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Syllidae (Polychaeta) from Lebanon with two new reports for the Mediterranean Sea

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Abstract: A collection of 24 samples from Lebanon (Eastern Mediterranean Sea) was studied yielding a number of 27 identified species. Two of them: *Exogone breviantennata* Hartmann-Schröder, 1959 and *Syllis bella* (Chamberlin, 1919) are new reports for the Mediterranean Sea. One more species, *Inermosyllis balearica* (San Martín, 1982) is a new report for the Eastern area. Another species *Syllis* cf. *mayeri* has been found but its identification is not completely certain. Similarities and differences with *Syllis mayeri* Musco & Giangrande, 2005 are exposed. A discussion about possible migration explanations to the presence in the Mediterranean of these species is included.

Résumé : *Syllidae (Polychaeta) des côtes du Liban, dont deux espèces nouvelles pour la Méditerranée.* Une collection de 24 échantillons provenant du Liban (Mer Méditerranéenne orientale) a été étudiée, permettant l'identification de 27 espèces de Syllidés. Deux d'entre elles : *Exogone breviantennata* Hartmann-Schröder, 1959 et *Syllis bella* (Chamberlin, 1919) sont nouvelles pour la Mer Méditerranée. Une espèce, *Inermosyllis balearica* (San Martín, 1982), est nouvelle pour le secteur oriental. Une autre espèce, *Syllis* cf. *mayeri*, a été trouvée mais son identification n'est pas encore validée. Des similitudes et des différences avec les *Syllis mayeri* Musco et Giangrande, 2005 sont exposées. Les causes possibles de cette migration expliquant la présence de ces espèces en Méditerranée sont discutées.

Keywords: Syllidae • Polychaeta • Taxonomy • New reports • Mediterranean Sea

Introduction

The Syllidae (Polychaeta) from Eastern Mediterranean Sea have been studied by several authors, especially during the last years. There are several ecological studies, faunistic analyses, and newly described species of Syllidae from the Aegean Sea (Çinar & Ergen, 2002; Çinar, 2003a; Çinar, 2005). Syllids and other polychaetes from the Suez Canal were studied by Ben-Eliahu (1972a). Polychaete faunas from Israel and the Gulf of Elat have been extensively studied in several works (Tebble, 1959; Day, 1965; Ben-Eliahu, 1975, 1976a, 1976b & 1976c; Ben-Eliahu & Fiege, 1995). Syllids from the same area were specifically studied by Ben-Eliahu (1977a & 1977b) and Harlock & Laubier

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(1966). Polychaetes from Beirut, the Lebanon, were studied by Laubier (1966), and those from Turkey by Ergen (1976) and Çinar (1999). Fauvel (1933 & 1937) studied the polychaetes from Egypt. A checklist, distribution, and ecological features of Syllidae and other polychaetes from Greece can be consulted in Simboura & Nicolaidou (2001). New species, ecology and systematic studies on polychaetes, including Syllidae, from Cyprus are those of Ben-Eliahu (1972b), Çinar (2003b), Çinar & Ergen (2003), Çinar et al. (2003), and more recently Musco et al. (2005). Finally, a broad biogeographic revision on Syllidae from the Mediterranean Sea (East and West areas) was carried out by Musco & Giangrande (2005a).

Numerous studies have recently stressed the introduction of foreign organisms into marine communities. Nishi & Kato (2004) studied the nature of introduced or cryptogenic species of polychaetes around the world, and concluded that Spionidae, Sabellidae, Serpulidae and Nereididae are the most frequent. In some instances, both the origin and the area of introduction were considerably distant (e.g. from South Africa, or Australia to Italy; from South Africa to the Pacific side of U.S.A.; from Western Europe to Japan). Several species have also been reported as introduced at the Northern Baltic Sea (Stigzelius et al., 1997). There are several reports about the Lessepsian migrations specific to the Eastern Mediterranean (i.e. from Red Sea to the Mediterranean through the Suez Canal) (Ben-Eliahu, 1972c; Por, 1971, 1978 & 1990; Ergen et al., 2002; Ergev et al., 2003; Çinar & Ergen, 2005; Çinar et al., 2006). Studies about alien species of invertebrates and vertebrates marine groups in the Mediterranean Sea are those of Çinar et al. (2005), Zenetos et al. (2005), and Çinar (2006). All coincide in considering the introduction of species as a relatively common process, despite information might sometimes be limited. While some introduction vectors have been hypothesized, (e.g. ballast water and fouled ships; Nishi & Kato, 2004), we do not really have concise data detailing how this happens, or how long and stable these introduction processes are. Furthermore, the geographic distribution of many species of polychaetes is often discontinuous, likely because there are still numerous poorly known areas around the world. This, hence, makes the tracking of species displacements along the globe more difficult.

We have studied a collection of Syllidae from Lebanon. The material was collected by Ghazi Bitar, Helmut Zibrowius and Michel Bariche, and is currently cured by Dr. Dieter Fiege at the Senckenberg Museum. Most of the revised species are well known, common and widely reported for the Mediterranean, as well as for the Levant Basin. However, there are two species previously unreported for the Mediterranean, plus one additional species previously reported only for the Western Mediterranean (but new for the Eastern basin). In this paper we offer a taxonomic account for the species found in order to contribute to a better knowledge of the Syllidae from Easter Mediterranean. We also include detailed descriptions, drawings, and SEM photographs of the most interesting species. The Eastern Basin is a geographical area in which many examples of new invasions have been already reported. In special, several events of accidental introductions by ships and Lessepsian migrations have been reported in the last years. We thereby include a discussion about the possible origin of our new reports for the Mediterranean.

Material and Methods

All the samples were collected during field trips in October 1999, May and June 2000, April 2001, September 2002, and July 2003. The samples were fixed in 10% formaldehyde-seawater solution and preserved in 70% alcohol solution. For identification, an Olympus SZ30 stereomicroscope and Olympus CH30 optic microscope were used. Drawings were made using a drawing tube in a Nikon Optiphot optic microscope equipped with interference contrast system (Nomarski). Selected specimens were critical point dried and subsequently coated with 102 Å of gold for SEM. Examination was taken with Philips XL30 electronic microscope, connected to an EDAX DX4i analyzer at SIDI (Servicio Interdepartamental de Investigación), Universidad Autónoma de Madrid (UAM). Width of the specimens was measured at level of proventricle, excluding parapodia. All the studied material is deposited at the Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt (SMF). Comparative material examined has been loaned by the Museo Nacional de Ciencias Naturales de Madrid, Spain (MNCN), the Australian Museum (AM) and the Muzeum Przyrodnicze Wroclaw, Poland (MPW).

Results

AUTOLYTINAE Langerhans, 1879

Myrianida prolifera (Müller, 1788)

Autolytus prolifer San Martín, 2003: 489-492, figs 269, 270.
Myrianida prolifera Nygren, 2004: 151-152, fig. 75A-E.

Material examined

1 specimen (SMF16470), Selaata, small caves and overhangs, 3-8 m, 18.x.1999. 1 specimen (SMF16468), Ras el Chakaa, cliff, 4-8 m, 19.x.1999.

Distribution

North East Atlantic Ocean. Mediterranean Sea.

Proceraea aurantiaca Claparède, 1864

Proceraea aurantiaca San Martín, 2003: 473-475, figs 259, 260 (in part). Çinar *et al.*, 2003: 748. Nygren, 2004: 44-45, fig. 6A-E.

Material examined

1 specimen (SMF16403), Selaata, small caves and overhangs, 3-8 m, 18.x.1999.

Distribution

North East Atlantic Ocean. Mediterranean Sea.

EUSYLLINAE Malaquin, 1893

Eusyllis kupfferi Langerhans, 1879

Eusyllis kupfferi Langerhans, 1879: 552, fig. 14. San Martín, 1990: 607, figs 12, 13. Çinar & Ergen, 2003: 177-178, fig. 1. San Martín & Hutchings, 2006: 276-278, figs 12D-F, 13A-G, 14A-E.

Material examined

1 specimen (SMF16399), Selaata, small caves and overhangs, 3-8 m, 18.x.1999. 1 specimen (SMF16428), Beirut, Harf el Kalb, overhangs, 34 m, 21.x.1999. 1 specimen (SMF16445), El Kassmieh, cliff with *Madracis pharensis*, 42-43 m, 25.x.1999. 1 specimen (SMF16351) and 1 specimen (SMF16362), Batroun, encrusted cliff, 9 m, 16.x.1999. 1 specimen (SMF16439), Ramkine Island, cave, 5-7 m, 31.v.2000.

Comparative material examined

4 specimens (AM W28218), Australia, New South Wales, Off old wharf, Richmond R., near Ballina, 28°52.5'S 153°33.6'E, drift algae, 6 m, 5.iii.1992.

Remarks

Eusyllis kupfferi is characterized by having net-shaped dorsal simple chaetae and compound chaetae with blades short, distally curved and unidentate. The examined specimens agree well with a recent description and iconography of same species made by the second author (San Martín & Hutchings, 2006). This species was described from Madeira (Langerhans, 1879) and reported on the Canary Islands (Núñez & San Martín, 1996), Cuba (San Martín, 1990) and Australia (San Martín & Hutchings, 2006) and was recently found in the Eastern Mediterranean Sea (Çinar & Ergen, 2003).

Distribution

Atlantic Ocean (Madeira, Canary Islands, Cuba). Australia (Queensland, Western Australia, New South Wales). Mediterranean Sea.

Eusyllis lamelligera Marion & Bobretzky, 1875

Eusyllis lamelligera Marion & Bobretzky, 1875: 33, pl. 3, figs 9A-C. San Martín, 2003: 117, figs 54, 55. Çinar & Ergen, 2003: 772-773. San Martín & Hutchings, 2006: 278-280, figs 15A-J, 16A-F.

Material examined

1 specimen (SMF16348), Ramkine Island, with crust and corals, 13 m, 22.x.1999. 3 specimens (SMF16367), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

North Atlantic. Australia (Atlantic and Pacific coasts). Mediterranean Sea.

Odontosyllis fulgurans
(Audouin & Milne Edwards, 1833)

Odontosyllis fulgurans Audouin & Milne Edwards, 1833: 229. San Martín, 2003: 104-106, fig. 46. Çinar & Ergen, 2003: 773.

Material examined

1 specimen (SMF16407), Ramkine Island, cave, 5-7 m, 31.v.2000. 3 specimens (SMF16456), Khaldeh, marina Villamar, with *Caulerpa scalpelliformis*, 1-2 m, 7.vi.2000. 2 specimens (SMF16373), Kfar Abida, 7-8 m, 30.v.2000. 1 specimen (SMF16353), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

Apparently cosmopolitan.

EXOGONINAE Langerhans, 1879

Exogone breviantennata Hartmann-Schröder, 1959

Exogone breviantennata Hartmann-Schröder, 1959: 125, figs 75-78.
Exogone (Exogone) breviantennata San Martín, 1991: 730, fig. 8; 2005: 141-142, figs 81A, 89A-I.

Material examined

2 specimens (SMF16384), Ras El Chakaa, cliff, 4-8 m, 19.x.1999. 1 specimen (SMF16390), Beirut harbour, 3-8 m,

2.vi.2000. 6 specimens (SMF16354), Batroun, encrusted cliff, 9 m, 16.x.1999.

Comparative material examined

4 specimens (AM W26457), Australia, Queensland: lagoon entrance, Lizard Island, 14º40'S 145º28'E, medium to fine sediment, 18m, 9.x.1978.

Description

Body long, slender. Prostomium wider than long; 4 eyes in trapezoidal arrangement. Antennae papilliform, inserted between anterior eyes, median antenna slightly longer than lateral ones. Palps longer than prostomium, completely fused, with a dorsal furrow and a distal notch. Tentacular cirri papilliform. Dorsal cirri small, similar to lateral antennae, present on all segments. Parapodia with one compound chaeta, blade spiniger-like, bidentate, with long marginal spines, shaft with subdistal spines and 4 compound falcigers, blades bidentate, proximal tooth larger than distal one, and long marginal spines, shafts with subdistal spines. Dorsal simple chaetae slender, bidentate, with small marginal spines. Ventral simple chaetae sigmoid, bidentate, smooth. One acicula per parapodium, distally rounded. Pharynx through 4 segments; pharyngeal tooth on anterior end. Proventricle short, through 2 segments.

Remarks

This species is similar to *Exogone verugera* but in *E. breviantennata* the proventricle is distinctly shorter and it has dorsal cirri on the second chaetiger (San Martín, 2003; 2005). The examined specimens agree well with a recent detailed description and iconography of the same species made by the second author (San Martín, 2005). Therefore, we do not consider necessary to include herein a more detailed study of the specimens. This is a new report for the Mediterranean Sea.

Distribution

Apparently circumtropical.

Sphaerosyllis pirifera Claparède, 1868

Sphaerosyllis pirifera Claparède, 1868: 205. San Martín, 2003: 212-216, figs 111-113. Çinar et al., 2003: 759.

Material examined

25 specimens (SMF16363), Batroun, encrusted cliff, 9 m, 16.x.1999. 1 specimen (SMF16440) and 1 specimen (SMF16415), Ramkine island, cave, 5-7 m, 31.v.2000. 1 specimen (SMF16455), Khaldeh, marina Villamar, with *Caulerpa scalpelliformis*, 1-2 m, 7.vi.2000. 2 specimens (SMF16375), Kfar Abida, 7-8 m, 30.v.2000. 1 specimen (SMF16422), Selaata, small caves and overhangs, 6-7 m, 23.x.1999. 1 specimen (SMF16417), El Heri, marina Beaulieu, 2-3 m, 3.vi.2000. 1 specimen (SMF16400), Selaata, small caves and overhangs, 3-8 m, 18.x.1999.

Distribution

Mediterranean Sea. East Atlantic Ocean (Iberian coasts).

SYLLINAE Grube, 1850

Branchiosyllis exilis (Gravier, 1900)

Syllis (Typosyllis) exilis Gravier, 1900: 160, figs 28-30.
Branchiosyllis exilis San Martín, 2003: 332, figs 184, 185. Çinar & Ergen, 2003: 776.

Material examined

3 specimens (SMF16416), El Heri, marina Beaulieu, 2-3 m, 3.vi.2000. 1 specimen (SMF16408), Ramkine Island, cave, 5-7 m, 31.v.2000. 9 specimens (SMF16405) and 1 specimen (SMF16388), Selaata, small caves and overhangs, 3-8 m, 18.x.1999. 1 specimen (SMF16420), Jbail Harbour, 1-2 m, 17.x.1999. 1 specimen (SMF16419), Jbail, Tablieh, 15-16 m, 17.x.1999. 1 specimen (SMF16429), Beirut, marina of Hotel Riviera, with algae, 2m, 21.x.1999. 2 specimens (SMF 16433), Batroun, among epifauna of *Chama pacifica*, 15.x.1999. 1 specimen (SMF16451), Ras el Chakaa, cave, 5-6 m, 4.vi.2000. 3 specimens (SMF16345), Ramkine Island, hardground, 13-14 m, 22.x.1999. 1 specimen (SMF16372), Kfar Abida, 7-8 m, 30.v.2000. 9 specimens (SMF16379), Ras El Chakaa, cliff, 4-8 m, 19.x.1999. 1 specimen (SMF16392), Beirut harbour, 3-8 m, 2.vi.2000. 6 specimens (SMF16358), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

Apparently circumtropical, also present in the Mediterranean Sea.

Eurysyllis tuberculata Ehlers, 1864

Eurysyllis tuberculata Ehlers, 1864: 264, figs 4-7. San Martín, 2003: 296, figs 162-164. Çinar & Ergen, 2003: 776.

Material examined

1 specimen (SMF16357), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

Red Sea. East Atlantic Ocean (Canary Islands), North West Atlantic Ocean (North Carolina to Gulf of México). Mediterranean Sea.

Inermosyllis balearica (San Martín, 1982)

Pseudosyllides balearica San Martín, 1982: 21.
Inermosyllis balearica San Martín, 2003: 326-329, figs 181, 182.

Material examined

1 specimen (SMF16361), Batroun, encrusted cliff, 9 m, 16.x.1999.

Remarks

The specimen agrees well with the descriptions. This species was previously only known for the Western Mediterranean (Iberian coasts, Balearic and Chafarinas Islands), this is the first report in the Eastern basin. Several species of syllids currently present in Western and Eastern basins were previously studied and reported only for the Western area. It could be because the Western area had been more exhaustively studied. Some authors also consider that syllids distribution suggests the existence of an "atlantism" gradient, decreasing eastwards and possibly corresponding to a temperature gradient (Musco & Giangrande, 2005a). However, the number of studies on polychaetes, and syllids in particular, in the Eastern basin has been highly increased during last years and many species that were only known for the Western part are now considered common in both areas. *Inermosyllis balearica* could be another example of species that has probably expanded its distribution from Western waters to Eastern areas of the Mediterranean Sea.

Distribution

Mediterranean Sea.

Opisthosyllis brunnea langerhans, 1879

Opisthosyllis brunnea Langerhans, 1879: 541. San Martín, 2003: 330-331, fig. 183.

Material examined

1 specimen (SMF16421), Enfeh, rock, 8-9 m, rocky shore, 26.x.1999.

Distribution

Atlantic Ocean (Madeira Island to South Africa). Indian Ocean (Mozambique, Somalia, Australia). Pacific Ocean (Japan, Korea & Panam.). Mediterranean Sea.

Syllis armillaris (Müller, 1771)

Nereis armillaris Müller, 1771: 150.
Typosyllis armillaris Licher, 1999: 189-199, fig. 84.
Syllis armillaris San Martín, 2003: 423-426, figs 232, 233. Çinar & Ergen, 2003: 778. Musco & Giangrande, 2005b: 472-473, fig. 4.

Material examined

3 specimens (SMF16418), El Heri, marina Beaulieu, 2-3 m, 3.vi.2000. 10 specimens (SMF16410), Ramkine Island, cave, 5-7 m, 31.v.2000. 3 specimens (SMF16389) and 13 specimens (SMF16406), Selaata, small caves and overhangs, 3-8 m, 18.x.1999. 2 specimens (SMF16423), Selaata, small caves and overhangs, 6-7 m, 23.x.1999. 1 specimen (SMF16435), Beirut harbour, 3-8 m, 2.vi.2000. 1 specimen (SMF16454), Khaldeh, marina Villamar, with *Caulerpa scalpelliformis*, 1-2 m, 7.vi.2000. 3 specimens (SMF16449), Ramkine Island, with barnacles, 3 m, 31.v.2000. 2 specimens (SMF16444), El Kassmieh, cliff with *Madracis pharensis*, 42-43 m, 25.x.1999. 9 specimens (SMF16425), Barbara, overhang, 26 m, 8.vi.2000. 3 specimens (SMF16347), Ramkine Island, hardground, 13-14 m, 22.x.1999. 2 specimens (SMF16380), Ras El Chakaa, cliff 4-8 m, 19.x.1999. 1 specimen (SMF16365), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

Apparently cosmopolitan.

Syllis bella (Chamberlin, 1919)
(Figs 1-3)

Typosyllis bella Chamberlin, 1919: 7. Licher, 1999: 94-96, fig. 45.
Syllis bella Capa et al., 2001: 107.

Material examined

35 specimens (SMF16434), Beirut harbour, 3-8 m, 2.vi.2000. 1 specimen (SMF16457), Khaldeh, marina Villamar, with *Caulerpa scalpelliformis*, 1-2 m, 7.vi.2000. 1 specimen (SMF16450), Ramkine Island, with barnacles, 3 m, 31.v.2000. 1 specimen (SMF16369), Kfar Abida, 7-8 m, 30.v.2000. 2 specimens (SMF16385) and 1 specimen (SMF16398), Ras El Chakaa, cliff, 4-8 m, 19.x.1999. 4 specimens (SMF16364), Batroun, encrusted cliff, 9 m, 16.x.1999.

Comparative material examined

Numerous specimens from Pacific of Panamá (Capa *et al.* 2001).

Description

One of longest specimen 12 mm long, 1 mm wide, with 56 segments. Body long, cylindrical in section, ventrally flattened. Dorsal colour pattern consisting in red pigmentation principally distributed on anterior and posterior parts of each segment forming transversal lines and also a medial

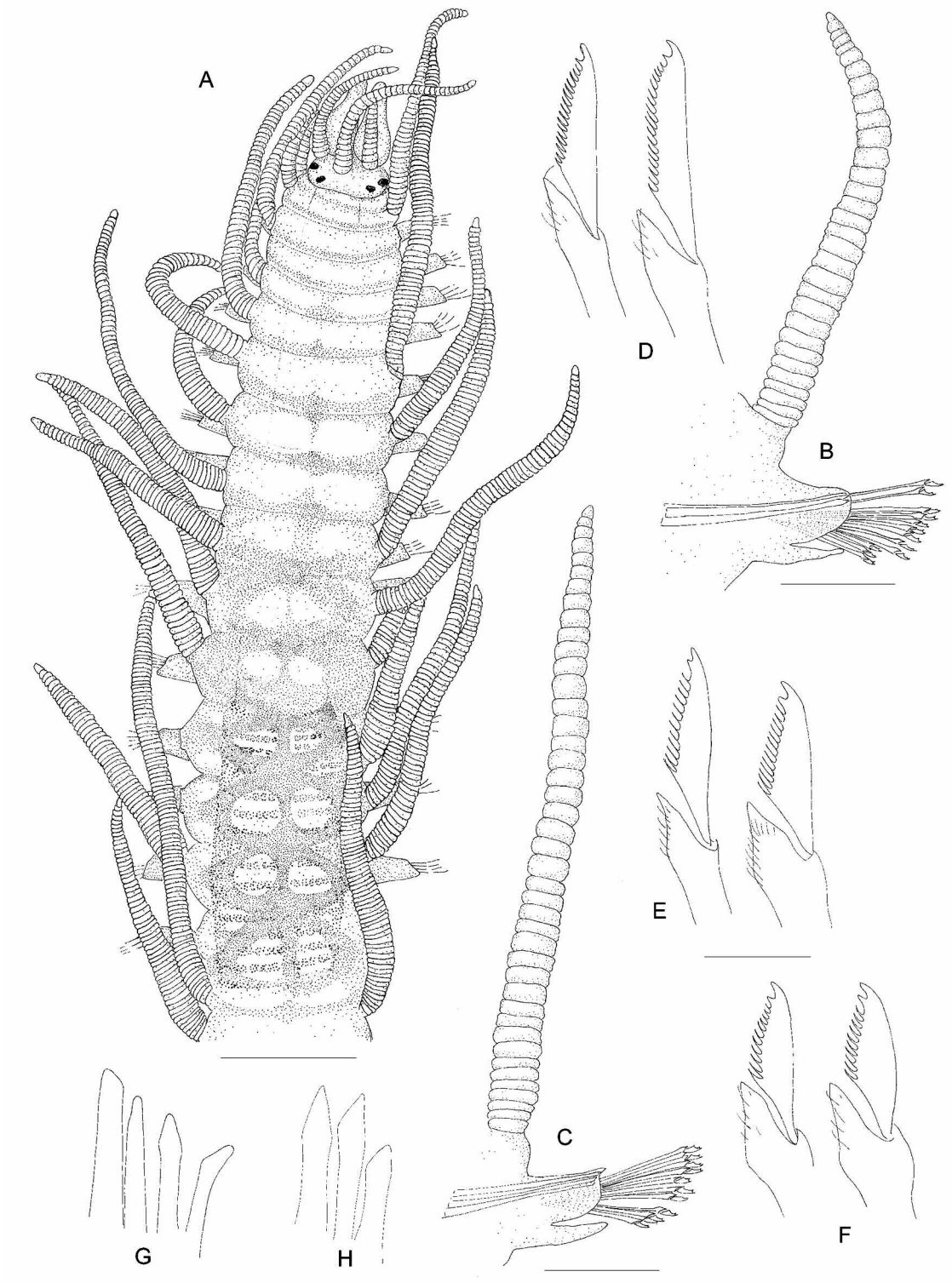

Figure 1. ***Syllis bella*. A.** Anterior part, dorsal view. **B.** Posterior parapodium, anterior view. **C.** Midbody parapodium, anterior view. **D.** Anterior chaetae. **E.** Midbody chaetae. **F.** Posterior chaetae. **G.** Anterior aciculae. **H.** Posterior aciculae. Scale: A, 0.5 mm; B, C, 0.2 mm; D-H, 20 µm.

Figure 1. ***Syllis bella*. A.** Partie antérieure, vue dorsale. **B.** Parapode postérieur, vue antérieure. **C.** Parapode moyen, vue antérieure. **D.** Soies antérieures. **E**. Soies moyennes. **F.** Soies postérieures. **G.** Acicules antérieures. **H.** Acicules postérieures. Echelle : A, 0,5 mm ; B, C, 0,2 mm ; D-H, 20 µm.

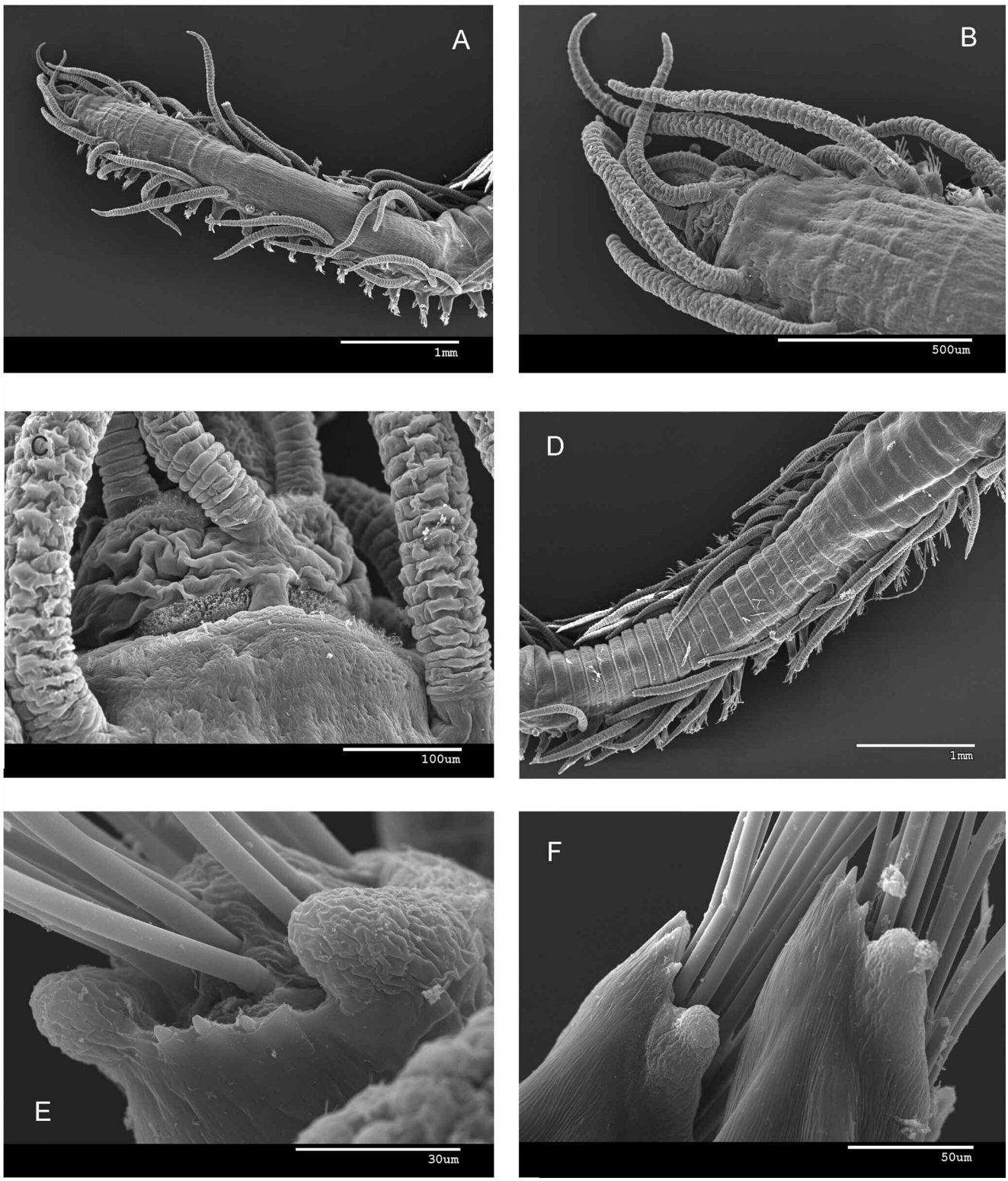

Figure 2. ***Syllis bella*.** SEM. **A, B.** Anterior end, dorsal view. **C.** Prostomium, dorsal view. **D.** Midbody segments. **E, F.** Midbody parapodia, lateral view.

Figure 2. ***Syllis bella*.** MEB. **A, B.** Extrémité antérieure, vue dorsale. **C.** Prostomium, vue dorsale. **D.** Segments moyens. **E, F.** Parapodes moyens, vue latérale.

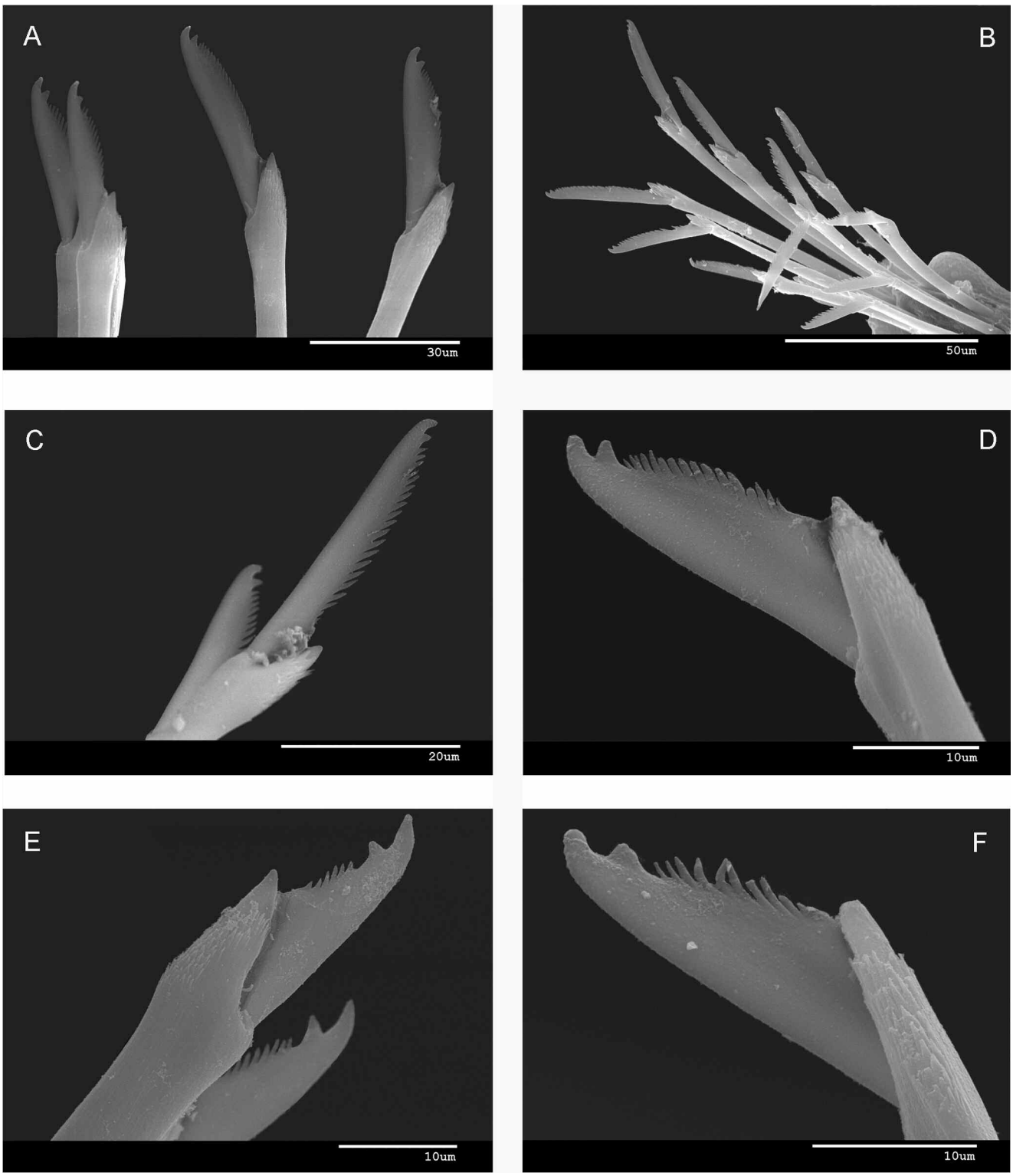

Figure 3. ***Syllis bella*.** SEM. **A-C.** Anterior chaetae. **D.** Midbody chaeta. **E, F.** Posterior chaetae.
Figure 3. ***Syllis bella*.** MEB. **A-C.** Soies antérieures. **D.** Soie moyenne. **E, F.** Soies postérieures.

longitudinal line. Colour pattern more distinct on proventricular segments (Fig. 1A). Prostomium wider than long, with two pairs of eyes in trapezoidal arrangement, anterior ones slightly larger than posterior pair, eye spots absent. Antennae, tentacular and dorsal cirri long and thick, with short, wide articles. Median antenna inserted on middle of prostomium, longer than combined length of prostomium and palps, with 38 articles; lateral antennae shorter, inserted on anterior margin of prostomium, with 27 articles (Fig. 1A). Palps triangular, longer than prostomium, fused at base with a distinct median groove. Nuchal organs forming two ciliary grooves between prostomium and peristomium (Fig. 2C). Peristomium similar in length to subsequent segments. Two pairs of tentacular cirri, dorsal tentacular cirri longer than antennae (Fig. 2B), with 43 articles, ventral ones shorter with 25 articles. Dorsal cirri of most anterior segments with 36-40 articles (Fig. 2A). Midbody and posterior dorsal cirri similar in length to anterior ones (Fig. 2D), with 40 articles. Spiral glands inside articles. Cirrophores distinct. Ventral cirri digitiform, inserted proximally and reaching tips of parapodia (Figs 1B, C). Anterior parapodia with 15 compound chaetae, bidentate blades, slightly decreasing in length (most dorsal c. 25 µm, most ventral c. 22 µm), blade edge with short spines (Figs 1D, 3A-C). Midbody parapodia with 11 compound chaetae, blades bidentate, similar in length to anterior ones (most dorsal c. 22 µm, most ventral c. 20 µm), with short spines on edge (Figs 1E, 3D). Posterior chaetigers with 11-14 compound chaetae, blades bidentate, shorter than those of anterior chaetigers (most dorsal c. 18 µm, most ventral c. 16 µm), and short spines on edge (Figs 1F, 3E, F). Shafts with distal spines. Anterior parapodia with 3-4 pointed aciculae, one slightly bent (Fig. 1G); midbody and posterior parapodia with 2-3 pointed aciculae (Figs 1H, 2E, F). Pygidium conical, with two anal cirri (c. 20 articles). Pharynx longer than proventricle, through 11 segments; tooth on anterior margin. Proventricle extending through 4 segments (Fig. 1A), with about 37 rows of muscular cells.

Remarks

The morphological characters of specimens of *S. bella* from Lebanon agree well with the original and subsequent descriptions of the species (type locality: California) and the comparative material studied from Panamá (Capa et al., 2001). However, the presence of this tropical species from the West Pacific Ocean in the Mediterranean Sea was unexpected since it is only known from Central American Pacific and there is not any intermediate report.

Specimens of *Syllis bella* from Lebanon present some variations in the colour pattern. Some specimens lost it completely; while others present transversal dark-red lines on each segment and, most of them, show a coloration patter consisting in red pigmentation principally distributed in anterior, middle and posterior parts of each segments forming transversal lines (the common coloration pattern of this species). These variations in the studied material could be attributed to the different preservation state of the specimens. There are also some small variations in number of articles of dorsal cirri and number of chaetae per parapodium between specimens from Lebanon and those described by Licher (1999) (from California). Specimens from California showed dorsal cirri with 16-32 articles alternatively, while dorsal cirri in specimens from Lebanon had 36-40 articles. Specimens from California had 9-10 compound chaetae per parapodium, while specimens from Lebanon had 11-15. However, these differences could be attributed to the differences in length between both groups of specimens (specimen described from California with 145 segments, specimen from Lebanon with 56). Therefore, there is not any clear difference between Lebanon specimens and those from Pacific Ocean, and we consider this species could have been introduced from its previous range. Genetic techniques will surely provide us with more information to investigate the identity and origin of this species.

Distribution

Pacific Ocean (California, Panamá). Mediterranean Sea (first report).

Syllis columbretensis (Campoy, 1982)

Typosyllis columbretensis Campoy, 1982: 413.
Syllis columbretensis San Martín, 2003: 443-447, figs 244, 245. Çinar & Ergen, 2003: 780.

Material examined

1 specimen (SMF16391), Beirut harbour, 3-8 m, 2.vi.2000.

Distribution

Atlantic Ocean (Spanish coast). Mediterranean Sea.

Syllis corallicola Verrill, 1900

Syllis (Typosyllis) corallicola Verrill, 1900: 603.
Typosyllis corallicola Licher, 1999: 116-119, fig. 54.
Syllis corallicola San Martín, 2003: 439-443, figs 242, 243. Çinar & Ergen, 2003: 780.

Material examined

1 specimen (SMF16412), Ramkine Island, cave, 5-7 m, 31.5.2000. 1 specimen (SMF16401), Selaata, small caves and overhangs, 3-8 m, 18.10.1999. 2 specimens (SMF16378), Kfar Abida, 7-8 m, 30.v.2000.

Distribution

Caribbean Sea (Bermudas, Antillas, Cuba). Atlantic Ocean (Spanish coasts). Mediterranean Sea.

Syllis ferrani Alós & San Martín, 1987

Syllis ferrani Alós & San Martín, 1987: 35-43, figs 1-5. San Martín, 2003: 390-394, figs 213, 214. Çinar & Ergen, 2003: 782.
Typosyllis ferrani Licher, 1999: 221-223, fig. 93.

Material examined

1 specimen (SMF16344), Ramkine Island, with crust and corals, 13 m, 22.x.1999. 2 specimens (SMF16352), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

Mediterranean Sea.

Syllis garciai (Campoy, 1982)

Langerhansia garciai Campoy, 1982: 386-389, p. 375.
Typosyllis garciai Licher, 1999: 74-75.
Syllis garciai San Martín, 2003: 400-405, figs 219, 220, 221. Çinar & Ergen, 2003: 782-783.

Material examined

1 specimen (SMF16424), Barbara, overhang, 26 m, 8.vi.2000. 2 specimens (SMF16355), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

East Atlantic Ocean (Galicia to Cabo Verde Islands). Caribbean Sea (Cuba, Venezuela). Mediterranean Sea.

Syllis gerlachi (Hartmann-Schröder, 1960)

Typosyllis gerlachi Hartmann-Schröder, 1960: 81-82, pl. 6, figs 43-44. Licher, 1999: 127-129, Fig. 57.
Syllis gerlachi San Martín, 2003: 376-378, figs. 205, 206. Çinar & Ergen, 2003: 783.

Material examined

4 specimens (SMF16371), Kfar Abida, 7-8 m, 30.v.2000. 6 specimens (SMF16356), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

Red Sea. East Atlantic Ocean (Galicia to Cape Verde Islands). Mediterranean Sea.

Syllis gracilis Grube, 1840

Syllis gracilis Grube, 1840: 77. Licher, 1999: 289-291, fig. 10A. San Martín, 2003: 413-416, figs 226, 227. Çinar & Ergen, 2003: 784.

Material examined

2 specimens (SMF16436) and 6 specimens (SMF16397), Beirut harbour, 3-8 m, 2.vi.2000. 1 specimen (SMF16432), Chak el Hatab, cave, 5 m, 4.vi.2000. 2 specimens (SMF16349), Ramkine Island, hardground, 13-14 m, 22.x.1999. 4 specimens (SMF16376), Kfar Abida, 7-8 m, 30.v.2000. 5 specimens (SMF16350), Batroun, encrusted cliff, 9 m, 16.x.1999. 1 specimen (SMF16437), Ramkine Island, hardground, 13-14 m, 22.x.1999. 1 specimen (SMF16386), Selaata, small caves and overhangs, 3-8 m, 18.x.99.

Distribution

Apparently cosmopolitan.

Syllis hyalina Grube, 1863

Typosyllis hyalina Grube, 1863: 45, pl. 4, fig. 8. Licher, 1999: 199-205, fig. 86.
Syllis hyalina San Martín, 2003: 426-429, figs 234, 235. Çinar & Ergen, 2003: 784, 785.

Material examined

10 specimens (SMF16402) and 1 specimen (SMF16387), Selaata, small caves and overhangs, 3-8 m, 18.x.1999. 1 specimen (SMF16430), Dora, on spines of *Stylocidaris affinis*, 50 m, 2.v.2000. 1 specimen (SMF16452), Khaldeh, marina Villamar, with *Caulerpa scalpelliformis*, 1-2 m, 7.vi.2000. 2 specimens (SMF16426), Barbara, overhang, 26 m, 8.vi.2000. 1 specimen (SMF16476), Ramkine Island, with crust and corals, 13m, 22.x.1999. 5 specimens (SMF16374), Kfar Abida, 7-8 m, 30.v.2000. 1 specimen (SMF16383), Ras El Chakaa, cliff, 4-8 m, 19.x.1999. 19 specimens (SMF16395), Beirut harbour, 3-8 m, 2.vi.2000. 2 specimens (SMF16441), Ramkine Island, cave, 5-7 m, 31.v.2000. 19 specimens (SMF16360), Batroun, encrusted cliff, 9 m, 16.x1999.

Distribution

Apparently cosmopolitan.

Syllis* cf. *mayeri Musco & Giangrande, 2005
(Figs 4-6)

(?) *Syllis mayeri* Musco & Giangrande, 2005b: 468-472, figs 1-3.

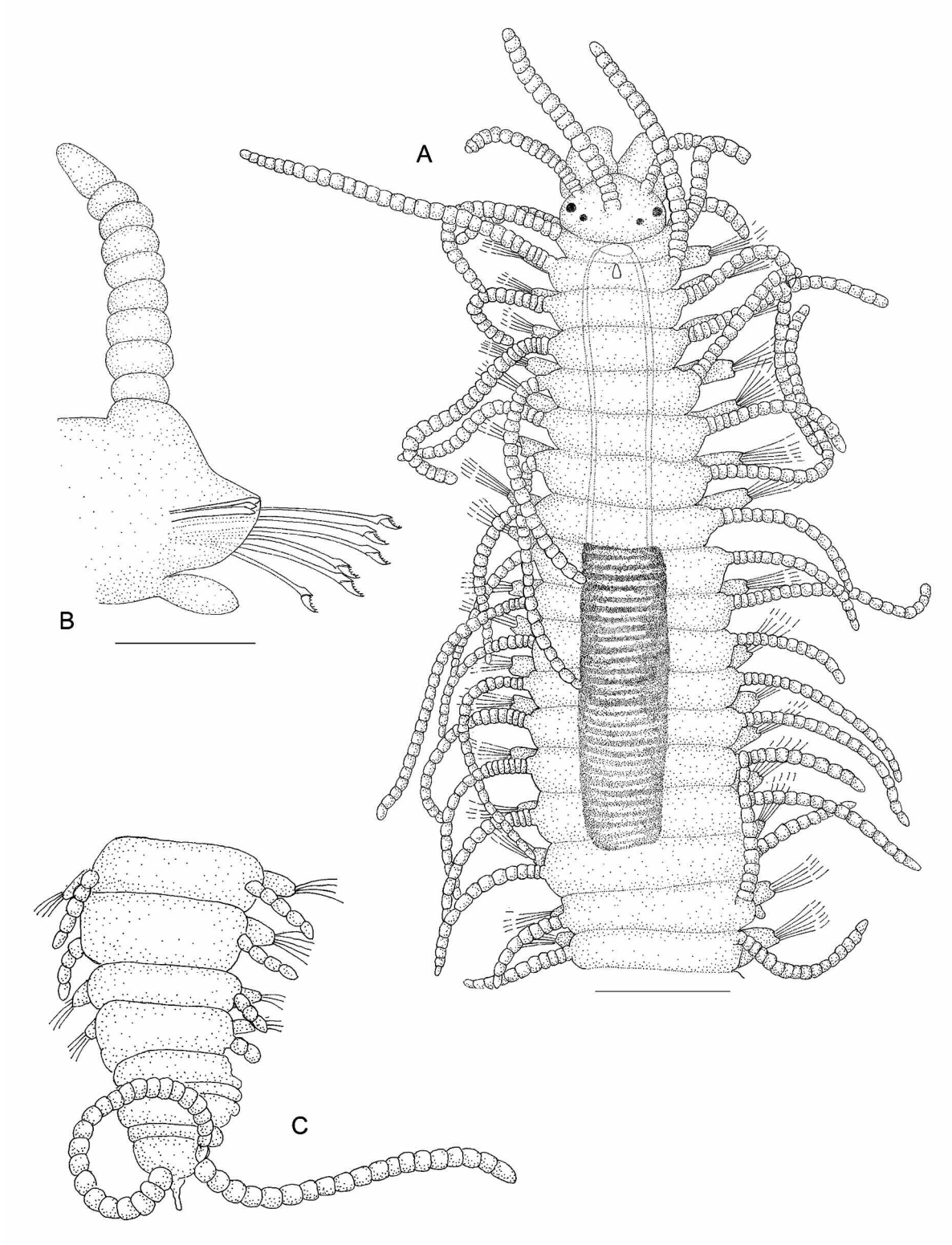

Figure 4. ***Syllis* cf. *mayeri*. A.** Anterior part, dorsal view. **B.** Midbody parapodium, anterior view. **C.** Posterior part, dorsal view. Scale: A, 0.4 mm; B, 98 µm; C, 0.2 mm.

Figure 4. ***Syllis* cf. *mayeri*. A.** Partie antérieure, vue dorsale. **B.** Parapode moyen, vue antérieure. **C.** Partie postérieure, vue dorsale. Echelle : A, 0,4 mm; B, 98 µm; C, 0,2 mm.

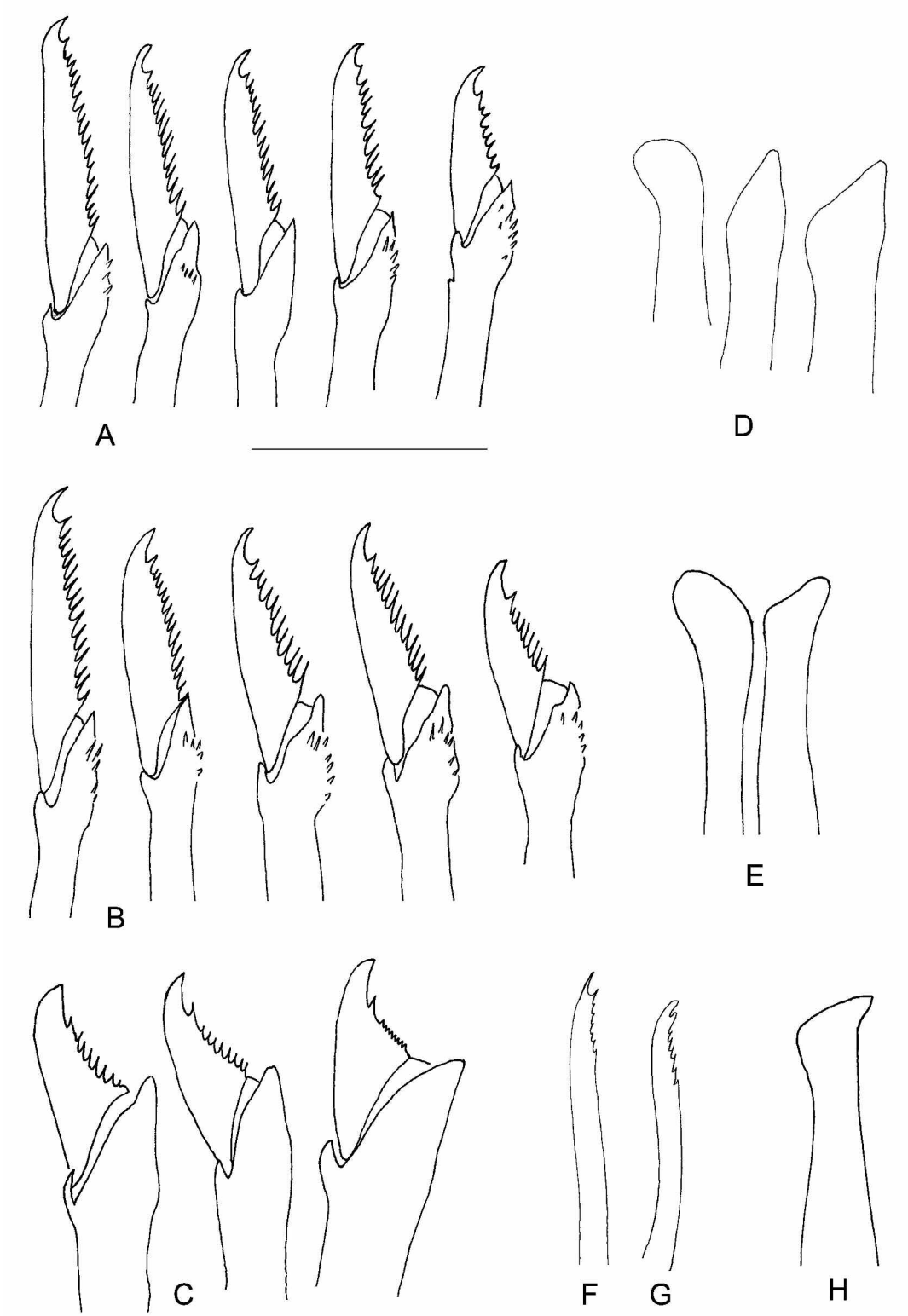

Figure 5. ***Syllis* cf. *mayeri*. A.** Anterior chaetae. **B.** Midbody chaetae. **C.** Posterior chaetae. **D.** Anterior aciculae. **E.** Midbody aciculae. **F.** Dorsal simple chaetae, posterior segment. **G.** Ventral simple chaeta, posterior segment. **H.** Posterior aciculum. Scale: A-H, 20 µm.

Figure 5. ***Syllis* cf. *mayeri*. A.** Soies antérieures. **B.** Soies moyennes. **C.** Soies postérieures. **D.** Acicules antérieures. **E.** Acicules moyens. **F.** Soies simples dorsales, segment postérieur. **G.** Soie simple ventrale, segment postérieur. **H.** Acicule postérieur. Echelle : A-H, 20 µm.

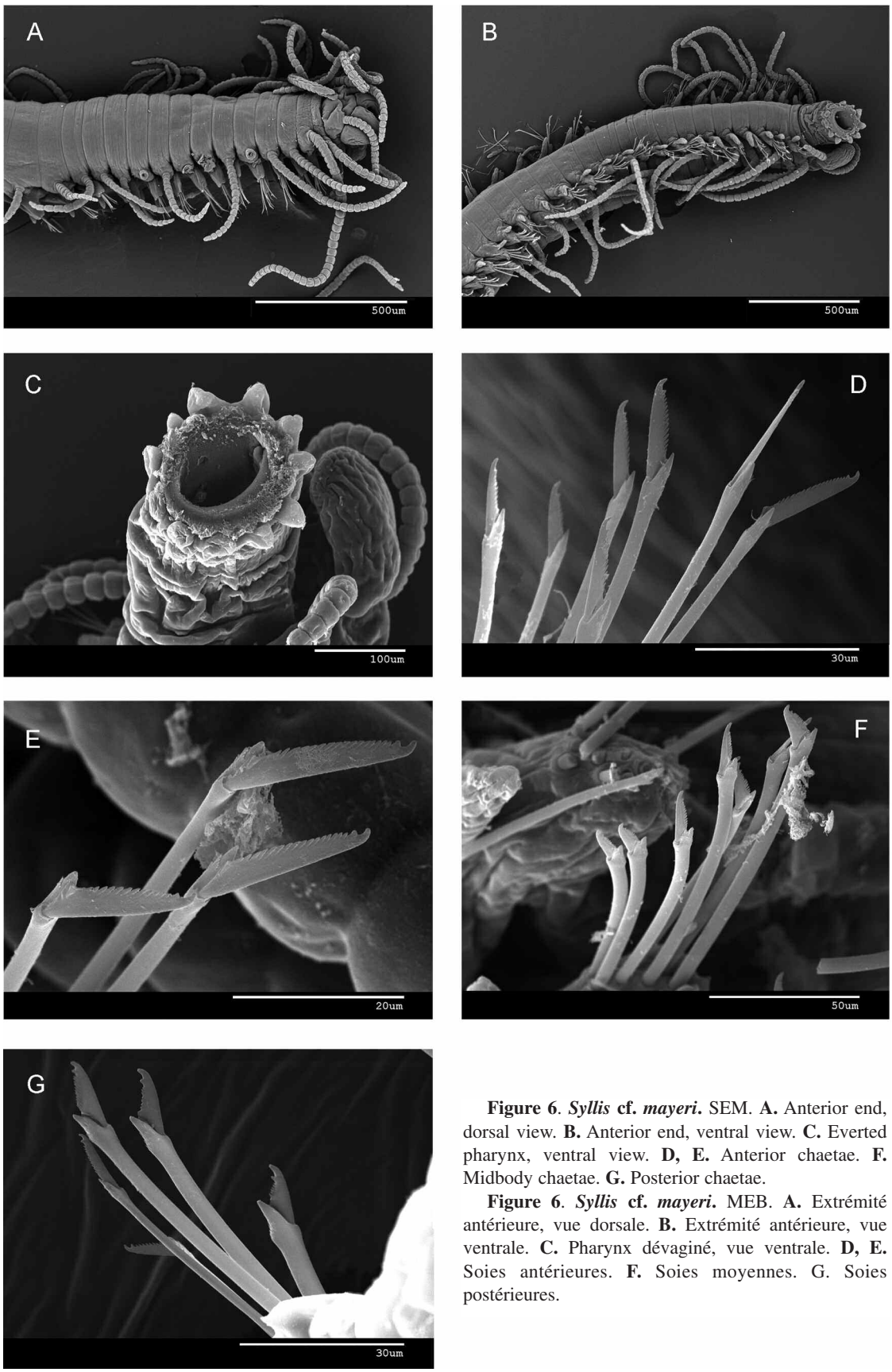

Figure 6. ***Syllis* cf. *mayeri*.** SEM. **A.** Anterior end, dorsal view. **B.** Anterior end, ventral view. **C.** Everted pharynx, ventral view. **D, E.** Anterior chaetae. **F.** Midbody chaetae. **G.** Posterior chaetae.

Figure 6. ***Syllis* cf. *mayeri*.** MEB. **A.** Extrémité antérieure, vue dorsale. **B.** Extrémité antérieure, vue ventrale. **C.** Pharynx dévaginé, vue ventrale. **D, E.** Soies antérieures. **F.** Soies moyennes. G. Soies postérieures.

Material examined

43 specimens (SMF16635), Selaata, small caves and overhangs, 3-8 m, 18.x.1999. 2 specimens (SMF16631), Selaata, caves and overhangs, 23.x.1999. 3 specimens (SMF16634), Jbail, Tablieh, 15-16 m, 17.x.1999. 6 specimens (SMF16469), Ras el Chakaa, cave, 5-6 m, 4.vi.2000. 4 specimens (SMF16630), Barbara, overhang, 26 m, 8.vi.2000. 7 specimens (SMF16629), Ramkine Island, with crust and corals, 13m, 22.x.1999. 29 specimens (SMF16465), Ras El Chakaa, cliff, 4-8 m, 19.x.1999. 1 specimen (SMF16459), Batroun, encrusted cliff, 9 m, 16.x.1999.

Comparative material examined

Syllis mayeri Musco & Giangrande, 2005b. Holotype (MNCN 16.01/10263), Carrie Bow Island (Belize).
Syllis armillaris (Müller, 1771). Several specimens (MNCN 16.01/6744 and 6745), Mediterranean Sea (Types lost).
Syllis gracilis Grube, 1840. 1 syntype (MPW395), Mediterranean Sea. Several specimens (MNCN 16.01/8927, 8928, 8936, 8938, 8948), Mediterranean Sea.
Syllis hyalina Grube, 1863. 1 syntype (MPW396), Lussin Island, Croatia.

Description

Best preserved specimen 8 mm long, 0.7 mm wide, with 70 segments. Prostomium wider than long, with two pairs of eyes in trapezoidal arrangement, anterior ones larger than posterior pair. Median antenna inserted on middle of prostomium, slightly longer than combined length of prostomium and palps, with 20 articles; shorter lateral antennae inserted on anterior margin of prostomium, with 15 articles (Figs 4A, 6A). Palps triangular, similar in length to prostomium, fused at basis with a distinct median groove. Peristomium shorter than subsequent segments, with two pairs of tentacular cirri. Dorsal tentacular cirri similar in length to lateral antennae, with 14 articles, ventral ones with 10 articles (Fig. 4A). Dorsal cirri of most anterior segments with 15-24 articles without a distinct alternation pattern (Fig. 4A). Dorsal cirri after proventricle shorter, with about 10 articles (Fig. 4A & B). Ventral cirri proximally inserted on parapodia, not extending beyond parapodial lobes (Fig. 4B). Anterior parapodia each with 6 compound, heterogomph chaetae, distal part of shafts provided with spines. Bidentate blades, with slight dorsoventral gradation in length (most dorsal c. 25 µm, most ventral c. 13 µm), moderate long spines on the blade edge (Figs 5A, 6D & E). Midbody chaetigers with 6-7 compound chaetae decreasing in number to 4-5 towards posterior segments (Fig. 6G). Blades bidentate, similar to those from anterior blades (Figs 5B & 6F). Posterior chaetae with shorter blades (c. 15-16 µm) (Fig. 5C), distal tips of fangs enlarged. Most posterior chaetigers with one simple dorsal chaeta and one ventral simple chaeta, both bidentate, distally curved and with some subdistal spines (Fig. 5F & G). Anterior parapodia with three aciculae, two distally pointed and one rounded (Fig. 5D). Midbody parapodia with two aciculae, one distally rounded and another distally pointed and slightly curved (Fig. 5E). Posterior segments with one pointed acicula slightly protruding from parapodia (Fig. 5H). Pygidium conical, two anal cirri with 22 articles and a median short anal papilla (Fig. 4C). Pharynx similar in length to proventricle; conical tooth on anterior margin, 10-11 terminal papilla and a distal crown of cilia (Fig. 6B & C). Proventricle extending through 7 segments, with about 40 cell-rows (Fig. 4A). Several specimens developing stolons.

Remarks

The examined specimens are closely related to the species *S. mayeri* from Belize. They are similar in the length and shape of dorsal cirri, which are long and slender on the anterior segments and short and spindle-shaped on the posterior ones. They are also similar in the chaetal shape. Anterior chaetae have in both cases bidentate blades longer than posterior ones, which are short and with distal tips of fangs quite long. Aciculae are similar too in shape and number (Musco & Giangrande, 2005b). Although these similarities are clear, there are also some differences. *Syllis mayeri* has relatively longer anterior dorsal cirri (30-20 articles), but they dismiss in length (7-9 articles) and become spindle-shaped from segments 6-7 towards posterior region. *Syllis* cf. *mayeri* also presents relatively long anterior dorsal cirri (15-24 articles), which dismiss in length becoming shorter and spindle-shaped in the posterior segments (9-10 articles). Notwithstanding, anterior dorsal cirri are shorter than those in *S. mayeri* and they become spindle-shaped and short on the segments after the proventricle (segments 16-17), being present, therefore, in a longer region than they are in *S. mayeri*. The proventricle is similar in length in both species (through 7 segments); however, the pharynx is longer in *S. mayeri* (through 14 segments) than in *S.* cf. *mayeri* (7 segments). In addition, the holotype of *S. mayeri* is considerably larger (24 mm length) while specimens of *S.* cf. *mayeri* from Lebanon are about (7-13 mm length). Considering these differences and the distant geographic distributions (Belize and Mediterranean), studied specimens are identified as *S.* cf. *mayeri*. Only two specimens (holotype and paratype) of *S. mayeri* have been found and, probably, more material of this species would be useful to clarify similarities and differences between both species.

Other similar species are *S. armillaris*, *S. gracilis* and *S. hyalina*, which are considered cosmopolitan species.

However, material from different parts of the world of same species often present some variations in chaetae shape and/or cirri length, being possible that they are in fact different taxa. All these species could actually be complexes of species, and therefore, there would be necessary a more detailed comparative study of material around the world to distinguish populations or even possible different species, which are currently blurred under the same name.

Distribution

Mediterranean Sea.

Syllis jorgei San Martín & López, 2000

Syllis jorgei San Martín & López, 2000: 430. San Martín, 2003: 382-386, figs 208-210. Çinar & Ergen, 2003: 785.

Material examined

1 specimen (SMF16409), Ramkine Island, cave, 5-7 m, 31.v.2000. 1 specimen (SMF16370), Kfar Abida, 7-8 m, 30.v.2000.

Distribution

Atlantic Ocean (Canary Islands). Mediterranean Sea.

Syllis prolifera Krohn, 1852

Syllis prolifera Krohn, 1852: 66-75, pl. 3, fig. 1. San Martín, 2003: 344-347, figs 186, 187. Çinar & Ergen, 2003: 786-787.
Typosyllis prolifera Licher, 1999: 135-140, figs 17S, 5B.

Material examined

1 specimen (SMF16393), Beirut harbour, 3-8 m, 2.vi.2000.

Distribution

Apparently cosmopolitan.

Syllis pulvinata (Langerhans, 1881)

Typosyllis pulvinata Langerhans, 1881: 97-98, 104. Licher, 1999: 158-160, fig. 70.
Syllis pulvinata San Martín, 2003: 372-375, figs 202-204. Çinar & Ergen, 2003: 787.

Material examined

2 specimens (SMF16431), El Zahrani, Harf el Hawieh el Jouani, 14 m, 6.vi.2000. 1 specimen (SMF16427), Barbara, overhang, 26 m, 8.vi.2000.

Distribution

East Atlantic Ocean (Gulf of Biscay to Canary Islands). Red Sea. Mediterranean Sea.

Syllis variegata Grube, 1860

Syllis variegata Grube, 1860: 85-86, pl.3, fig. 6. San Martín, 2003: 351-354, figs 190, 191. Çinar & Ergen, 2003: 788.
Typosyllis variegata Licher, 1999: 101-108, figs 10B, 17D, 49.

Material examined

1 specimen (SMF16368), Batroun, encrusted cliff, 9 m, 16.x.1999.

Distribution

Apparently cosmopolitan.

Trypanosyllis aeolis Langerhans, 1879

Trypanosyllis aeolis Langerhans, 1879: 558. San Martín, 2003: 315-319, figs 174-176. Çinar & Ergen, 2003: 789.

Material examined

1 specimen (SMF16453), Khaldeh, marina Villamar, with *Caulerpa scalpelliformis*, 1-2 m, 7.vi.2000.

Distribution

Apparently circumtropical.

Trypanosyllis zebra (Grube, 1860)

Syllis zebra Grube, 1860: 86. Licher, 1999: 295, 296. San Martín, 2003: 311-315, figs 171-173. Çinar & Ergen, 2003: 789-790.

Material examined

2 specimens (SMF16414), Ramkine Island, cave, 5-7 m, 31.v.2000. 5 specimens (SMF16404), Selaata, small caves and overhangs, 3-8 m, 18.x.1999. 1 specimen (SMF16377), Kfar Abida, 7-8 m, 30.v.2000. 1 specimen (SMF16382), Ras El Chakaa, cliff, 4-8 m, 19.x.1999. 1 specimen (SMF16394), Beirut harbour, 3-8 m, 2.vi.2000. 3 specimens (SMF16366), Batroun, encrusted cliff, 9 m, 16.x.1999. 1 specimen (SMF16442) Jabail, Tablieh, 15-16 m, 17.x.1999.

Distribution

Apparently cosmopolitan.

Discussion

Until present, several species of syllids have been considered introduced in the Mediterranean Sea. For instance, *Paraexogone wolfi* San Martín, 1991 (from Gulf of México and Florida) and *Sphaerosyllis longipapillata*

Hartmann-Schröder, 1979 (from Eastern Australia) were found in Northern Cyprus by Çinar et al. (2003), and *Eusyllis kupfferi* (from Madeira, Cuba and Canary Islands) by Çinar & Ergen 2003. The species *Branchiosyllis exilis* and *Opisthosyllis brunnea* (Ergen et al., 2002) had been traditionally considered Lessepsian migrants; however, Ergen et al. (2002) suggested that they could not be considered real Lessepsian species since their distribution is very wide. *Streptosyllis arenae* Webster & Benedict, 1884 was proposed by Zenetos et al. (2005) as a possible alien species, although its identification is still not certain. In contrast, *S. longipapillata* was proposed as a real Lessepsian migrant (Çinar et al., 2003). Likely, this number of Lessepsian migrants and, in general, the number of all introduced species is very low, and many other species may possibly remain unreported (Çinar, 2003a).

Detecting new aliens depends on accurate taxonomic identifications and the knowledge of local biodiversity (Çinar et al., 2005). However, the lack of knowledge on this issue is, effectively, one of the principal problems in understanding patterns of syllid distribution (Çinar & Ergen, 2002; 2003; Çinar et al., 2003; Musco & Giangrande, 2005a). Another problem is the possible existence of complexes of species, whose identity is blurred under one common specific name; some examples are: *B. exilis*, *S. armillaris*, *S. hyalina* and *S. gracilis* (Martin & Britayev, 1998; San Martín, 2003; Musco & Giangrande, 2005b). Besides, updating of syllid inventories is obviously necessary if aiming to detect possible migrations (Musco & Giangrande, 2005a). Thus, these set of difficulties usually make the identification of introduced species, and the explanation of possible paths of migration, gather in a scenario of unstable conjectures. However, our knowledge of the group is rapidly increasing, and all the small contributions we are currently undertaking shall surely provide a more robust theoretical rationale upon which to identify the origins of the polychaete fauna in the Mediterranean Sea, as well as of other areas.

There are several possibilities that might explain the ways of introduction of the two new reports for the Mediterranean described herein. *Exogone breviantennata* has a circumtropical geographical distribution. The presence of this species on the Lebanon coast and its absence in other well-studied basins of the Mediterranean suggest that it is a newly introduced species for the Mediterranean. It was also reported in the Red Sea (as *E. ovalis*, a synonymy). Hence, the establishment in habitats of the Lebanon utilizing the pathway of the Suez Canal cannot be counter-argued, and therefore, it could be considered as a possible Lessepsian migration. Its possible occurrence on other Levant coasts should notwithstanding be re-checked. In contrast, *S. bella* presents a quite distant distribution from the Mediterranean (Eastern Central Pacific Ocean), and its presence in the Mediterranean coasts is more difficult to explain. We postulate that probably this species could have migrated by fouled ships. The maritime traffic is quite abundant between all seas and it is responsible, in many cases, of the introduction of maritime foreign species (Stigzelius et al., 1997; Çinar & Ergen, 2005; Çinar et al., 2005 & 2006). Musco & Giangrande (2005a) suggested the possibility of a general "tropicalization" trend of the Mediterranean fauna. This has been advocated as a possible explanation for the current presence of several species otherwise typical from warm waters. In turn, other species, generally from cold waters, previously reported in the Mediterranean, are seemingly absent now since they have not been recently reported. The presence of *E. breviantennata* and *S. bella* could support this hypothesis.

Finally, the geographic distribution of *Syllis mayeri* is less known. It has only been reported in a distant area, such as Belice (Musco & Giangrande, 2005b). If the identification of *S.* cf. *mayeri* would finally be corroborated as *S. mayeri*, the pathway by which it has become established in waters of the Lebanon would be unknown at this stage.

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