are much smaller, the median antenna is inserted at the same level as lateral ones; on anterior margin of prostomium, the dorsal papillae are very numerous and distinct, and the blades of the compound chaetae are much longer. *Sphaerosyllis bardukaciculata* San Martín, 2005 has longer antennae, and only simple chaetae from midbody. *Sphaerosyllis lateropapillata* Hartmann-Schröder, 1986, has longer antennae, pharynx, proventricle, and blades of compound chaetae, and also some long papillae on laterals of each segment. Finally, *S. georgeharrisoni* San Martín, 2005, has very similar parapodial glands, but both antennae and dorsal cirri are more elongated and the compound chaetae have longer blades.

**Etymology:** This species is dedicated to Ángel Climent Ballester, a deceased colleague, for his invaluable assistance and collaboration on research surveys.

Genus *Parapionosyllis* Fauvel, 1923

*Parapionosyllis* Fauvel, 1923: 289

Diagnosis.- San Martín (2003): 277; (2005): 106.

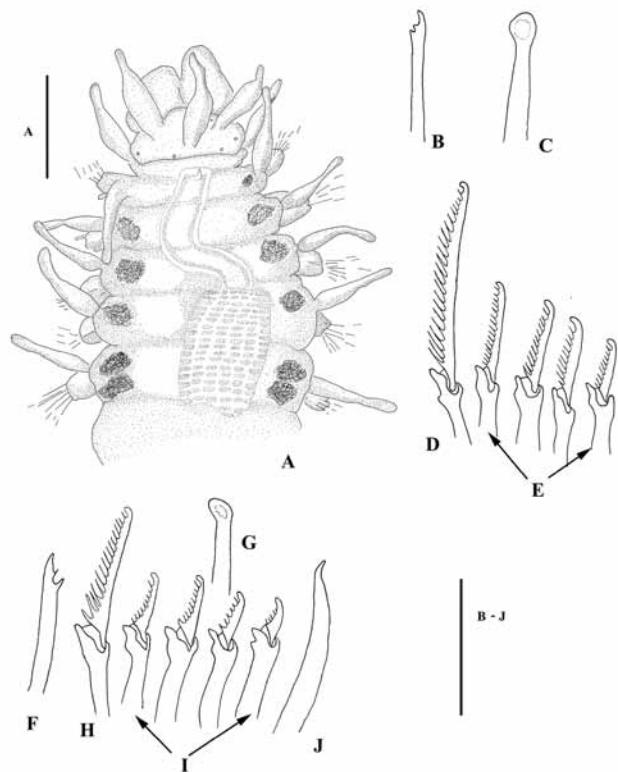
*Parapionosyllis* cf. *macaronesiensis* Brito, Núñez & San Martín, 2000

Fig. 3E and 4A-J

(?) *Parapionosyllis* sp.-Nuñez et al. 1995:6

(?) *Parapionosyllis macaronesiensis* Brito, Nuñez & San Martin, 2000: 1148, fig. 1.

**Material examined:** One specimen (MNCNM 16.01/11375), from off Alicante, Spain ( $0^{\circ}31.026'W$  /  $38^{\circ}17.880'N$ ), Summer 2007, fine sand, 4 m depth, station C1. One specimen (MNCNM 16.01/11376) off Ali-



**Fig. 4:** *Parapionosyllis* cf. *macaronesiensis*. A) Anterior end, dorsal view; B) dorsal simple chaeta, midbody parapodia; C) acicula, midbody parapodia; D) Long-bladed compound chaeta, midbody parapodia; E) Short-bladed compound chaetae, midbody parapodia; F) dorsal simple chaeta, posterior parapodia; G) acicula, posterior parapodia; H) Long-bladed compound chaeta, posterior parapodia; I) Short-bladed compound chaetae, posterior parapodia; J) ventral simple chaeta, posterior parapodia. Scale: A 0.1 mm; B-J 20  $\mu$ m.

cante, Spain ( $0^{\circ}30.744'W$  /  $38^{\circ}18.210'N$ ), Summer 2008, fine sandy mud, 10 meters, station B2. An additional specimen was also identified as *P. cf. macaronesiensis*, Alicante, Spain ( $0^{\circ}31.026'W$  /  $38^{\circ}17.880'N$ ), Summer 2007, fine sand, 4 m depth, station C1 but it was damaged. In total, three specimens were collected (Table 1).

**Description:** Body long, thin, filiform, without coloration, 2.4 mm long, 0.22 mm wide, for 31 chaetigers. Prostomium semicircular to ovate-pentagonal, with four small eyes in open trapezoidal arrangement and two small anterior eyespots. Three antennae, skittle-shaped (Fig. 4A); median antennae slightly behind posterior eyes, about 0.112 mm in length, slightly shorter than prostomium and palps together; lateral antennae inserted near anterior margin of prostomium (Fig. 4A). Palps broad, similar in length to prostomium, fused along basal half, leaving a mid-dorsal scar. Peristomium shorter than subsequent segments, covering posterior part of prostomium. One pair of tentacular cirri, originating ventro-laterally, shorter than lateral antennae; peristomium dorsally reduced (Fig. 4A). Dorsal cirri on all chaetigers, similar in length or smaller than lateral antennae (0.87-0.1 mm).

Parapodial conical, proportionally short, rounded, with a small distal papilla; ventral cirri digitiform, slightly shorter than parapodial lobes; 1-2 distinct parapodial gland at each side of each segment, with brown-reddish granular material (Fig. 4A). Parapodia each with one long-bladed compound heterogomph chaeta (Fig. 4D, H); occasionally 2 at midbody, and 5-6 other falcigers with shorter blades anteriorly, 3-4 posteriorly (Fig. 4E, I). Long blades unidentate, with tips rounded and provided with a subdistal fine spine and long, upwardly extending coarse serration on edge, longer and thicker basally, about 23-24  $\mu\text{m}$  on anterior parapodia, 31  $\mu\text{m}$  on midbody (Fig. 4D), 20  $\mu\text{m}$  posteriorly (Fig. 4H). Remaining falcigers similar throughout; blades with rounded tip, provided with a subdistal spine, and long serrations on edge, especially on uppermost chaetae; anterior dorso-ventral gradation in length of falcigers (Fig. 4E, I); blades of anterior parapodia, 15  $\mu\text{m}$  above, 8  $\mu\text{m}$  below; blades of midbody falcigers 15  $\mu\text{m}$  above, 9  $\mu\text{m}$  below (Fig. 4E), blades of posterior falcigers 10  $\mu\text{m}$  above, 7  $\mu\text{m}$  below (Fig. 4I); shafts thicker more ventrally and posteriorly. Solitary dorsal simple capillary chaeta from anterior-midbody parapodia, with 2 subdistal spines (Fig. 4B). Posterior parapodia each with solitary ventral simple, sigmoid unidentate chaeta (Fig. 4J). Solitary thick acicula on each parapodium, distally rounded and hollow at tip (Fig. 4C, G). Pharynx extending through about 3-4 segments, with a conical, middorsal tooth on the anterior rim. Proventricle shorter than pharynx, extending through about two segments and with about 16 rows of muscular cells (Fig. 4A). Pygidium with two anal cirri, about 0.18 mm in length; longer than dorsal cirri.

**Remarks:** The examined Mediterranean specimens have some differences with the original description in small details. For instance, the length and ratio of blades appear to be slightly different, the number of muscle cell rows is 16 instead of 18 in the Macaronesian specimens, presence of anterior eyespots in the Mediterranean specimens, and the dorsal simple chaetae have less number of marginal teeth, with a slightly different appearance. All these differences and having only 3 specimens, cause us to report this species with some caution. The most similar species to *Parapionosyllis macaronesiensis* is *P. brevicirra* Day, 1954, the type locality of which is Tristan da Cunha Island. Although its locality type is in the Southern Atlantic Ocean, nowadays, it is also known from the Mediterranean Sea. Both species are characterised by the presence of long-bladed compound chaetae (pseudospinigers). *Parapionosyllis brevicirra* has smaller and straight spines on the cutting edge of the blades, while other species of the genus, such as *P. labronica* Cognetti, 1965, *P. minuta* (Pierantoni, 1903), *P. elegans* (Pierantoni, 1903), *P. cabezali* Parapar, San Martín & Moreira, 2000 and *P. longicirrata* (Webster & Benedict, 1884) bear compound chaetae with much shorter blades and shorter spinulation.

*P. macaronesiensis* differs from *P. brevicirra* in the

type of arrangement of the parapodial glands. *P. brevicirra* was firstly described without them (Day, 1954, Hartmann-Schöder, 1962). However, Alós *et al.* (1983) described some specimens with parapodial glands bearing fibrillar material and San Martín (2003) described this species with both granular and fibrillar material, with an irregular distribution throughout all the chaetigers. Both kinds of parapodial glands can appear simultaneously on each chaetiger. *P. macaronesiensis* also have two parapodial glands on its side at each segment, but always only with granular material. *P. cabezali* differs from *P. macaronesiensis* by having two kinds of parapodial glands. *P. macaronesiensis* also differs from the above species in the shape of the dorsal simple chaetae. The dorsal simple chaetae of *P. macaronesiensis* has two subdistal spines, while it has 3-4 similar spines in *P. brevicirra* and several spines in *P. cabezali*, being one of the thicker. *P. uebelackerae* San Martín 1991 is also a very similar species but it has long-bladed compound chaetae only on the anterior parapodia, which are proportionally shorter and provided with shorter serration (San Martín, 1991; Brito *et al.* 2000). *P. floridana* San Martín 1991 has longer, apparently biarticulated dorsal cirri, a longer pharynx, lacks parapodial glands and the dorsal simple chaetae has several, equal serrations (San Martín, 1991; Brito *et al.*, 2000).

*Parapionosyllis abriguensis* Riera, Núñez & Brito, 2006, from Tenerife, Canary Islands, has similar compound chaetae, but the glands are inside the dorsal cirri and both dorsal and ventral simple chaetae are very different (see Riera *et al.*, 2006).

**Distribution:** Firstly described by Brito *et al.* (2000) in Madeira and Canary Islands, Central East Atlantic. It could be a new report for the Mediterranean Sea.

**Habitat:** Our specimens inhabited soft sediments. One specimen inhabited sandy areas lacking vegetation as some of the specimens collected by Brito *et al.* (2000) and the other one in a muddier habitat; with a depth range of 4-10 m. Brito *et al.* (2000) collected their specimens in a depth range of 4-18 m.

Subfamily Syllinae Grube, 1850

Genus *Syllis* Lamark, 1818

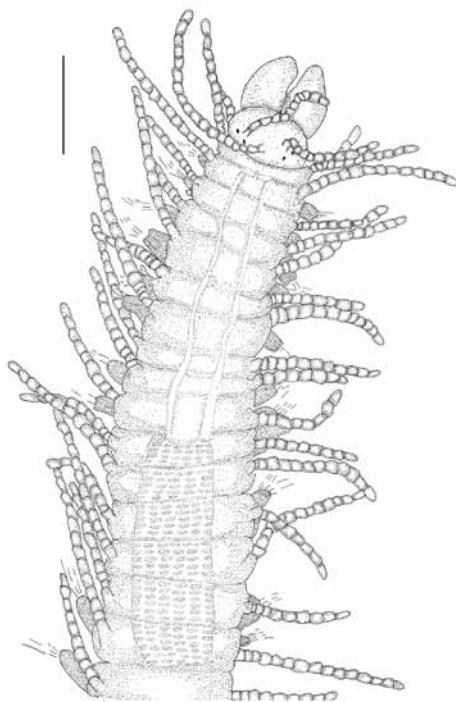
*Syllis* Lamarck, 1818: 318

*Syllis* cf. *mauretanica* (Licher, 1999) n. comb.

Figs. 5-6 A-I and 7

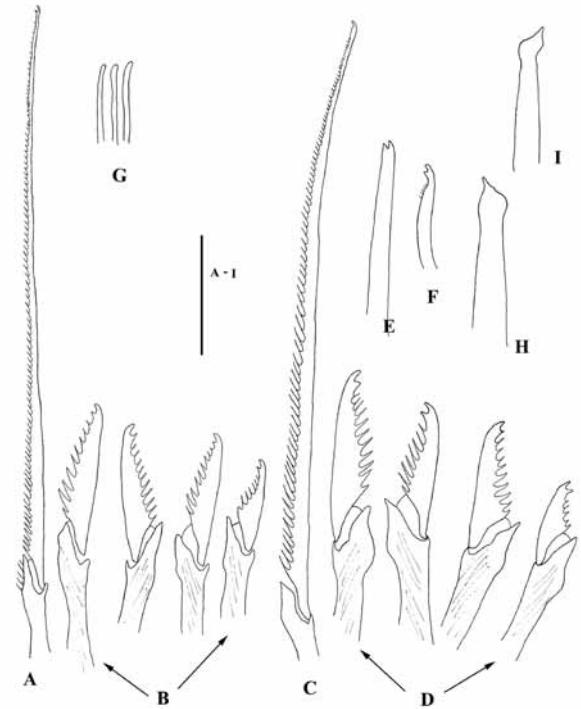
(?) *Typosyllis mauretanica* Licher, 1999: 78, figs. 35, 36

**Material examined:** 1 specimen (MNCNM 16.01/11377), off Alicante, Spain, ( $0^{\circ}30.792^{\prime}\text{W}$  /  $38^{\circ}18.738^{\prime}\text{N}$ ), Winter 2004, coarse sediments, 4 m depth, station A1; 2 specimens (MNCNM 16.01/11378), off Alicante, Spain ( $0^{\circ}30.792^{\prime}\text{W}$  /  $38^{\circ}18.738^{\prime}\text{N}$ ), Summer 2004, muddy fine sand sediments, 4 m depth, station A1; 14



**Fig. 5:** *Syllis* cf. *mauretanica* n. comb. A) anterior end, dorsal view. Scale: 0.18 mm.

specimens (MNCNM 16.01/11379), off Alicante, Spain, ( $0^{\circ}30.792'W / 38^{\circ}18.738'N$ ), Summer 2005, muddy fine sand with some gravels, 4 m depth, station A1; 1 specimen (MNCNM 16.01/11380), off Alicante, Spain ( $0^{\circ}30.894'W / 38^{\circ}18.372'N$ ), Summer 2006, coarse, medium and fine sediments with mud, 4 m depth, station B1; 1 specimen (MNCNM 16.01/11381), off Alicante, Spain ( $0^{\circ}30.882'W / 38^{\circ}17.886'N$ ), Summer 2006, muddy fine sand with coarse sediments, 10 m depth, station C2; 1 specimen (MNCNM 16.01/11382), off Alicante, Spain ( $0^{\circ}30.468'W / 38^{\circ}18.570'N$ ), Summer 2007, fine sandy mud sediments with some coarse sands, 10 m depth, station A2; 2 specimen (MNCNM 16.01/11383), off Alicante, Spain ( $0^{\circ}30.894'W / 38^{\circ}18.372'N$ ), Summer 2007, coarse sediments with some mud, 4 m depth, station B1; 2 specimens (MNCNM 16.01/11465), off Alicante, Spain ( $0^{\circ}30.744'W / 38^{\circ}18.210'N$ ), Summer 2007, fine sandy mud sediments with some gravels, 10 m depth, station B2; 4 specimens (MNCNM 16.01/11623), off Alicante, Spain ( $0^{\circ}30.234'W / 38^{\circ}18.120'N$ ), Summer 2007, fine sandy mud sediments, 15 m depth, station B3 and 3 specimens (MNCNM 16.01/11624), off Alicante, Spain ( $0^{\circ}30.744'W / 38^{\circ}18.210'N$ ), Summer 2009, muddy fine sand sediments, 10 m depth station B2. Another four specimens were prepared for photographs and spoiled, 1 specimen, Alicante, Spain ( $0^{\circ}30.468'W / 38^{\circ}18.570'N$ ), Winter 2006, fine sandy mud, 10 m depth, station A2; 1 specimen, Alicante, Spain ( $0^{\circ}30.744'W / 38^{\circ}18.210'N$ ), Summer 2007, muddy fine sand, 10 m depth, station B2; 1 specimen, Alicante, Spain ( $0^{\circ}30.744'W / 38^{\circ}18.210'N$ ),



**Fig. 6:** *Syllis* cf *mauretanica* n. comb. A) pseudospiniger chaeta, anterior-midbody parapodia; B) falciger chaetae, anterior-midbody parapodia; C) pseudospiniger chaeta, midbody-posterior parapodia; D) falciger chaetae, midbody-posterior parapodia; E) dorsal simple chaeta, posterior parapodia; F) ventral simple chaeta, posterior parapodia; G) aciculae, anterior parapodia; H-I) acicula, posterior parapodia. Scale: A-I 20  $\mu$ m.

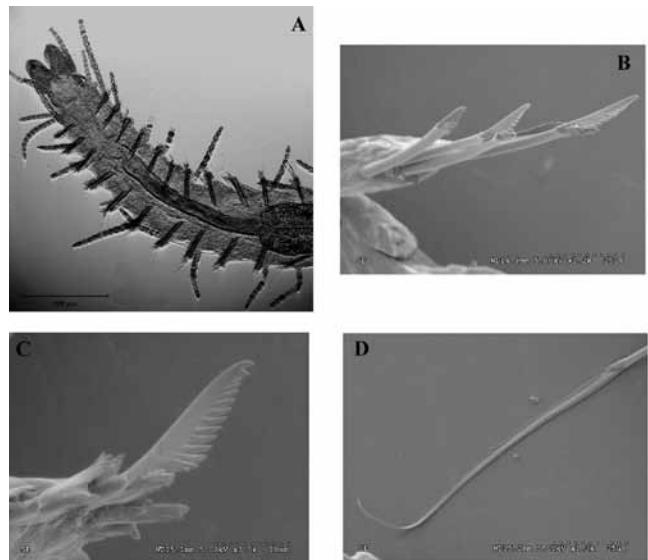
Summer 2009, muddy fine sand, 10 m depth, station B2 and the last one, Alicante, Spain ( $0^{\circ}29.880'W / 38^{\circ}18.582'N$ ), Summer 2009, muddy fine sand, 15 m depth, station A3. A total of 35 specimens were identified (Table 1).

*Description:* Body long, slender; longest complete specimen 6.64 mm long, 0.3 mm wide, with about 57 chaetigers. Prostomium oval with four small eyes in trapezoidal arrangement, almost disappearing by fixation. Median antenna longer than prostomium and palps together, with about 21 articles, originating between posterior pair of eyes (Fig. 5). Lateral antennae similar in length to prostomium and palps together, with 11-12 articles, originating in front of anterior eyes. Palps longer than prostomium, fused basally, with a dorsal scar (Fig. 5). Tentacular segment shorter than subsequent segments; dorsal tentacular cirri shorter than median antenna, slightly longer than lateral antennae with about 12 articles; ventral tentacular cirri shorter than dorsal ones, with 5-6 articles (Fig. 5). Dorsal cirri alternating long and short; dorsal cirri of chaetiger 1 with 14, chaetiger 2 with 9, chaetiger 3 with 12 articles. After proventricle long ones with 12-15 articles, short ones with 8-10 articles (Fig. 5). Parapodial lobes short, conical and rounded. Ventral cirri digitiform, similar in length to parapodia,

can be slightly longer in posterior chaetiges. Parapodia each with 1 (2 on anterior parapodia) pseudospinigerous chaetae, slightly bidentate on anterior parapodia, unidentate from proventricular segments onwards, with moderately long spines on margin (Fig. 6A, C). Furthermore, a number of bidentate falcigers per bundle: 6-7 on anterior parapodia, 5 on midbody and 3-4 on posterior parapodia, with proximal teeth slightly smaller than distal ones and moderately long spines on margin, longer basally, shorter progressively distally (Fig. 6B, D). Blades of pseudospinigers about 96  $\mu\text{m}$  on anterior and midbody parapodia (Fig. 6A), 100  $\mu\text{m}$  on midbody and posterior parapodia (Fig. 6C); most posterior parapodia with short pseudospinigers (about 35  $\mu\text{m}$ ) that replace the long ones. Falcigers about 26  $\mu\text{m}$  above to 15  $\mu\text{m}$  below on anterior-midbody parapodia (Fig. 6B); about 28  $\mu\text{m}$  above to 15  $\mu\text{m}$  below posteriorly (Fig. 6D). Solitary dorsal simple chaetae (Fig. 6E), only on most posterior parapodia, smooth, distally bifid; ventral simple chaetae (Fig. 6F), only on most posterior parapodia, bidentate; both teeth similar, with few subdistal, very short spines. Anterior parapodia with three slender aciculae (Fig. 6G), decreasing progressively to 2 and finally 1 from midbody, increasing in thickness, acuminate (Fig. 6I, H). Pharynx long and narrow, extending through 9 segments; pharyngeal tooth located on anterior rim (Fig. 5). Proventricle shorter and broader than pharynx, extending through 6 segments, with approximately 35 muscle cell rows (Fig. 5). Some specimens with a shorter proventricle, extending through 4 chaetigers. Pigydiun with two anal cirri (about 0.41 mm in length), longer than dorsal cirri, with 20 articles and a small unarticulated papilla.

**Reproduction:** Some specimens with ovocytes from chaetiger 8; about 6-12 ovocytes at each chaetiger on midbody and 1-3 ovocytes on posterior chaetigers, smaller ones 96  $\mu\text{m}$  in diameter, bigger ones 136  $\mu\text{m}$ .

**Remarks:** *Syllis mauretanica* has unidentate (slightly bidentate on anterior parapodia) pseudospiniger chaetae and falcigers with bidentate blades and moderately long spines on margin, longer basally becoming progressively shorter to the distal part of blades, bidentate dorsal simple capillary chaetae and acuminate aciculae. The most similar species in the Iberian Peninsula and the Mediterranean is *S. garciai* (Campoy, 1982), which has spines of blades that are much longer and surpass the level of blade (see Campoy, 1982; San Martín, 2003). *S. parapari* San Martín & López, 2000, has blades with much shorter spines than *S. mauretanica* and short, fusiform dorsal cirri; *S. beneliahui* (Campoy & Alquézar, 1982) has also acuminate aciculae and very similar falcigers, although the spines on the falcigerous blades are not as long as in *S. mauretanica*. Furthermore, the pseudospinigers of the *S. beneliahue* are much shorter, distinctly bidentate and dorsal cirri are longer than in *S. mauretanica*. *Syllis rosea* (Langerhans, 1879) has very different aciculae, ending in right angle, truncate capillary dorsal chaetae



**Fig. 7:** Confocal laser scanning microscopy (CLSM) and SEM images of *Syllis mauretanica*. A) CLSM image of anterior-dorsal part of *Syllis* cf. *mauretanica*. B) and C) SEM images of falciger chaetae on midbody chaetigers and D) SEM images of pseudospiniger chaeta on anterior chaetigers. Scale: A 300  $\mu\text{m}$ ; B and D 25  $\mu\text{m}$  and C 10  $\mu\text{m}$ .

and bidentate tips of pseudospinigers, except on posterior parapodia, in which they are distinctly rounded and unidentate. Furthermore, spines on the margin of all chaetae are much shorter than in *S. mauretanica*.

Our specimens have slight differences to the original description, so we consider this report with caution. The type specimens (Holotype and 4 Paratypes), from Mauritania (E Africa), lack eyes, the palps are described as separated, there is a conspicuous ventral pigmentation and the ventral simple chaetae are apparently absent. However, these differences can be explained because fixation of specimens sometimes produce lose pigmentation on eyes or in the body; the palps in the genus *Syllis* (or *Typosyllis*) are basally fused, with a dorsal scar, although the basal fusion is differently developed in the different species and some specimens lack ventral simple chaetae, especially after detachment of a stolon. There is an error in the publication (Licher, 1999) about this species, since figure 35 does not represent *S. mauretanica*, but *S. cerina* (previously described, and figured in fig. 33); however in the original thesis the anterior end and ventral segments are represented in figure 35.

There is another species described by Licher (1999) and recently reported from the Mediterranean, *S. hyllebergi* (Consentino, 2011); that species is similar but has blades of falcigers with longer spines on margin.

A similar species was also described in the Eastern Central Pacific Ocean, *S. magna* (Westheide, 1974). This species differs from *S. mauretanica* mainly in the shape of cirri and the length of spines. *S. magna* shows much longer dorsal cirri than *S. mauretanica*, however, the spines on the cutting edge of the blades are shorter in

*Syllis magna*. Likewise, these differences are observed in *S. cornuta* (Rathke, 1943) described from North Europe. Another difference is that the posterior acicula in *S. cornuta* (Rathke, 1943) is straight instead of the acuminate ones in *S. mauretanica*. The Cuban species, *S. botosaneanui* (Hartmann-Schröder, 1973), possesses shorter cirri and longer spines in the blades than *S. mauretanica* and the spines are directed upwards. *S. broomensis* (Hartmann-Schröder, 1979) is also similar to *S. mauretanica* but it is slender and has longer cirri, and its pseudospinigers are longer.

**Distribution:** This species is only known from the type locality, Banc d'Arguin, Mauritania (Licher 1999). Therefore, it could be a new report for the Mediterranean Sea.

**Habitat:** Its preferential habitat was stated by Licher (1999) to be infralittoral seagrass beds. However, in this study it was found in sediments of a wide range of grain size and the presence of the algae *Caulerpa prolifera* mainly in the deepest stations. This species showed a depth range between 4 and 15 meters, but it was more abundant in shallower stations.

## Discussion

There are some reasons for the high marine biodiversity of the Mediterranean (Bianchi & Morri, 2000). One reason is its geological history (Maldonado, 1985; Rufel, 1997). Another reason is the introduction, intentionally or accidentally, of alien species (a high percentage is due to Lessepsian migration) (Bianchi & Morri, 2000; Zenetos *et al.*, 2010). There are also some evidences that the Mediterranean biodiversity patterns are presenting facing changes that can be related to increasing seawater temperature due to climate change (Francour *et al.*, 1994). This increase of temperature would facilitate that warm-water species expand their geographical range (McKinney, 1999). In this sense, both species *P. macaronesiensis*, which distribution area was restricted to the Central East Atlantic (Madeira Islands, Selvagens Islands and Canary Islands) (Brito *et al.*, 2000) and *S. mauretanica*, that was only reported in Mauritania could be introduced accidentally from the Atlantic Ocean to the Mediterranean Sea through the Strait of Gibraltar. However, they have probably expanded their geographical range area due to the increase of temperature and they could be sharing the habitat with other native species. According to Galil (2006) and Por (1978), tropical species have been entering the Mediterranean through either the Suez Canal (Lessepsian migration) or the Strait of Gibraltar for decades. Furthermore, Bianchi & Morri (2003) and Musco & Giangrande (2005) suggested the possibility of a “tropicalisation” trend of the Mediterranean fauna. Another reason could be that the presence of these new reports and the new species is the result of a more intense scientific investigation.

According to Musco & Giangrande (2005), updating syllid inventories is necessary if aiming to detect possible migrations. In addition, Aguado & San Martín (2007) also indicated several possibilities that might explain the ways of introduction of new reports for the Mediterranean Sea in their survey. Therefore, further research would be necessary to understand the reason why these species are present in the Mediterranean Sea.

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