

## A new sponge-associated species, *Syllis mayeri* n. sp. (Polychaeta: Syllidae), with a discussion on the status of *S. armillaris* (Müller, 1776)\*

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**SUMMARY:** In the framework of a study carried out along the Belizean coasts, a new species of syllid, *Syllis mayeri* n. sp., was found harboured by the sponge *Ircinia strobilina*. The description of this new taxon is given, and compared to other similar congeneric species and to some Mediterranean material from the southern Italian coast ascribed to *S. armillaris*. The new species is characterized by some stout compound chaetae with ypsiloid appearance, whose probable use for attaching to the host is hypothesized. Other diagnostic features are antennae, tentacular cirri and dorsal cirri of the anterior portion of the body that are longer than in similar, compared species. Moreover, the mid-body dorsal cirri are typically spindle-shaped. A discussion on the status of some sponge-associated taxa from tropical and subtropical seas attributed to the so-called cosmopolitan *S. armillaris* is also given.

**Keywords:** Syllidae, Belize, Mediterranean, cosmopolitanism, symbiosis.

**RESUMEN:** UNA NUEVA ESPECIE ASOCIADA A ESPONJAS, *SYLLIS MAYERI* N. SP. (POLYCHAETA: SYLLIDAE), CON UNA DISCUSIÓN SOBRE LA POSICIÓN TAXONÓMICA DE *S. ARMILLARIS* (MÜLLER, 1776). – Una nueva especie de sílido, *Syllis mayeri* n. sp., se encontró durante la realización de un estudio sobre poliquetos asociados a la esponja *Ircinia strobilina* en la costa de Belice. En el presente trabajo, se describe el nuevo taxón y se compara con otras especies similares, así como con otro material mediterráneo de la costa del sur de Italia atribuido a *S. armillaris*. La nueva especie se caracteriza por presentar algunas sedas compuestas engrosadas, de apariencia ypsiloide, que podría usar para engancharse a su huésped. Otros caracteres diagnósticos son la longitud de las antenas, cirros tentaculares y cirros dorsales de la región anterior del cuerpo, mayor que en las especies similares comparadas. Además, los cirros dorsales de la mitad del cuerpo son típicamente fusiformes. Se discute también la posición de algunos taxa simbioses de distribución tropical y subtropical atribuidos a *S. armillaris*, considerada tradicionalmente como una especie cosmopolita.

**Palabras clave:** Syllidae, Belice, Mediterráneo, cosmopolitismo, simbiosis.

### INTRODUCTION

During a study on polychaetes associated with the sponge *Ircinia strobilina* (Lamarck, 1816) carried out at Carrie Bow Island (Belize) (Giangrande

*et al.*, 2002), two large individuals of a taxon, firstly identified as *Syllis* cf. *armillaris*, were found. A further, more detailed examination highlighted some features, including the symbiotic-like shape of some chaetae (Martin and Britayev, 1998), that distinguished the collected specimens from *S. armillaris* (Müller, 1771).

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*Syllis armillaris*, however, is a problematic taxon. The species was initially described in Arctic waters (Greenland), and is currently considered to be a cosmopolitan form (Licher, 1999; Uebelacker, 1984). However, some descriptions of taxa assigned to *S. armillaris* markedly differ from each other and from Licher's (1999) re-description of the species. This is the reason why López *et al.* (2001) proposed the existence of a sibling-species-complex, thus criticizing its so-called cosmopolitan distribution.

The species has also been reported widely distributed along the Italian coast, inhabiting photophilic hard substrata with algal covering (Castelli *et al.*, 1995). It has been considered a herbivorous form (Giangrande *et al.*, 2000).

In the present paper, in addition to the description of the new species from Belize, we compared it to some Mediterranean material from the southern Italian coast ascribed to *S. armillaris*.

## MATERIAL AND METHODS

The material from Carrie Bow Island, Belize was sorted from the sponge *Ircinia strobilina*, collected in July 2001 in the sub-littoral zone at 15 m depth by SCUBA-divers. Samples were fixed with 10% formalin, sorted under a stereomicroscope and then preserved in 70% ethanol. One specimen was chosen as the holotype and deposited in the Museo Nacional de Ciencias Naturales de Madrid (MNCNM). For scanning electron microscope (SEM) observations, one preserved worm was washed three times in distilled water (30 min each), run through a series of ethanol ending with 100%, critical-point dried, attached to a stub and coated with gold. SEM observation was carried out at the University of Genoa and all the images were captured and stored in digital format.

The study was also based on preserved specimens of *S. armillaris* which were deposited within the authors' personal collection in the Dipartimento di Scienze e Tecnologie Biologiche e Ambientali of the University of Lecce (Italy). The material was collected from Torre Inserraglio (Nardò, southern Italy, Ionian Sea) in July 2003 by scraping off the hard substrate at 1 m depth, on photophilic algal substratum using SCUBA-diving. Samples were fixed in 10% formalin, sorted under a stereomicroscope and then preserved in 70% ethanol. Drawings were obtained using a camera lucida.

## TAXONOMIC ACCOUNT

Family SYLLIDAE Grube, 1850  
Subfamily SYLLINAE Grube, 1850  
Genus *Syllis* Lamarck, 1818  
*Syllis mayeri* n. sp. (Figs. 1-3)

*Material examined*: 2 specimens from Carrie Bow Island (Belize), 15 m depth, on July 2001, within *Ircinia strobilina* (Lamarck, 1816), Renata Manconi coll. Holotype: MNCNM catalogue number 16.01/10263. Paratype: under preparation for SEM, in the authors' personal collection.

*Type locality*: Carrie Bow Island, Belize.

*Description*: Body cylindrical and slender, narrowing towards prostomium and pygidium; brownish, without colour marks; 24 mm long and 0.6 mm wide at proventricle level without parapodia (0.8 mm at chaetiger 26); 163 chaetigers (Figs. 1a, c). Prostomium (Fig. 1b) oval to rounded; palps long, somewhat ovoid, fused at bases; 4 lensed eyes in open trapezoidal arrangement; 3 antennae with triangular arrangement at insertion; median antenna with about 20 articles, and lateral ones with 14 articles. Tentacular segment (peristomium) rectangular and shorter than subsequent segment. Tentacular cirri very long; dorsal ones with 34-35 articles and ventral ones with 19-20 articles. Pharynx long, 1.9 mm (14 chaetigers) and 0.20 mm wide with a relatively large, sub-romboidal, anterior tooth. Proventricle shorter than pharynx, 1 mm in length (7 chaetigers) and 0.37 mm wide, with 33 muscle cell rows.

Dorsal cirri of anterior segments long, alternating 30-20 articles; dorsal cirri from proventricular region short, with only 7-9 articles (Fig. 3f), becoming shorter and spindle-shaped from mid-body (Fig. 1d, 3e). Ventral cirri slender and digitiform (Fig. 3d). Parapodia conical, with 7-9 compound chaetae on anterior chaetigers, 7-8 on mid-body chaetigers, and 4-5 on posterior ones.

Blade lengths ranging from 41  $\mu\text{m}$  of dorsal-most to 21  $\mu\text{m}$  of ventral-most, with distinct dorso-ventral gradation in the anterior region (Figs. 2a-d, 3a). Gradation progressively less marked (Fig. 3b) towards mid-body (starting from about chaetiger 35) with all blades short and stout, measuring about 20  $\mu\text{m}$ , without gradation, and having an ypsiloid appearance on some parapodia (Figs. 2f-h, 3c). Falcigers of posterior parapodia return again to a shape similar to the anterior ones, with dorso-ventral gradation (Figs. 2j-l), but slender (34.4  $\mu\text{m}$  longest blades, 25  $\mu\text{m}$  middle ones, and 18  $\mu\text{m}$  shortest

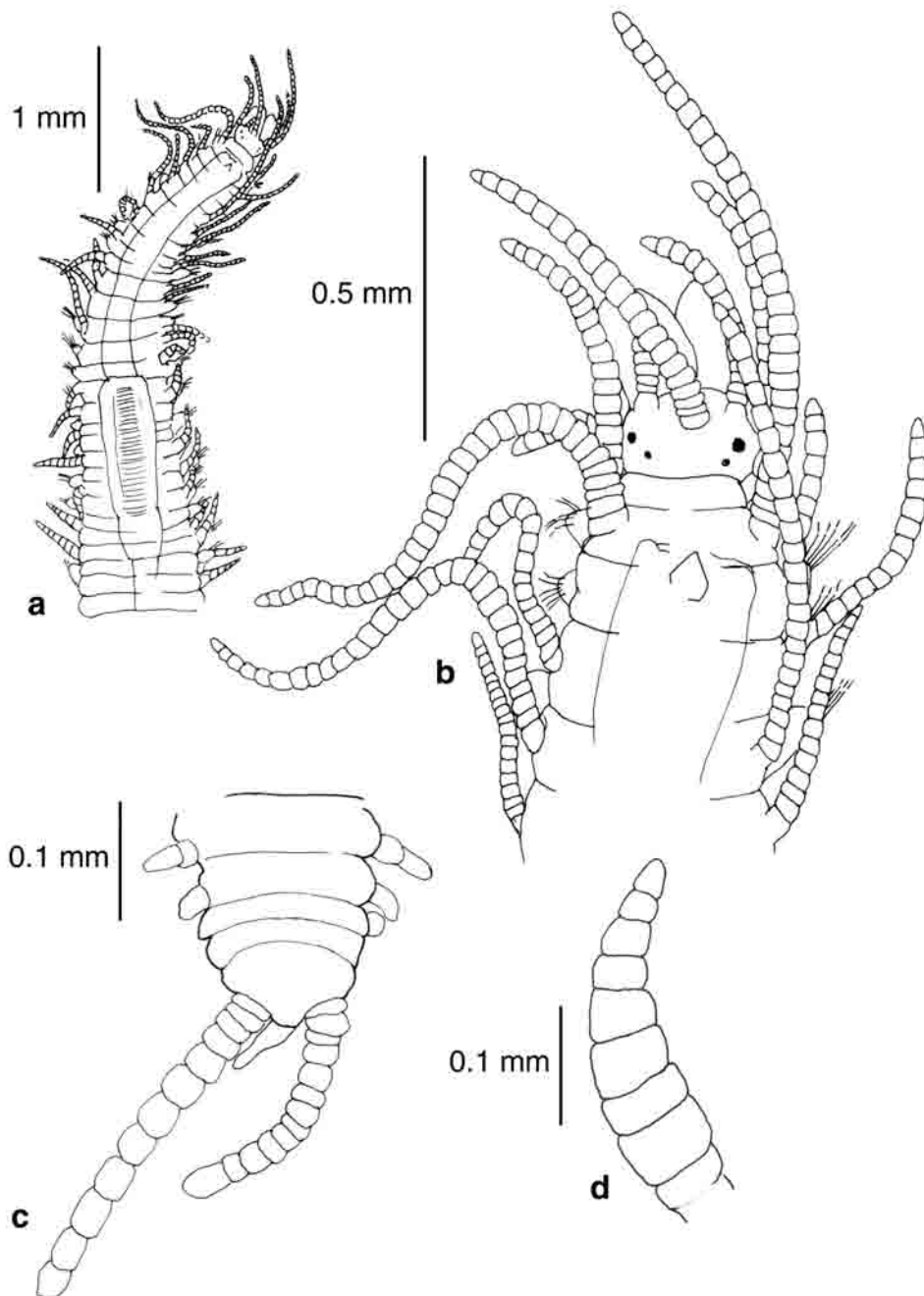


FIG. 1. – *Syllis mayeri* n. sp. (a) anterior end, dorsal view; (b) prostomium; (c) pygidium; (d) dorsal cirrus, mid-body.

ones). Tip of chaetae clearly bidentate on anterior and posterior falcigers, but much less clear at mid-body; sub-distal tooth almost disappears in very short, stout blades, giving them a unidentate appearance. Dorsal (Fig. 2m) and ventral (Fig. 2n) simple bidentate chaetae, both starting from chaetiger 147; ventral being present until last chaetiger, dorsal one disappearing after chaetiger 151. Aciculae stout emerging from the chaetigers in mid-posterior parapodia, numbering 4 in the anterior chaetigers, 2, very different in sizes, in mid-body, and solitary in

the posterior parapodia (Fig. 2e, i, o). Pygidium with two lateral anal cirri, with 12 articles, and a median, not articulate, digitiform appendage (Fig. 1c).

*Ecology:* The new species was found in the canals of the sponge *Ircinia strobilina* collected in the sub-littoral zone at 15 m depth.

*Etymology:* We would like to name the new species after Alexander M. H. Mayer, a young artist and friend, recently deceased.

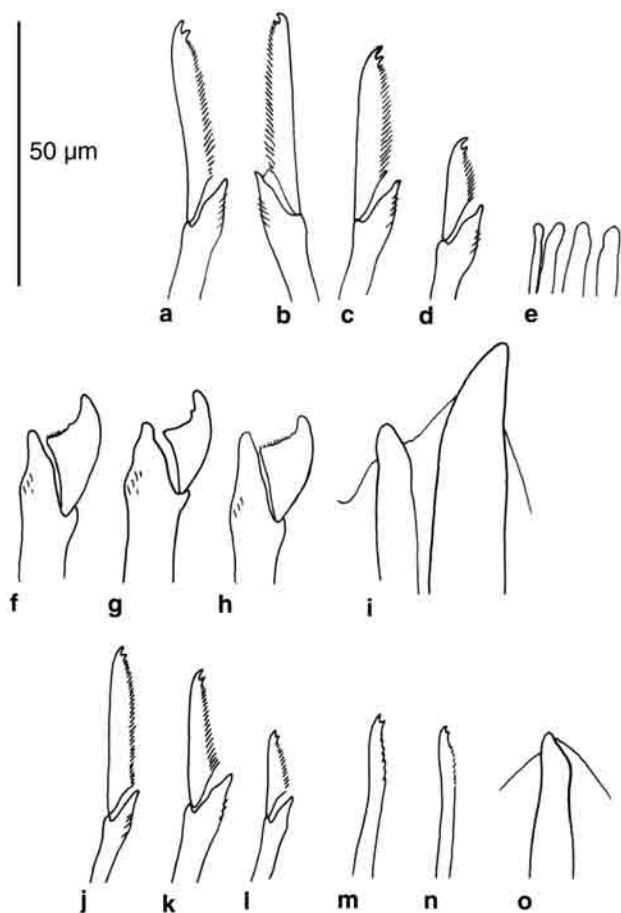


FIG. 2. – *Syllis mayeri* n. sp. (a-d) chaetae, anterior parapodia; (e) aciculae, anterior parapodia; (f-h) stout chaetae, mid-body; (i) aciculae, mid-body; (j-l) chaetae, posterior parapodia; (m) dorsal simple chaeta; (n) same, ventral (o) acicula, posterior parapodia.

**Remarks:** The slender appearance of the anterior segments, of one of the specimens examined could indicate the presence of asexual reproduction, as already observed in related taxa (López *et al.*, 2001).

The two individuals examined showed a variation in the length of the blade. The stout compound chaetae of the middle portion of the body was slightly shorter and more clearly ypsiloid in the specimen utilized for SEM analysis. The presence of these chaetae could be an indication of the life-style of the species. Similar chaetae are present in other symbiotic syllids, as well as in other symbiotic polychaetes belonging to other families. Stout blades could, in fact, be useful for attaching to the host (Martin and Britayev, 1998). However, it is hard to infer a strict relation between structure and function. Similar chaetae (or stout, secondary simple chaetae; e.g. *S. gracilis*, *S. ferrani*, *S. amica*) are also present in other syllids not considered symbiotic, but which also inhabit a large range of habitats apart from living organisms (San Martín, 2003).

Ypsiloid chaeta is one of the features that distinguish *S. mayeri* n. sp. from *S. armillaris* (Müller, 1771), the species that most closely resembles the new taxon. However, among the congeneric species, Licher (1999) considered a group of different taxa as included in the “*armillaris* complex”. *Syllis mayeri* n. sp. roughly resembles the taxa included in this group in the general shape of the aciculae; however, among these species, *S. crassicirrata* (Treadwell, 1925), *S. neglecta* Grube, 1870, *S. stellaepolaris* (Hartmann-Schröder, 1993), and *S. valida* Grube, 1857, clearly differ in the shape and length of the blades of chaetae. In particular, in the anterior chaetigers, the blades are always shorter than those observed in the new taxon. In addition to blade shape, *S. krohnii* Ehlers, 1864 and *S. ehlersioides* (Marenzeller, 1890) differ in the general aspect of the dorsal cirri; in particular, the dorsal cirri from the mid-body are always longer than in *S. mayeri* n. sp. *Syllis violacea* (Grube, 1870) always has clearly bidentate chaetae and long and short dorsal cirri alternating all along the body. *Syllis hyalina* Grube, 1863, resembles *S. mayeri* n. sp. in the general aspect of the body and in the shape of the anterior chaetae blades, but differs in the length of the antennae, tentacular cirri, and anterior dorsal cirri (always shorter in *S. hyalina*) and in the number of chaetae per chaetiger (always higher in *S. hyalina*). Among the species not included in the “*armillaris* complex”, *S. ferrani* Alós and San Martín, 1987 shows a similar distributional pattern and shape of the median dorsal cirri, but differs in the presence of the characteristic 8-shaped dorsal colour marks and the typical stout secondary simple chaeta. *Syllis gracilis* Grube, 1840 resembles the new taxon in the general aspects of the body and in the shape and length of the median dorsal cirri, but differs due to the fusion between the blade and shaft of the stout chaetae of the mid-body (absent in *S. mayeri* n. sp.), the ovoid ventral cirri (digitiform and slender in *S. mayeri* n. sp.) and the shorter tentacular cirri and anterior dorsal cirri.

However, the strong likeness between the new species and *S. armillaris* requires a deeper analysis. Apart from the presence of the peculiar ypsiloid stout chaeta, other differences distinguish the new taxon from *S. armillaris*. Among these are: the length of the antennae, the tentacular cirri and dorsal cirri of the anterior portion of the body are longer in the new taxon; the more marked spindle-shape of the posterior dorsal cirri; the length of the pharynx, which is longer in the new taxon, also showing a

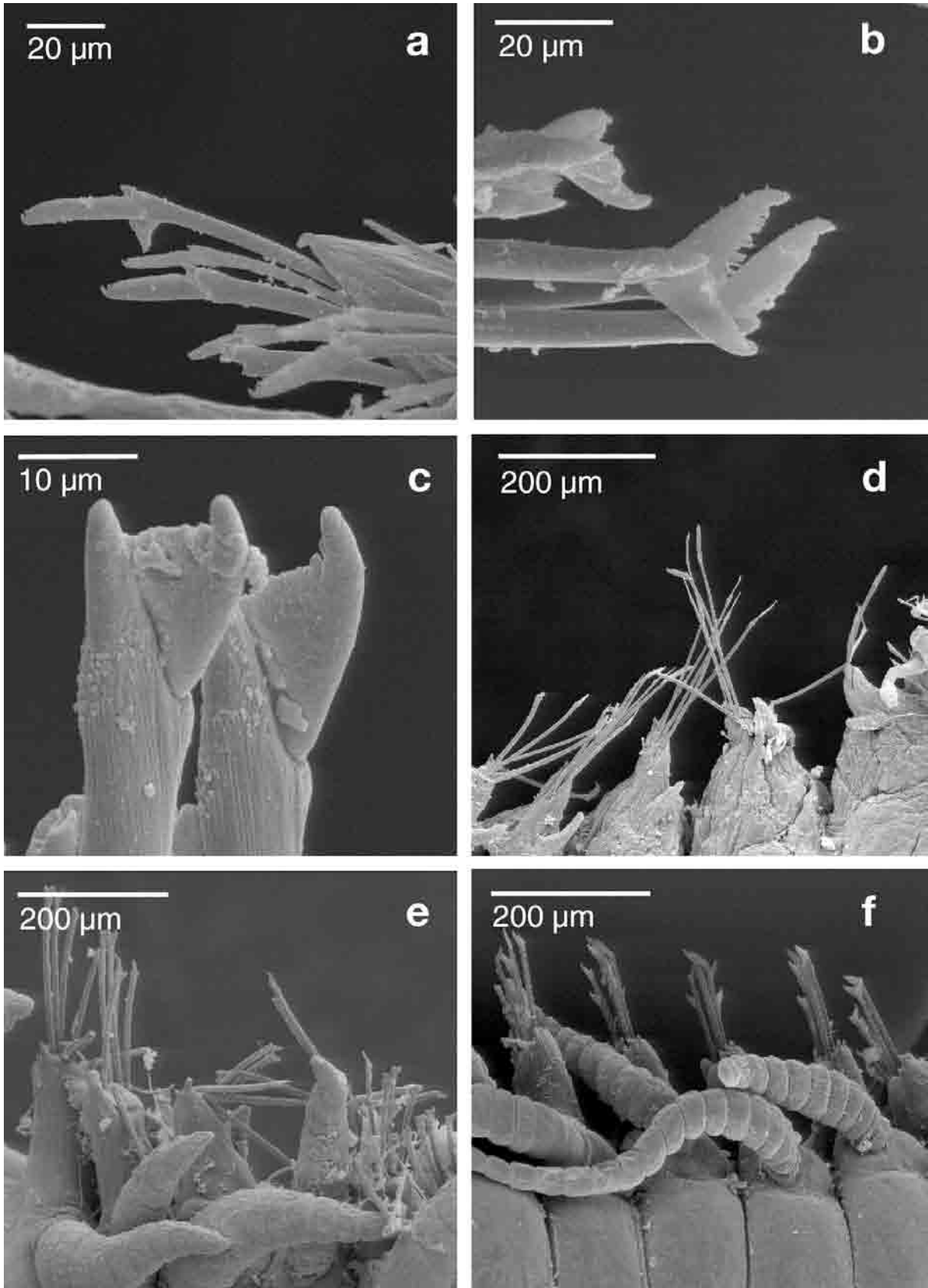


FIG. 3. – *Syllis mayeri* n. sp. SEM photos. (a) chaetae, anterior parapodia; (b) same, proventricular region; (c) same, mid-body; (d) ventral cirri; (e) dorsal cirri, mid-body; (f) same, proventricular region.

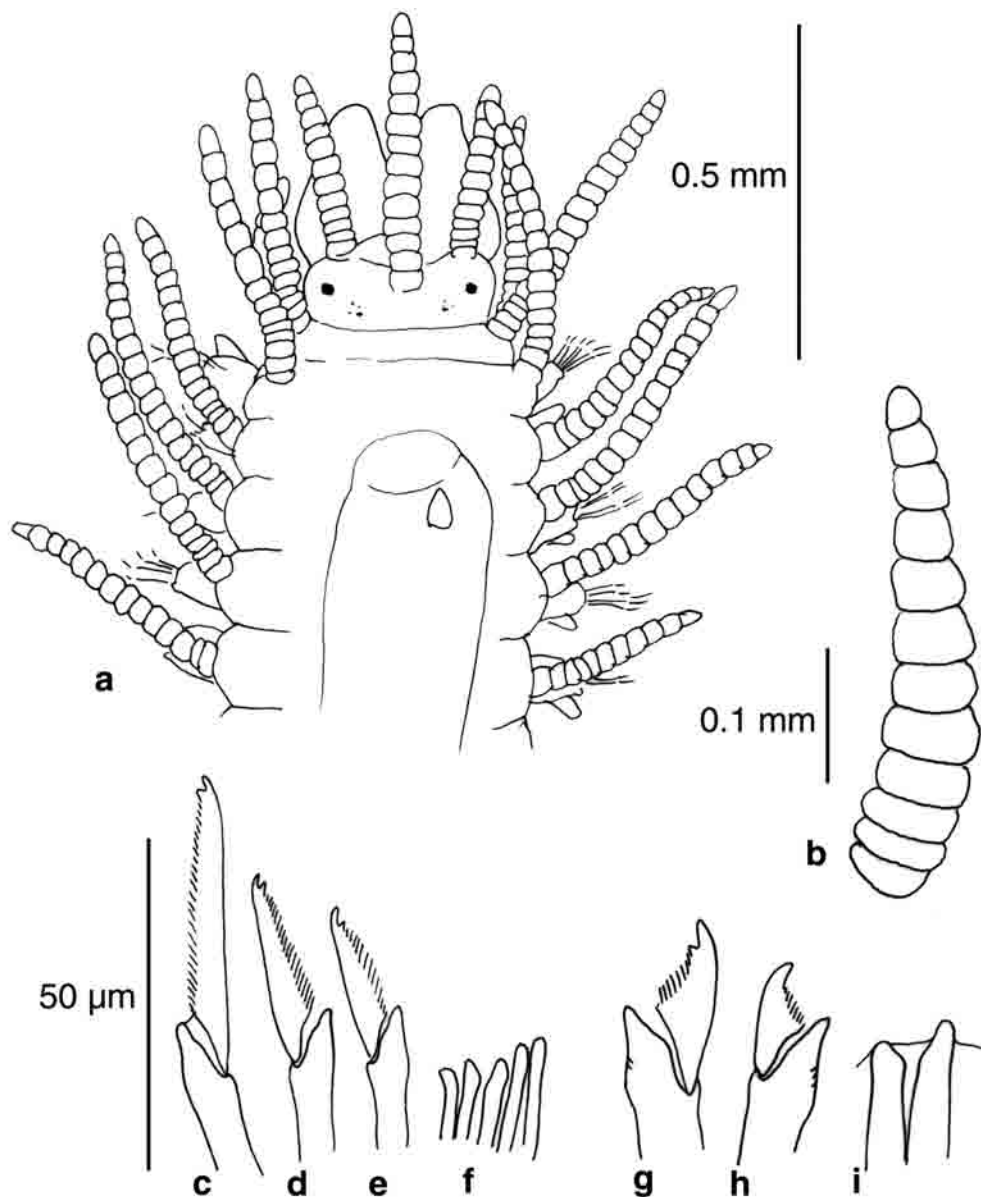


FIG. 4. – *Syllis armillaris*. (Müller, 1771). (a) prostomium; (b) dorsal cirrus, mid-body; (c-e) chaetae, anterior parapodia; (f) aciculae, anterior parapodia; (g,h) chaetae, mid-body; (i) aciculae, mid-body. Specimen from southern Italy.

bigger faringeal tooth; the length of the blades, that in the new taxon are always longer in all chaetal kinds. The new species measurements were compared to similarly sized specimens of Licher's (1999) re-description.

***Syllis armillaris* (Müller, 1771) (Fig. 4)**

*Nereis armillaris* Müller, 1771;  
*Typosyllis armillaris* (Müller): Licher, 1999

*Material examined*: 31 specimens (preserved in 70% ethanol in the authors' collection), collected on July 2003 from 1 m depth, on photophilic algal substratum at Torre Inserraglio (Nardò, southern Italy, Ionian Sea).

*Description*: Largest specimen 24 mm long and 0.53 mm wide; 155 chaetigers. Body cylindrical, brownish without colour marks. Prostomium (Fig. 4a) oval; palps long, triangular, fused at bases; 4 lensed eyes in open trapezoidal arrangement; median antenna with 13-14 articles and lateral ones with 10-12. Pharynx 1.3 mm long (9 chaetigers), armed with a relatively short, conical, anterior tooth. Proventricle 1 mm long (7 chaetigers), with 37 muscle cell rows. Tentacular segment (peristomium) rectangular and narrower than subsequent segments; tentacular dorsal and ventral cirri with 15 and 11 articles respectively. Dorsal cirri of anterior segments alternating in length

(15-18 articles on chaetiger 1, 12-15 on chaetiger 2); dorsal cirri of mid-body (Fig. 4b) slightly spindle-shaped, alternating 7-9 articles. Anterior chaetigers with 10-11 falcigers, 4-5 on mid-body ones. Blade lengths ranging from 44  $\mu\text{m}$  of dorsal-most to 23  $\mu\text{m}$  of ventral-most on anterior parapodia (Figs. 4c-e), from 26  $\mu\text{m}$  to 17  $\mu\text{m}$  on mid-body parapodia (Figs. 4g, h) and from 34.5  $\mu\text{m}$  to 18.4  $\mu\text{m}$  on posterior ones. Blades with distinct dorso-ventral gradation on anterior and posterior chaetigers, less marked on mid-body ones. Tip of chaetae clearly bidentate on anterior and posterior parapodia; the sub-distal tooth becomes finer on the mid-body parapodia giving the blades a unidentate appearance. Aciculae (Figs. 4f, i), numbering 5 in the anterior parapodia, 2, similar in size, in mid-body, and solitary, straight and with oblique tip emerging from the chaetiger in the posterior parapodia.

*Ecology and distribution:* The species is considered cosmopolitan and inhabits a great variety of habitats, ranging from sandy bottoms or stones to *Laminaria*, *Posidonia* meadows and algae from 0 to 100 m depth, including living organisms.

*Remarks:* The specimens of *S. armillaris* correspond well both to San Martín's (2003) description for the Iberian coast, except for having a lower number of anterior chaetae, and to Licher's (1999) re-description of the species, apart from the blade length of both anterior and posterior parapodia (longer in the Mediterranean material) and in the number of anterior chaete (higher in the Mediterranean material).

## DISCUSSION

The taxonomy of *S. armillaris* is an old problem shared with other syllids that are reported to have large geographic distributions. This is the case, for example, of the most representative symbiotic species harboured by sponges, *Haplosyllis spongicola* (Grube, 1855), whose close examination revealed the existence of a complex of species morphologically and biologically distinguishable (Martin *et al.*, 2003).

Ben-Eliahu (1977), discussing the polymorphic status of *S. armillaris*, distinguished 3 types of *S. armillaris*: Type 1, without the usual reduction in number and length of falcigers, and with chaetae blades that are always bidentate; this type strongly

resembles *S. hyalina*. In fact, according to Licher (1999), the main differences between the two species can be found in the number of chaetae from anterior parapodia (higher in *S. hyalina*); the number of proventricular rows of muscle cells (higher in the first species); and the position of the aciculae (never protruding from the parapodia in *S. hyalina*). Type 2, without a marked reduction in the number of chaetae, but with a reduction in the length of blades, becoming unidentate in the mid-body, and becoming long again and bidentate toward the pygidium; this type is the true *S. armillaris*. Finally, type 3 is characterized by the reduction in number of chaetae in the mid-body, with consolidation of the blade tending towards an ypsiloid condition, increasing in length and becoming posteriorly bidentate. This last type clearly resembles *S. mayeri* n. sp.

Some taxa ascribed to *S. armillaris*, but having the characteristic stout chaetae in the middle portion of the body, could be, in our opinion, ascribed to the type 3 group. They are *S. gracilis* Grube, 1840, reported for Cuba (Rullier, 1974), *Typosyllis armillaris*, for the Red Sea (Amoureux *et al.*, 1978), *S. striata* (Hartman-Schröder, 1960) for the Red Sea (Hartman-Schröder, 1960), and *S. armillaris* for the Mediterranean coast of Israel and the Gulf of Elat (Ben Eliahu, 1977). All these records have the habitat in common: they were found within sponges in tropical or subtropical areas.

Finally, another tropical symbiotic form that cannot be ascribed to the type 3 group is that reported as *S. cf armillaris* by López *et al.* (2001). This last taxon has a pharynx that is longer than that of *S. armillaris*, lacks the dorso-ventral gradation of chaetae on the mid-body, and has stronger spindle-shaped middle dorsal cirri. These features correspond well to what was observed in *S. mayeri* n. sp., as well as the length of blades of the dorsal-most anterior falcigers. However, the new taxon differs in the length of tentacular cirri (longer in our specimens), in the characteristic ypsiloid chaeta (absent in *S. cf armillaris*), in a different dorso-ventral gradation of the blades of the anterior falcigers (41-21  $\mu\text{m}$  in *S. mayeri* n. sp. vs. 41-31  $\mu\text{m}$  in *S. cf armillaris*) and in the absence of a clear gradation in the stout chaetae of the middle-posterior part of the body (20  $\mu\text{m}$  vs. 20-25  $\mu\text{m}$ ). Another difference is the living habitat: the specimens of *S. cf armillaris* were found associated with specimens of hermit-crabs (López *et al.*, 2001), and not within sponges.

In conclusion, even though we agree with the existence of an *S. armillaris* sibling species com-

plex, the presently described new species is clearly distinguishable from *S. armillaris* as confirmed by the comparison between *S. mayeri* n. sp. and specimens of *S. armillaris* collected in the Mediterranean Sea (southern Italy).

Moreover, some forms markedly differing from *S. armillaris*, have been roughly considered the same species up to now. This is the case of *S. armillaris* type 3 group sensu Ben-Eliahu (1977), to which *S. mayeri* n. sp. seems to belong.

Our hypothesis is that the symbiotic species with ypsilonid chaetae and tropical distribution do not belong to the *S. armillaris* sibling species complex (whose existence may be an interesting subject for further studies). In this context, and according to our finding, the supposed cosmopolitanism of the species could be nothing more than a mirror of the lack of taxonomic knowledge.

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