



## Description of a new species of *Streptosyllis* (Polychaeta: Syllidae) from the Mediterranean and Canary Islands with a re-description of *Streptosyllis arenae* and comments on the taxonomy of *Streptosyllis* and some morphologically similar genera

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### Abstract

A new *Streptosyllis* species, *S. nunezi* n. sp., is described from shallow sandy substrates in the Mediterranean and the Canary Islands. The new species is distinguished by a unique combination of characters: teeth of the shafts of the compound chaetae covered by hyaline hood; 1–2 lateral tips formed by the hyaline hood covering the blades of the compound chaetae; strongly serrated dorsal simple chaetae which appear as 2–4 robust teeth when viewed laterally. The re-description of its closest congener, the type species *S. arenae* Webster and Benedict, 1884, is also provided based on the type material, as well as a key to the currently valid species and table of characters for the genus. Finally, some comments are made for the characters distinguishing the genera *Streptosyllis*, *Syllides*, *Anoplosyllis*, *Astreptosyllis* and *Streptospinigera*, which are listed in a table and a potential key for their identification is proposed.

**Key words:** Mediterranean, Canary Islands, sandy substrate, *Astreptosyllis*, *Streptospinigera*, *Syllides*, *Anoplosyllis*, *Streptosyllis*, *Streptosyllis arenae*, *Streptosyllis nunezi* n. sp.

### Introduction

The genus *Streptosyllis* was erected by Webster and Benedict in 1884 for a single species, *Streptosyllis arenae*, from Provincetown, Massachusetts, USA. In 1887, the same authors described *S. varians* from Eastport, Maine, USA. Southern (1914) described two new species *S. websteri* and *S. bidentata* from Bofin and Ballynakill, Ireland, and emended the definition of the genus. Currently, the genus is characterized by having an unarmed pharynx, palps fused at the base, enlarged aciculae and modified compound chaetae on a number of anterior parapodia (Brito *et al.* 2000; San Martín 2003).

In addition to these four, another 13 species of *Streptosyllis* have been described (of these, one has been synonymized (*S. pettiboneae* Perkins 1981) and one is of uncertain status (*S. cryptopalpa* Hartmann-Schröder 1960)): *S. verrilli* (Moore 1907) from Cape Cod, Massachusetts, USA; *S. cryptopalpa* Hartmann-Schröder 1960 and *S. reducta* Hartmann-Schröder 1960 from the Red Sea; *S. latipalpa* Banse 1968 from Puget Sound, Washington, USA; *S. magnapalpa* Hartmann-Schröder 1981 from Horrocks, Australia; *S. aequiseta* Hartmann-Schröder 1981 from Exmouth, Tantabiddy Creek, Australia; *S. pettiboneae* Perkins 1981 from Florida, USA; *S. templadoi* San Martín 1984 from the Balearic Islands, Spain; *S. biarticulata* Hartmann-Schröder 1991 from Heron Island, Australia; *S. suhrmeyeri* Hartmann-Schröder 1993 from Tierra del Fuego, Argentina;

*S. baolingi* and *S. hainanensis* Ding and Westheide 1994 from Hainan Island, China and *S. campoyi* Brito, Núñez and San Martín 2000 from the Canary Islands, Spain.

In this paper, a new species, *S. nunezi*, from sandy beaches of the Mediterranean (Crete, Tuscany) and of the northeastern Atlantic (Canary Islands) is described. Its affinity with another record of the genus as *S. arenae* (Castelli & Lardicci 1986) from the western Mediterranean is discussed. A re-description of *S. arenae* based on a paratype, the type species of the genus, is also provided.

Finally, an analysis of the key characters of *Streptosyllis* species, based on the literature is given along with a discussion of the taxonomic status of morphologically similar genera *Streptosyllis* Webster and Benedict 1884, *Syllides* Ørsted 1845, *Anoplosyllis* Claparède 1868, *Streptospinigera* Kudenov 1983 and *Astreptosyllis* Kudenov and Dorsey 1982.

## Material and methods

Specimens of *Streptosyllis* were collected from Pahia Ammos Beach, Crete (35°06'43''N 25°48'34''E), and Collelungo Beach, Maremma Park, Tuscany (42°38'02''N 11°04'23''E), from shallow waters (1–5 m), as well as from deeper (20 m) sandy substrates in Agaete Coast (Gran Canaria), Canary Islands (28°05'48''N 15°42'43''W). Sandy substrate ranged from fine to coarse sediments. Pahia Ammos Beach is located on the north-eastern coast of Crete (Gulf of Mirabello) and is characterized by fine to coarse sands and moderate wave exposure. High winds predominate causing large quantities of litter and organic material to be washed ashore. Collelungo Beach (Regional Natural Park of Maremma) is an exposed microtidal beach with a very shallow slope, representative of an undisturbed Mediterranean sandy beach (Papageorgiou *et al.* 2006). At the stations of Crete and Maremma Park, sampling was carried out along three parallel transects spaced 1 m apart. At each station two samples were collected with cylindrical acrylic corers (9.4 cm inner diameter) that penetrated 25 cm into the substratum. The samples were separated into 0–10 and 10–25 cm sections and washed through a 0.5 mm mesh sieve. The animals were subsequently fixed in a 5% formalin solution, buffered with sea water, before being preserved in 75% ethanol. The station on the Agaete Coast was sampled with a metallic frame of 20 x 20 x 20 cm. Those samples were also sieved through a 0.5 mm mesh and fixed in a 4% formalin solution, buffered with sea water, and subsequently preserved in 70% ethanol solution (Palmero *et al.* 2005). An Olympus BX50 microscope with a drawing tube was used for observations and for making illustrations in pencil. Pencil drawings were scanned, imported into a graphic program (CorelDraw), re-drawn and saved as a vector graphic.

Specimens are deposited in the invertebrate collection of the Smithsonian National Museum of Natural History, Washington D.C., USA (USNM 1113750 – USNM 1113760).

## Results

### Genus *Streptosyllis* Webster & Benedict 1884

*Streptosyllis* Webster & Benedict, 1844: 711.

*Streptosyllis* - San Martín, 2003: 120.

*Streptosyllis* - San Martín & Hutchings, 2006: 354–355.

*Type species: Streptosyllis arenae* Webster & Benedict, 1884.

**Diagnosis:** Body small. Four eyes, occasionally anterior pair of eyespots present. Palps fused at base, occasionally reduced to small papillae. Anterior parapodia with modified compound chaetae; sometimes with enlarged aciculae. Dorsal simple chaetae present, ventral simple chaetae absent. Compound chaetae

homogomph or hemigomph, falcigerous, occasionally spinigerous. Dorsal cirri smooth, pseudoarticulated or articulated with granular inclusions. Ventral cirri digitiform, sometimes longer than parapodial lobe. Pharynx unarmed with crown of soft papillae. Pygidium with one median and two lateral anal cirri.

### ***Streptosyllis arenae* Webster & Benedict 1884**

Figures 1–3

*Streptosyllis arenae* Webster & Benedict, 1884: 711–713, Figures 17–23.

*Streptosyllis arenae* - Pettibone, 1963: 127, Figures 31 l–m; - Hartmann-Schröder, 1996: 163.

**Material examined:** 3 out of 5 paratypes USNM 417 labelled as *S. arenae* (holotype unavailable).

**Type locality:** Provincetown, Cape Cod, Massachusetts, USA.

**Habitat:** Sandy bottoms, shallow water.

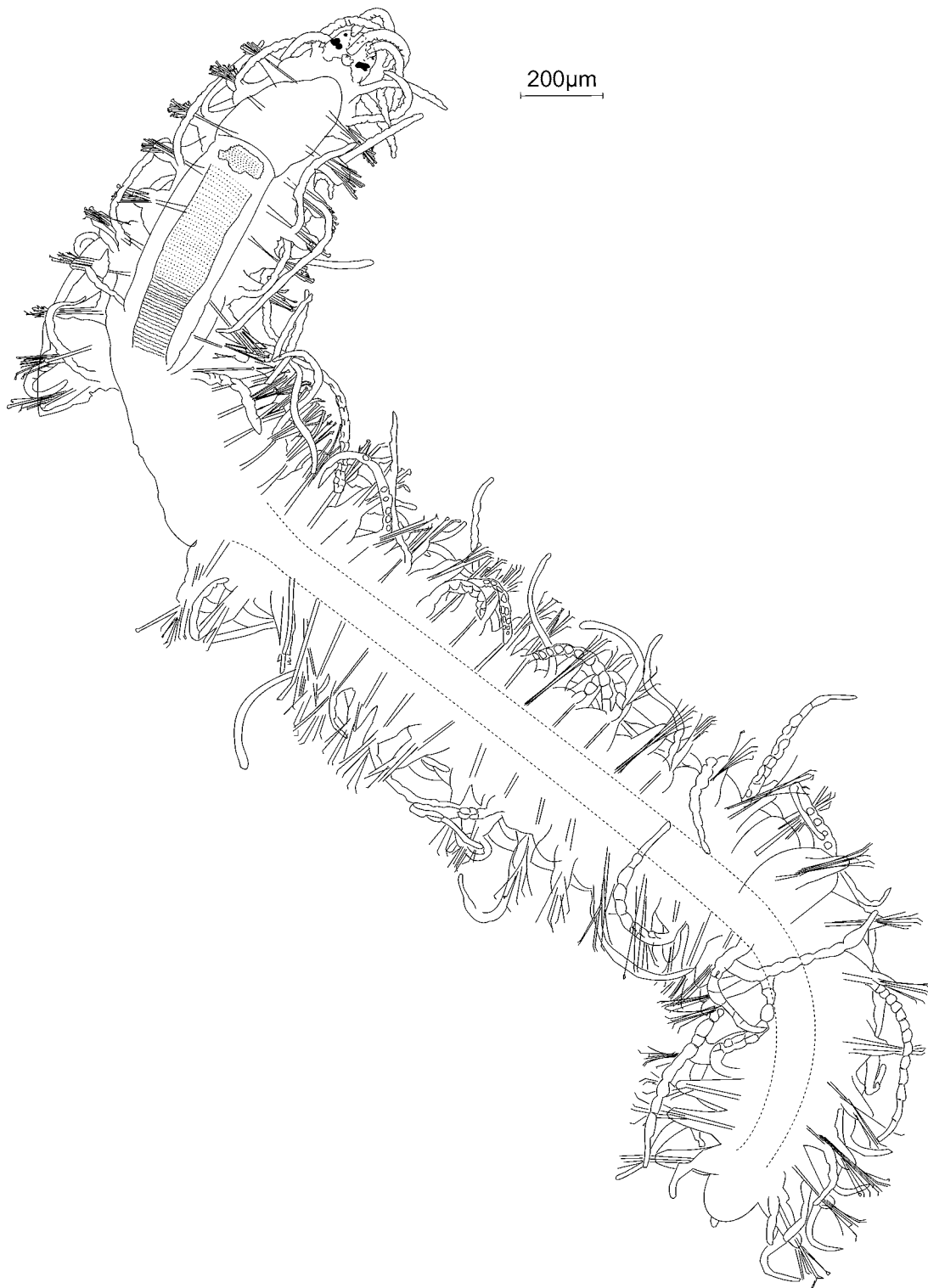
**Description:** (based on the paratype labelled 119/1717, fixed on slide): Body ca. 2.8 mm long, for 40 chaetigers; maximal width 300  $\mu\text{m}$  without parapodial lobes, 440  $\mu\text{m}$  with parapodial lobes and 570  $\mu\text{m}$  including chaetae (5<sup>th</sup> segment) (Figure 1). Head semi-circular, wider than long, anterior margin regularly rounded. Two pairs of eyes, one pair of eyespots, latter located near anterior margin (near eye spots). Three antennae present, each irregularly wrinkled, median antenna inserted between two pairs of lateral eyes in middle of prostomium, lateral antennae located near anterior margin of prostomium. Median antenna ca. 370  $\mu\text{m}$  long, lateral ones ca. 120  $\mu\text{m}$ . Palps form two rounded lobes, fused basally, outer margins prolonged into vestigial cirrus (Figure 2g). Palps directed ventrally, not visible dorsally. Peristomium indistinct, bearing two pairs of tentacular cirri, each about as long as lateral antennae. Dorsal cirri about same length as lateral antennae, some longer, generally shorter near posterior end. Shape and structure of dorsal cirri varies within same animal: either smooth, wrinkled, pseudo-articulated with granular rounded inclusions, articulated with each article divided longitudinally or articulated without divided articles (Figures 1, 2d–f). Ventral cirri slightly wrinkled, digitiform, wide at base, about length of parapodial lobe of first segments, then becoming longer, about twice length of parapodial lobe in posterior part and longer than dorsal cirri (Figures 2a–c). Pygidium with tiny median anal cirrus, lateral anal cirri not observed (Figure 1). Dorsal simple chaeta present from chaetiger 1, slightly curved, ca. 55  $\mu\text{m}$  anteriorly, 90  $\mu\text{m}$  posteriorly, tip bluntly rounded and covered by hyaline hood (Figures 3j–o). Up to ten hemigomph compound chaetae in each parapodium, length ca. 45  $\mu\text{m}$  anteriorly, 85  $\mu\text{m}$  posteriorly (Figures 2a–c). Shaft of compound chaetae ending in up to three rounded teeth (Webster and Benedict report four teeth, not observed in material examined), sometimes with notched tips. Blades of two kinds, longer ones (ca. 19  $\mu\text{m}$ ) in dorsal chaetae, shorter ones (ca. 12  $\mu\text{m}$ ) in ventral chaetae, becoming longer towards posterior end. In first five chaetigers only chaetae with short blades present (Figures 3p–s); from chaetiger 6 onwards, two long-bladed and 8–9 short-bladed chaetae per bundle present. Longer blades unidentate with rounded tip covered by halo-shaped hyaline hood, and small tooth near distal part (Figures 3t–v). Shorter blades with more acute tip and hood covering not only tip of blade but prolonged down to distal end of shaft. (Figure 3s). Aciculae distinctively enlarged on chaetigers 2–5, one per parapodium, each distally knobbed, terminating at tip of parapodial lobe (Figure 3a–i). Length of aciculae ca. 130  $\mu\text{m}$  in anterior chaetigers, 190  $\mu\text{m}$  in posterior chaetigers. Pharynx unarmed, extending from anterior end to chaetiger 3. Proventriculus extending through 6–7 segments, with about 56 muscle cell rows (Figure 1).

**Character variation:** Length of median anal cirrus varies among paratypes: from very short to about as long as dorsal cirri.

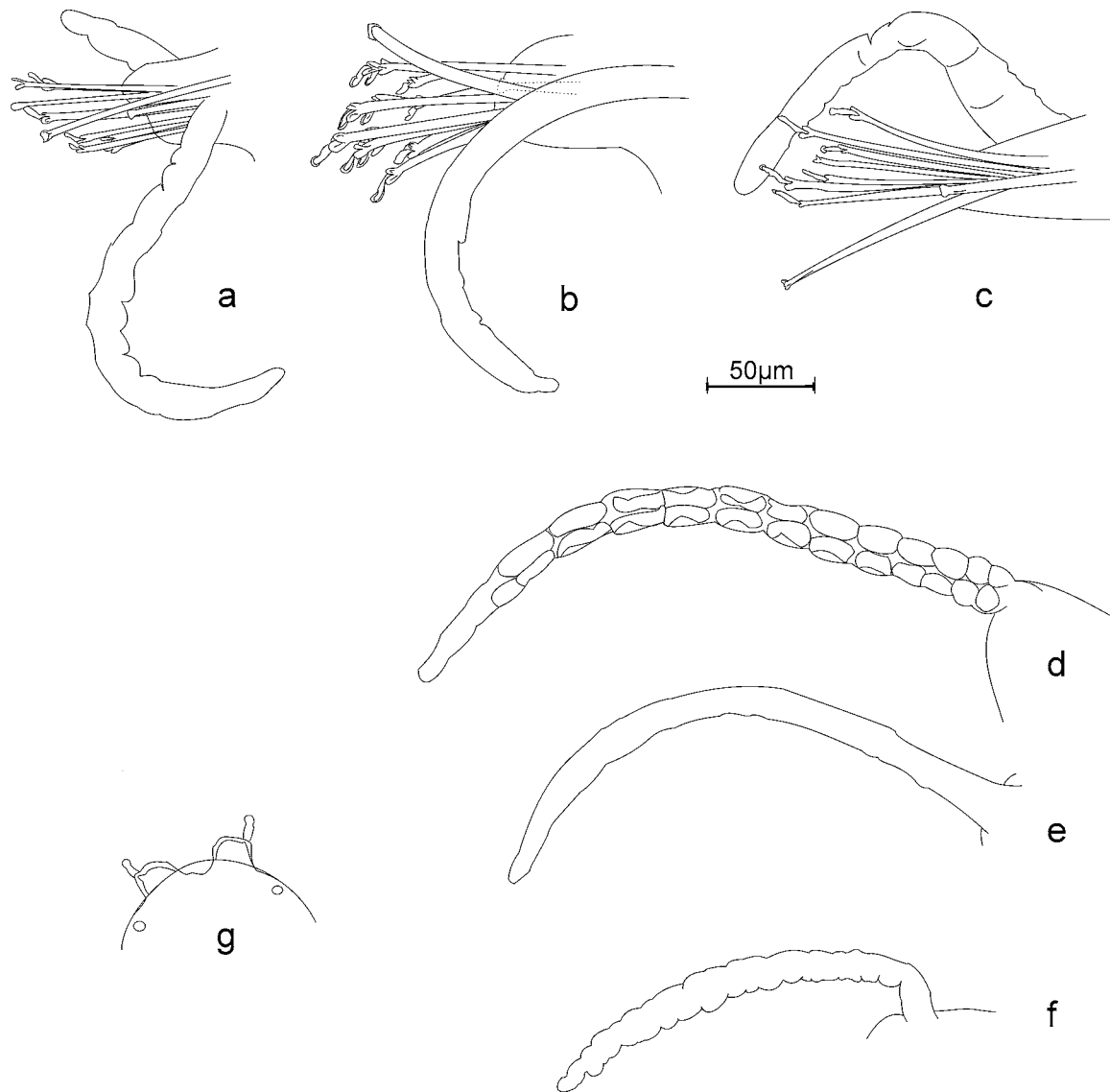
**Remarks:** Of the five individuals labelled as paratypes of *Streptosyllis arenae* (USNM 417), one is preserved in alcohol, the four others are fixed on three slides. The fixative is unknown; it is assumed that euparal had been used. Two of the five paratypes can be identified as belonging to other species: a) The individual

preserved in alcohol was identified by Pettibone as *S. varians*, which is confirmed here; b) The red coloured worm on the slide labelled 118/1717 can only be tentatively identified as *S. cf. latipalpa* because the quality of the individual does not allow its exact identification.

**Distribution:** Northwestern Atlantic (Cape Cod, Massachusetts).



**FIGURE 1.** *Streptosyllis arenae*, dorsal view; paratype USNM 417, slide 119/1717.



**FIGURE 2.** *Streptosyllis arenae*, a) Right parapodium, chaetiger 1, dorsal view; b) Left parapodium with dorsal cirrus, chaetiger 16, dorsal view; c) Right parapodium with ventral cirrus, chaetiger 37, dorsal view; d) Articulated dorsal cirrus, chaetiger 17; e) smooth dorsal cirrus, chaetiger 20; f) pseudoarticulated dorsal cirrus, chaetiger 2; g) Palps, dorsal view; a, b, c, d, e, f: paratype USNM 417, slide 119/1717; g: paratype USNM 417, slide 25/1717.

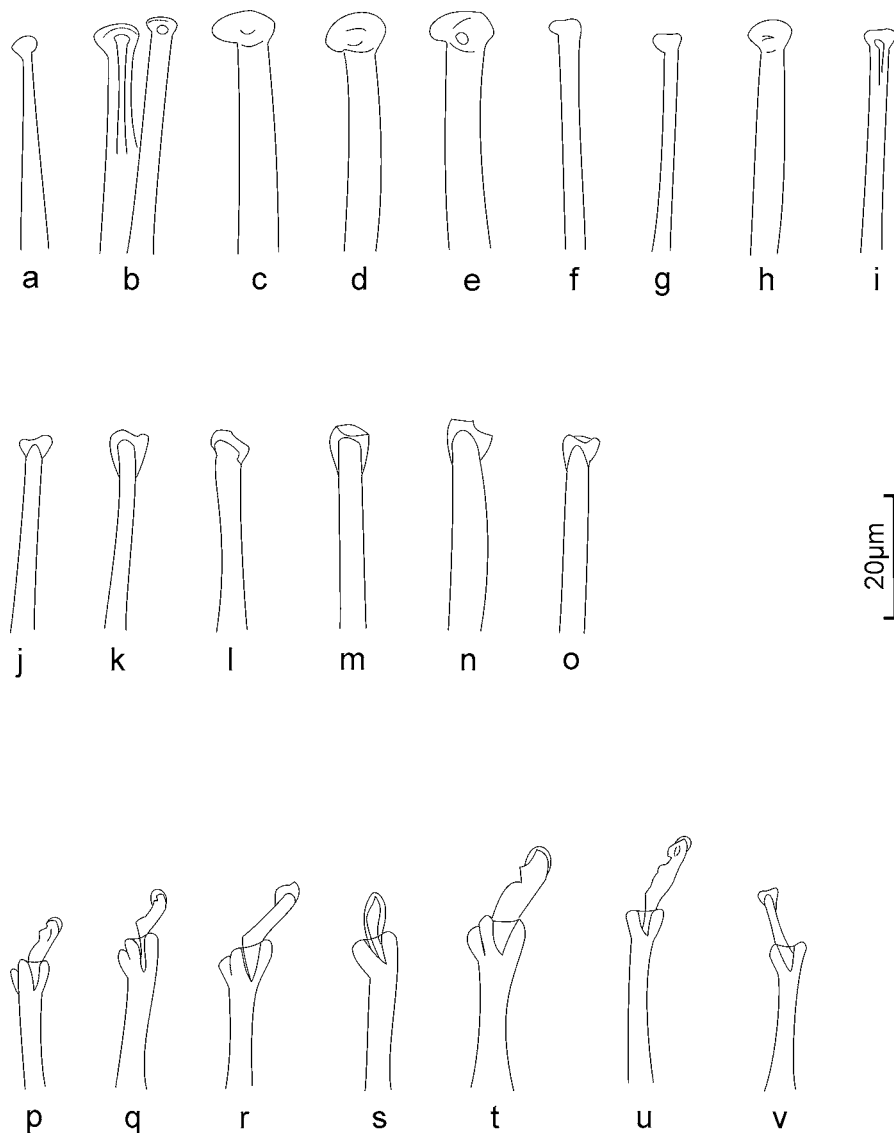
***Streptosyllis nunezi* n. sp.**

Figures 4–6

*Streptosyllis arenae* - Castelli & Lardicci, 1986: 145–148, Figure 1.

*Streptosyllis* aff. *arenae* - Palmero *et al.*, 2005: 287–296, Figures 2 I–O, 3B.

**Material examined:** 11 individuals from sandy beaches in Crete, Tuscany and Canary Islands: Holotype and paratypes 1–5 and 7–9 (registration numbers USNM 1113750, USNM 1113751, USNM 1113752, USNM 1113753, USNM 1113754, USNM 1113755, USNM 1113757, USNM 1113758, USNM 1113759, correspondingly) collected from Pahia Ammos Beach at depths of 1–5 m; Paratype 6 (USNM 1113756), collected from Collelungo Beach at depth of 1 m; Paratype 10 (USNM 1113760) from the Canary Islands (courtesy of Dr. Jorge Núñez, Universidad de La Laguna), collected at depth of 20 m.

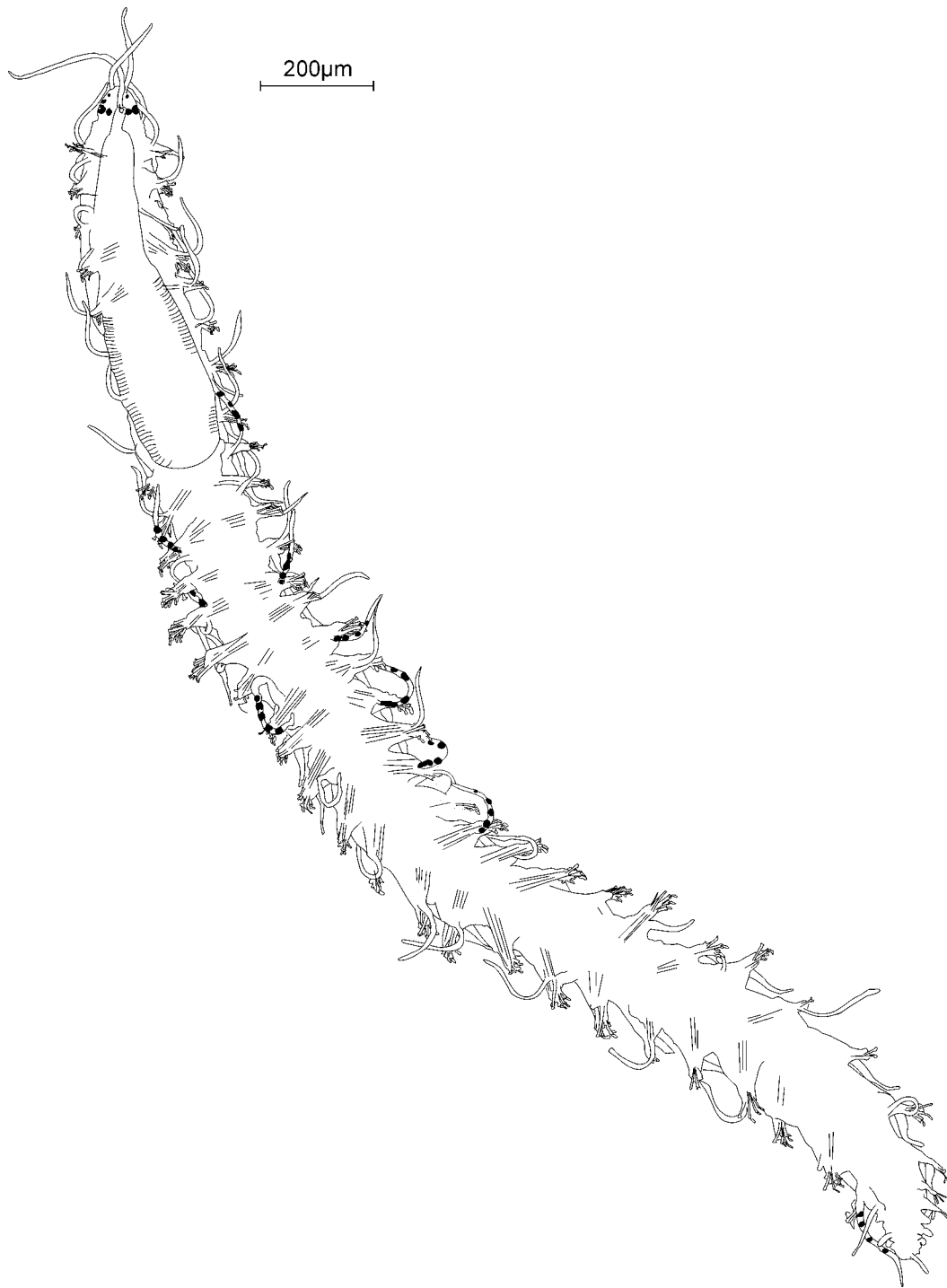


**FIGURE 3.** *Streptosyllis arenae*, a) Acicula, chaetiger 1; b) Aciculae, chaetiger 2; c) Acicula, chaetiger 3; d) Acicula, chaetiger 4; e) Acicula, chaetiger 5; f) Acicula, chaetiger 6; g) Acicula, chaetiger 7; h) Acicula, chaetiger 14; i) Acicula, chaetiger 37; j) Simple dorsal chaeta, chaetiger 1; k) Simple dorsal chaeta, chaetiger 2; l) Simple dorsal chaeta, chaetiger 3; m) Simple dorsal chaeta, chaetiger 4; n) Simple dorsal chaeta, chaetiger 14; o) Simple dorsal chaeta, chaetiger 37; p) Compound chaeta, chaetiger 1; q) Compound chaeta, chaetiger 2; r) Compound chaeta, chaetiger 3; s) Compound chaeta, chaetiger 4; t) Compound chaeta, chaetiger 20; u) Compound chaeta, chaetiger 37, dorsal view; v) Compound chaeta, chaetiger 37, lateral view; *paratype* USNM 417, slide 119/1717.

**Type locality:** Pahia Ammos Beach, Crete, Greece.

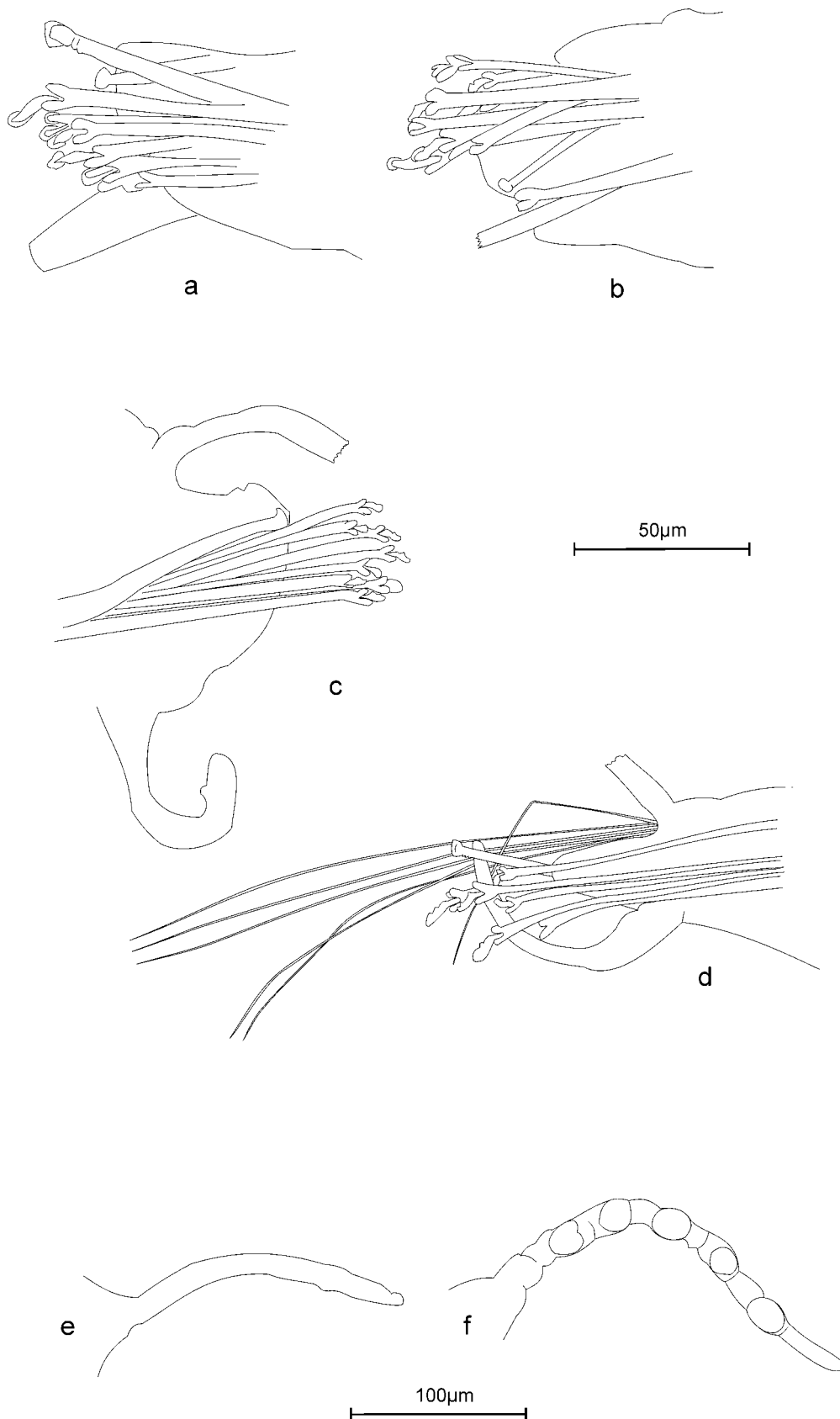
**Habitat:** Fine to coarse sandy substrates, shallow waters (1–20 m).

**Description:** (based on holotype USNM 1113750): Body ca. 2.5 mm long, for 33 chaetigers; maximal width 140 µm without parapodial lobes, 210 µm with parapodial lobes and 260 µm including chaetae (14<sup>th</sup> segment) (Figure 4). Head semi-circular, about as wide as long, anterior margin rounded. Two pairs of eyes, one pair of eyespots, latter located near anterior margin. Three smooth antennae, median antenna originating between two pairs of eyes in middle of prostomium, lateral ones near anterior margin (near eye spots). Median antenna ca. 260 µm long, lateral antennae 130 µm long. Palps directed ventrally, not visible dorsally, forming two rounded basally fused lobes; outer margins prolonged into vestigial cirrus. Peristomium not clearly separated from first segment, bearing two pairs of tentacular cirri, about as long as lateral antennae. Dorsal cirri smooth, thin (Figure 5e), articulated in chaetigers 7, 11, 13, 14, 15, 16, 18, 20 and 30 (often only on one side



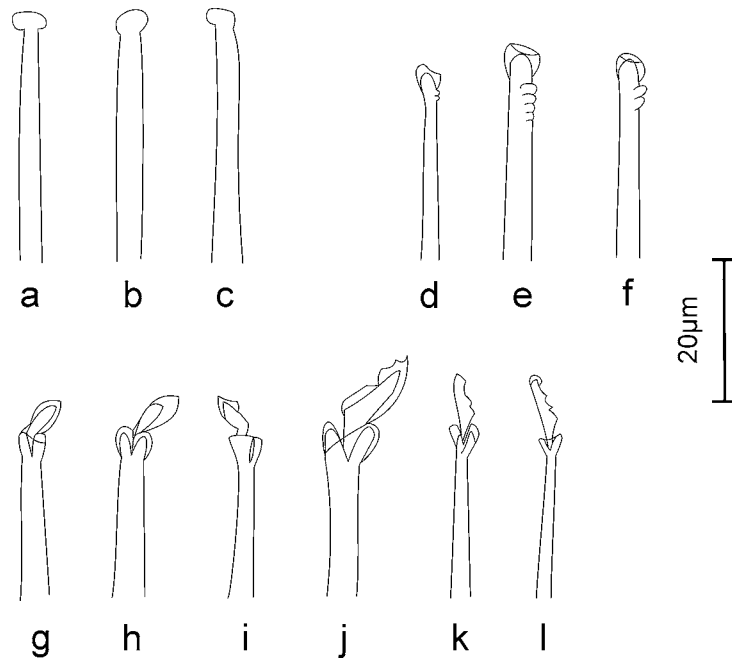
**FIGURE 4.** *Streptosyllis nunezi* n. sp., dorsal view; holotype USNM 1113750.

of animal), longitudinally divided articles with granular inclusions (Figure 5f). Dorsal cirri about two thirds length of lateral antennae (ca. 90  $\mu$ m) in anterior and middle chaetigers, becoming longer in posterior chaetigers. Ventral cirri smooth, digitiform, almost as long as parapodial lobes in anterior and middle chaetigers, then becoming longer near posterior end (Figure 4). Median anal cirrus (ca. 90  $\mu$ m long) present, lateral cirri not observed. Dorsal simple chaeta present from chaetiger 1, slightly curved, ca. 23  $\mu$ m long, reaching to level of shaft of compound chaetae, tip bluntly rounded, covered by hyaline hood, proximal part strongly serrated immediately below hood, shaped as two, sometimes 3–4 rounded teeth (Figures 6d–f); sometimes second simple chaeta present. Up to 8–9 hemigomph compound chaetae in each parapodium, upper chaetae in fascicles ca. 32  $\mu$ m long, lower chaetae shorter, ca. 20  $\mu$ m long (Figures 5a–d). Shaft of compound chaetae with up to



**FIGURE 5.** *Streptosyllis nunezi* n. sp., a) Right parapodium, chaetiger 10, dorsal view; b) Right parapodium, chaetiger 22, dorsal view; c) Right parapodium, chaetiger 5, lateral view; d) Left parapodium, chaetiger 21, lateral view; e) smooth dorsal cirrus, chaetiger 11; f) articulated dorsal cirrus, chaetiger 11; a, b: paratype 1 USNM 1113751; c: paratype 7 USNM 1113757; d: paratype 9 USNM 1113759; e, f: holotype USNM 1113750.





**FIGURE 6.** *Streptosyllis nunezi* n. sp., a) Acicula, chaetiger 4; b) Acicula, chaetiger 11; c) Acicula, chaetiger 22; d) Simple dorsal chaeta, chaetiger 4; e) Simple dorsal chaeta, chaetiger 20; f) Simple dorsal chaeta, chaetiger 30; g) Ventral compound chaeta, chaetiger 4; h) Dorsal compound chaeta, chaetiger 4; i) Ventral compound chaeta, chaetiger 13; j) Dorsal compound chaeta, chaetiger 13; k) Ventral compound chaeta, chaetiger 25; l) Dorsal compound chaeta, chaetiger 25; a, b, c: paratype 1 USNM 1113751; d, g, h: paratype 2 USNM 1113752; e, f, i, j, k, l: holotype USNM 1113750.

three apical rounded teeth, sometimes notched; with hyaline hood covering these teeth and entire distal part of shaft (Figures 6g–l). Blades of two kinds, longer ones (ca. 15 µm) on dorsal chaetae, shorter ones (ca. 7 µm) on ventral chaetae. Chaetigers 1–5 with only blades of short type (Figures 6g–h), from chaetiger 6 onwards two long-bladed and 6–7 short-bladed chaetae present. Longer blades unidentate with pointed tip covered by hyaline hood extending along side of blade, forming an acute, sometimes bent, tip and with 1–2 tips further down the blade (Figure 6j). Shorter blades with blunt hood covering tip (Figure 6l). Blades in far posterior parapodia appearing very thin, slightly serrated. Aciculae not distinctively enlarged. A single acicula in each parapodium, terminating at end of parapodial lobe. Aciculae distally knobbed, knob bluntly rounded, sometimes irregularly (one side of the knob larger than the other) (Figures 6a–c). Pharynx with distal crown of ten soft papillae, unarmed, extending from anterior end to the beginning of chaetiger 5. Proventriculus extending through 4–5 segments, with about 45 muscle cell rows (Figure 4). Pale yellow in alcohol.

**Character variation:** Lateral anal cirri present, varying in length from as long as dorsal cirri to several times longer (up to 440 µm) (paratypes 3, 4); compound chaetae with only short blades from chaetigers 1–6; longer blades unidentate with pointed tip covered by halo-shaped hyaline hood; blades of compound chaetae smooth throughout the body; enlarged aciculae present on chaetigers 2–6 (paratype 10); some individuals with sexual products and natatory chaetae, from about chaetiger 16 onward (paratypes 3, 4, 6, 9).

**Remarks:** *Streptosyllis nunezi* n. sp., is most closely related to *S. arenae* because they share the following characters in common: both the dorsal simple chaetae and the blades of the compound chaetae are covered by a hyaline hood, and the palps are not visible dorsally. *S. nunezi* n. sp., differs from *S. arenae* in that the teeth of the shaft of the compound chaetae are covered by a hyaline hood, whereas in the latter species only the shaft is covered; the hood of blades of the compound chaetae forms 1–2 lateral tips, whereas in *S. arenae* the hood is smooth; the dorsal simple chaetae, being smooth in *S. arenae*, are strongly serrated on the margin, forming 2–4 rounded teeth when viewed laterally in *S. nunezi* n. sp.; the pharynx extends through about five segments in the new species instead of through 6–7 segments in *S. arenae*. *S. biarticulata* also has a hyaline hood on the shaft of the long-bladed falcigers, on the dorsal simple chaetae and on the blades of the short-bladed falcigers,

however it differs from *S. nunezi* **n. sp.**, in having smooth dorsal simple chaetae and the palps are visible dorsally. Five species of the genus have a hyaline hood on the blades of the compound chaetae: *S. arenae*, *S. templadoi*, *S. magnapalpa*, *S. biarticulata* and *S. nunezi* **n. sp.** *S. nunezi* **n. sp.**, can clearly be distinguished from the other four species because it is the only one to have serrated dorsal simple chaetae. *S. nunezi* **n. sp.** has thus a unique combination of characters which clearly differentiate it from all other *Streptosyllis* species: (a) palps not visible dorsally; (b) hyaline hood covering the teeth of shafts of the compound chaetae; (c) strongly serrated margins of dorsal simple chaetae, visible as 2–4 rounded teeth; (d) hood on the blades of the compound chaetae forming 1–2 lateral tips. The latter three characters are not shared by any other *Streptosyllis* species.

**Distribution:** Mediterranean Sea (Crete, Italy), northeastern Atlantic (Canary Islands).

**Etymology:** The species is named after Dr. Jorge Núñez for his contribution to this study.

**TABLE 1.** Diagnostic characters of closely related genera *Syllides*, *Anoplosyllis*, *Streptosyllis*, *Astreptosyllis* and *Streptospinigera*. Superscript numbers refer to the following publications: <sup>1</sup>San Martín & Hutchings 2006, <sup>2</sup>Banse 1971, <sup>3</sup>San Martín 2003, <sup>4</sup>Hartmann-Schröder 1960, <sup>5</sup>Webster & Benedict 1884, <sup>6</sup>Sardá & San Martín 1991, <sup>7</sup>Kudenov & Dorsey 1982, <sup>8</sup>Hartmann-Schröder 1986, <sup>9</sup>Kudenov 1983, <sup>10</sup>Ohwada 1988

	<i>Syllides</i> Ørsted 1845 <sup>1</sup>	<i>Anoplosyllis</i> Claparède 1868 <sup>1</sup>	<i>Streptosyllis</i> Webster & Benedict 1884 <sup>1</sup>
Number of eyes	4	4	4*
Number of eyespots	2	2	2
Palps	fused at base, sometimes reduced to or ending with tiny papillae <sup>2</sup>	fused at base, small	fused at base, sometimes terminating with 2 papillae, occasionally reduced and only papillae visible
Dorsal cirri	anteriorly smooth, articulated from 3 <sup>rd</sup> chaetiger onwards	smooth	smooth or indistinctly articulated
Ventral cirri	sometimes large <sup>2</sup>	short <sup>3</sup>	sometimes longer than parapodial lobes
Tentacular cirri	smooth	smooth	smooth**
Anal cirri	2 lateral + 1 median appendices <sup>2</sup>	2 lateral + 1 median appendices <sup>3</sup>	2 lateral + 1 median appendices <sup>3</sup>
Aciculae: enlarged	no <sup>2</sup>	no <sup>3</sup>	in anterior chaetigers***
Aciculae: tip	variable	variable	knobbed
Dorsal simple chaetae	one kind throughout body*	one kind throughout body	one kind throughout body
Dorsal simple chaetae: hood	absent or very small	absent	present or absent
Ventral simple chaetae	sometimes present	sometimes present <sup>3</sup>	absent****
Compound chaetae: length of blades	dorso-ventral gradation in length within fascicle**	dorso-ventral gradation in length within fascicle	two kinds of blades per fascicle (long dorsal/ stout ventral)*****
Compound chaetae: insertion of blades	heterogomph	heterogomph	homo- to hemigomph
Compound chaetae: tip of blades	usually bidentate***	unidentate or bidentate	unidentate or bidentate
Falcigers / spinigers	falcigers****	falcigers	falcigers, sometimes spiniger-like
Anterior parapodia: modified chaetae	no*****	no	yes
Pharynx	unarmed, with or without papillae <sup>2</sup>	unarmed	unarmed, with papillae*****

Remarks	<p>*<i>S. longocirrata</i>: two kinds of dorsal simple chaetae: thick anteriorly, capillaryform posteriorly<sup>2</sup>  **<i>S. longocirrata</i>: long and short ones<sup>2</sup>***<i>S. longocirrata</i>: unidentate, only posteriorly bidentate<sup>2</sup>****<i>S. longocirrata</i>: spiniger-like<sup>2</sup>  *****<i>S. longocirrata</i>: modified compound chaetae in anterior parapodia<sup>2</sup></p>	<p>*<i>S. cryptopalpa</i>: 6 eyes<sup>4</sup>  **<i>S. arenae</i>: pseudoarticulated<sup>5</sup>;  <i>S. biarticulata</i>: articulated<sup>1</sup>  *** <i>S. reducta</i>: no enlarged aciculae<sup>4</sup>; <i>S. nunezi</i> n. sp.: variable  ****<i>S. verrilli</i>: present posteriorly<sup>6</sup>  *****<i>S. biarticulata</i>: dorso-ventral gradation<sup>1</sup>  *****<i>S. reducta</i> &amp; <i>S. cryptopalpa</i>: armed pharynx<sup>4</sup></p>
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continued.

	<i>Astreptosyllis</i> Kudenov & Dorsey 1982 <sup>1</sup>	<i>Streptospinigera</i> Kudenov 1983 <sup>9</sup>
Number of eyes	4	6*
Number of eyespots	-*	-*
Palps	fused at base, visible from above	fused at base, visible from above, lacking papillae
Dorsal cirri	anteriorly smooth, articulated from 3 <sup>rd</sup> chaetiger onwards	anteriorly smooth, posteriorly annulated
Ventral cirri	short anteriorly, prolonged posteriorly	not extending parapodial lobes
Tentacular cirri	smooth**	smooth
Anal cirri	2 anal cirri***	2 lateral + 1 median appendices
Aciculae: enlarged	no <sup>7</sup>	in anterior chaetigers
Aciculae: tip	knobbed	rounded or hooked
Dorsal simple chaetae	one kind throughout body	two kinds: thick anteriorly, capillary form medially and posteriorly
Dorsal simple chaetae: hood	present, longitudinally striated	absent
Ventral simple chaetae	sometimes present	absent
Compound chaetae: length of blades	dorso-ventral gradation in length within fascicle	two kinds of blades per fascicle (long dorsal/short ventral)
Compound chaetae: insertion of blades	hetero- or hemigomph	homo- to hemigomph
Compound chaetae: tip of blades	unidentate	unidentate
Falcigers / spinigers	falcigers	falcigers and spinigers
Anterior parapodia: modified chaetae	yes	yes
Pharynx	unarmed, with papillae	unarmed, with or without papillae**
Remarks	<p>*<i>A. similiseta</i>: 2 eyespots<sup>8</sup>  **<i>A. acrassiseta</i>: tentacular cirri pseudoannulated<sup>7</sup>  ***<i>A. acrassiseta</i>: anal cirri absent<sup>7</sup>; <i>A. acrassiseta</i>: anal cirri not observed<sup>1</sup>; <i>A. similiseta</i>: single anal cirrus<sup>1</sup>; generic diagnosis: 2 anal cirri<sup>1</sup></p>	<p>*<i>S. alternocirrus</i>: 4 eyes + 2 eyespots<sup>10</sup>  **<i>S. heteroseta</i>: no papillae observed<sup>9</sup>;  <i>S. alternocirrus</i>: 10 papillae<sup>10</sup></p>

## Discussion

Although the new species is tentatively placed into the genus *Streptosyllis* since it complies with most of the generic characters as provided by San Martín (2003) and San Martín and Hutchings (2006), an analysis of five

morphologically similar genera – *Streptosyllis*, *Syllides*, *Anoplosyllis*, *Streptospinigera* and *Astreptosyllis* – demonstrates the degree of confusion in the use of characters for their diagnoses and suggests that a major revision of these genera and the species currently assigned to them is urgently needed.

The taxonomic division of the Eusyllinae into genera, and even the separation of the four subfamilies of the Syllidae family (Eusyllinae, Syllinae, Autolyninae, Exogoninae) as initially proposed by Rioja (1925), who, in fact, accepted Malaquin's (1893) division of the family into tribes (San Martín 1984), has been considered as unsatisfactory (Böggemann *et al.* 2003; Licher 1996). The complex formed by the five similar genera *Streptosyllis*, *Syllides*, *Anoplosyllis*, *Streptospinigera* and *Astreptosyllis* (previously considered to be a synonym of *Syllides*, but resurrected by San Martín (2003)) requires a revision: a comparison of the key characters of these genera clearly shows this (Table 1). Many species placed in these genera exhibit characters not compliant with the generic definitions. For example, *Syllides longocirrata* (Ørsted 1845), the type species of *Syllides*, shares many key characters with *Streptospinigera* (two kinds of dorsal simple chaetae, two kinds of compound chaetae per fascicle, spiniger-like compound chaetae). Likewise, to distinguish *Streptosyllis* and *Streptospinigera* from the similar *Syllides* often the enlarged aciculae occurring in the former two genera has been used (San Martín 2003). However, since *S. reducta* does not have enlarged aciculae according to the original description (Hartmann-Schröder 1960:95) and since individuals of *S. nunezi* **n. sp.**, may or may not have enlarged aciculae, this character does not appear to be consistent. The differentiation of the genera should therefore be based on other characters, as proposed in the following tentative key:

1. Blades of compound chaetae with dorso-ventral gradation in length within fascicle .....2
  - Two kinds of compound chaetae within fascicle, few long dorsal ones, numerous short ventral ones, all lacking dorso-ventral gradation in length .....3
2. Dorsal cirri articulated from the 3<sup>rd</sup> chaetiger onwards .....4
  - Dorsal cirri smooth throughout body ..... *Anoplosyllis*
3. Two kinds of dorsal simple chaetae: thick anteriorly, capillary-form posteriorly ..... *Streptospinigera*
  - One kind of dorsal simple chaeta throughout the body ..... *Streptosyllis*
4. Dorsal simple chaetae with longitudinally striated hood; blades of compound chaetae unidentate.....
  - ..... *Astreptosyllis*
  - Dorsal simple chaetae without or with small, non-striated hood; blades of compound chaetae bidentate ..  
..... *Syllides*

To date, five species of *Streptosyllis* have been reported from the Mediterranean: *S. websteri*, *S. bidentata*, *S. templadoi*, *S. campoyi* and *S. arenae*. The latter species, originally described from the coasts of New England, USA has also been recorded in the southern North Sea (Govaere *et al.* 1980), although this record has been questioned by Hartmann-Schröder (1996). The characters of the individual reported from Italy under the name of *S. arenae* (Castelli & Lardicci 1986) are also very similar to those of *S. nunezi* **n. sp.** The request to the authors for the loan of the material was not successful (A. Castelli, pers. comm.), but the description and illustrations show that the individual has a hyaline hood around the teeth of the shaft of the compound chaetae, a distal serration forming maximally four teeth on the dorsal simple chaetae and a hyaline hood on the blades of the compound chaetae which forms two tips. Furthermore, the shape and size of the blades of the compound chaetae are very similar to the ones of *S. nunezi* **n. sp.** Finally, the habitat from which the individual was collected is nearly identical to that of Maremma Park from which one of the paratypes of *Streptosyllis nunezi* *n.sp.* was collected. Castelli and Lardicci (1986) report a sandy, shallow (1.5 m) location near the mouth of Arno River, Tuscany, about 100 km away from Collelungo Beach (Maremma). Consequently, the individual from Italy might well belong to *S. nunezi* **n. sp.**, and the presence of *S. arenae* in the Mediterranean is doubtful and unlikely.

**TABLE 2.** Diagnostic characters for all *Streptosyllis* species. Characters based on original description, unless indicated by superscript numbers referring to: <sup>1</sup>own observation on paratype, <sup>2</sup>Pettibone 1963, <sup>3</sup>Hartmann-Schröder 1996, <sup>4</sup>Southern 1914, <sup>5</sup>Brito *et al.* 2000, <sup>6</sup>San Martín & Hutchings 2006, <sup>7</sup>Böggemann *et al.* 2003, <sup>8</sup>Sardá & San Martín 1992

	<i>S. nunezi</i> n. sp.	<i>S. arenae</i> Webster & Benedict 1884	<i>S. varians</i> Webster & Benedict 1887	<i>S. websteri</i> Southern 1914	<i>S. bidentata</i> Southern 1914	<i>S. crypto-</i> <i>palpa</i> Hart- mann- Schröder 1960	<i>S. reducta</i> Hart- mann- Schröder 1960	<i>S. lati-</i> <i>palpa</i> Banse 1968	<i>S. magna-</i> <i>palpa</i> Hart- mann- Schröder 1981
Number of eyes + eyespots	4 + 2	4 + 2	4 + 2–6	4 + 2 <sup>5</sup>	4 + 2 <sup>5</sup>	6 + 2	4	?	4
Palps: visible dorsally	no	no	yes	no*	no	no	no	yes	yes
Dorsal cirri: articulation	smooth, articu- lated	articu- lated, smooth, pseudo- articulated	pseudo- articu- lated, articulated	smooth, pseudo- articulated	smooth, pseudo- articulated	pseudo- articulated	?	pseudo- articu- lated, articulated	articulated
Compound chae- tae: shaft mor- phology	3 teeth	4 teeth*	2–3 teeth <sup>2</sup>	4 teeth	3–4 teeth	2 teeth, one with distal secondary tooth	?	2 teeth, one with 3 distal sec- ondary teeth	2–4 irregu- lar teeth
Compound chae- tae: hooded shafts	yes	no	no	no	no	no	no	no	no
Blades: tip	uniden- tate	unidentate	uniden- tate and bidentate	bidentate <sup>5</sup>	bidentate	bidentate	may be bidentate	bidentate	unidentate and biden- tate <sup>6</sup>
Blades: serration	posteri- orly	no	no	yes	yes	yes	yes	yes	yes
Number of long blades	2	2 <sup>1</sup>	?	2 <sup>6</sup>	2*	?	?	1–2	?
Number of short blades	6–7	8–9 <sup>1</sup>	?	5–8 <sup>6</sup>	7**	?	?	6–10	?
Blades: hoods	yes	yes	no	no	no	no	no	no	yes
Dorsal simple chaetae: tip	uniden- tate	unidentate	unidentate	unidentate	unidentate	unidentate	uniden- tate	unidentate	unidentate
Dorsal simple chaeta: serration	yes	no	yes	yes	yes	yes	yes	yes	yes
Dorsal simple chaetae: hoods	yes	yes	no	from ch. 6 <sup>5</sup>	from ch. 6– 7 <sup>5</sup>	no	no	no	yes
Second simple chaetae	somet- times posteri- orly	no <sup>1</sup>	rarely present	no	no <sup>5</sup>	no	no	no	no
Chaetigers with enlarged acicu- lae	3–5; 2 and 6 less so*	2–5 <sup>3</sup>	1–23 <sup>4*</sup>	2–5	2–5; 6 and 7 less so	2–5	none	2–5	2–6
Enlarged acicu- lae: tips	knobbed	knobbed <sup>3</sup>	knobbed	knobbed	knobbed	knobbed	N/A	knobbed	blunt <sup>6</sup>
Pharynx: length (number of chae- tigers)	4–5	3 <sup>1</sup>	6	3–5 <sup>5</sup>	3	?	?	?	5–6 <sup>6</sup>

Pharynx: papillae	10	?	present	present	8	present	?	?	10 + crown of smaller ones <sup>6</sup>
Pharynx armed	no	no <sup>1</sup>	?	no	no	yes	yes	no	no
Proventriculum: length (number of chaetigers)	5–6	6–7 <sup>1</sup>	8	5–7 <sup>5</sup>	6	5	3	4–5	5
Proventriculum: number of muscle rings	45–50	56 <sup>1</sup>	?	50	48	40	38	?	35
Remarks	*not in all individuals	*3 teeth <sup>1</sup>	*2–20 or 23 <sup>2</sup>	*papillae visible on outer margin <sup>5</sup>	*1 <sup>5</sup> **4 <sup>5</sup>				

continued.

	<i>S. aequisetata</i> Hartmann-Schröder 1981	<i>S. templadoi</i> San Martín 1984	<i>S. biarticulata</i> Hartmann-Schröder 1991	<i>S. suhrmeyeri</i> Hartmann-Schröder 1993	<i>S. baolingi</i> Ding & Westheide 1994	<i>S. hainanensis</i> Ding & Westheide 1994	<i>S. campoyi</i> Brito, Núñez & San Martín 2000	<i>S. verrilli</i> (Moore 1907) <sup>8</sup>
Number of eyes + eyespots	4 + 2 <sup>6</sup>	4 + 2	4	?	4 + 2	4	4 + 2	4 + 2
Palps: visible dorsally	no	no	yes	yes	yes	yes	no	no
Dorsal cirri: articulation	smooth*	articulated, smooth, pseudo-articulated <sup>7</sup>	articulated	more or less articulated	articulated	articulated	articulated	pseudo-articulated
Compound chaetae: shaft morphology	3–4 irregular teeth, secondary tooth	2 teeth	2 teeth	2 teeth	3 teeth	2 teeth, one with distal secondary tooth	2 teeth, one with distal secondary tooth	2 teeth, one with distal secondary tooth
Compound chaetae: hooded shafts	no	no	on shafts of long blades	no	no	no	no	no
Blades: tip	bidentate	unidentate	unidentate	bidentate	unidentate and bidentate	unidentate, hooked	bidentate	bidentate
Blades: serration	yes	no	yes	yes	yes	yes	yes	yes
Number of long blades	1–3	1–2	?	1–2	1	1–2	1–2	3
Number of short blades	7–11	10	?	?	6–8	5–6	5–8	12
Blades: hoods	no	yes	yes	no	no	no	no	no
Dorsal simple chaetae: tip	unidentate	unidentate	unidentate	unidentate	unidentate	unidentate	unidentate	bidentate
Dorsal simple chaeta: serration	yes	no	no	yes	yes	yes	yes	yes
Dorsal simple chaetae: hoods	yes	from ch. 7	yes	no	ch. 1 and after ch. 5	ch. 1 and after ch. 5	from ch. 7	no
Second simple chaetae	no	no	no	no	no	no	no	posteriorly

Chaetigers with enlarged aciculae	2–6**	2–6	2–4	2–6; 7 less so	2–4	2–5	2–6	2–5; 6 less so
Enlarged aciculae: tips	knobbed	truncated	knobbed	knobbed	knobbed	knobbed	knobbed	t-shaped
Pharynx: length (number of chaetigers)	3–4 <sup>6</sup>	5	4	8	5	5	4–5	3
Pharynx: papillae	10 <sup>6,7</sup>	?	?	?	10	?	present	10
Pharynx armed	No	no	no	?	no	no	no	no
Proventriculum: length (number of chaetigers)	4–6 <sup>7</sup>	4	3.5	6–7	4	4.5	5	4.5
Proventriculum: number of muscle rings	40–48	40	35	40	48	40	?	55
Remarks	*articulate d <sup>7</sup> **2–7; 8 less so <sup>7</sup>							

The new species *S. nunezi* **n. sp.**, has been placed into the genus *Streptosyllis*. The species *Syllides verrilli* Moore 1907 has been recently moved to *Streptosyllis* by Sardá and San Martín (1992) due to the presence of enlarged aciculae in the anterior chaetigers. The species described by Perkins (1981) as *S. pettiboneae* has been considered as a synonym of *S. websteri* (Brito *et al.* 2000). The status of *S. cryptopalpa* is not clear from the literature. Brito *et al.* (2000) assign the description of *S. websteri* by San Martín (1984) to *S. bidentata*, which would result in a synonymy of *S. cryptopalpa* with *S. bidentata*, since San Martín (1984) accepts Hartmann-Schröder's (1974) synonymy of *S. cryptopalpa* with *S. websteri*. Wehe and Fiege (2002) share this view by listing *S. cryptopalpa* as a synonym of *S. bidentata* in their checklist of the polychaetes of the Arabian Seas. However, Hartmann-Schröder herself refers to *S. cryptopalpa* as a valid species in her description of *S. aequiseta*, stating that for *S. aequiseta* the greatest similarity exists with *S. cryptopalpa*, especially with regard to the shape of the chaetae. According to Hartmann-Schröder (1981:33): “Die größte Ähnlichkeit besteht mit *S. cryptopalpa* Hartmann-Schröder, besonders in der Form der Borsten.”

As shown in Tables 1 and 2, not all species within the genus *Streptosyllis* comply entirely with its current definition. *S. cryptopalpa* and *S. reducta* differ in having an armed pharynx and no clear enlargement of the aciculae in the anterior parapodia. The validity of the latter character in these species cannot, however, be clearly concluded from the literature, since in the original description for *S. reducta*, Hartmann-Schröder (1960:95) states: “Die Acicula ist in allen Parapodien gleich und nirgends besonders auffällig dick.” This translates as: “aciculae are similar throughout all parapodia and nowhere notably enlarged.” However, in the same publication Hartmann-Schröder (1960:96) describes the aciculae of *S. reducta* and *S. cryptopalpa* as “bei weitem nicht so stark in den vorderen Parapodien verdickt, wie es bei anderen Arten auffällig ist”, implying a slight enlargement. A re-examination of the type material is thus necessary in order to clarify the taxonomic position of these two species. The enlarged aciculae, however, seem not to be a valid character for the definition of the genus since some individuals may have them, while some others may not, as observed in the new species. A tentative key to all valid *Streptosyllis* species, according to the above discussion, can be found below.

1. Palps well developed, dorsally visible.....2
- Palps not well developed, not visible dorsally.....8

2. Blades of compound chaetae with hyaline hood .....	3
- Blades of compound chaetae without hyaline hood .....	4
3. Enlarged aciculae present on chaetigers 2–4 .....	<i>S. biarticulata</i>
- Enlarged aciculae present on chaetigers 2–6 .....	<i>S. magnapalpa</i>
4. Dorsal simple chaetae with hyaline hood from chaetiger 5 onwards .....	5
- Dorsal simple chaetae without hyaline hood .....	6
5. Enlarged aciculae present on chaetigers 2–4 .....	<i>S. baolingi</i>
- Enlarged aciculae present on chaetigers 2–5 .....	<i>S. hainanensis</i>
6. Enlarged aciculae present on chaetigers 2–20/23 .....	<i>S. varians</i>
- Enlarged aciculae present on few anterior chaetigers only .....	7
7. Enlarged aciculae present on chaetigers 2–5 .....	<i>S. latipalpa</i>
- Enlarged aciculae present on chaetigers 2–6, in chaetiger 7 more slender than on chaetigers 2–6 but larger than on chaetiger 8 .....	<i>S. suhrmeyeri</i>
8. Simple dorsal chaetae with hyaline hood, at least posteriorly .....	9
- Simple dorsal chaetae without hyaline hood .....	15
9. Blades of compound chaetae with hyaline hood .....	10
- Blades of compound chaetae without hyaline hood .....	12
10. Distal end of shafts of compound chaetae covered by hyaline hood .....	<i>S. nunezi</i> <b>n. sp.</b>
- Distal end of shafts of compound chaetae not covered by hyaline hood .....	11
11. Spiniger-like compound chaetae present .....	<i>S. templadoi</i>
- Spiniger-like compound chaetae absent .....	<i>S. arenae</i>
12. Enlarged aciculae present on segments 2–5 .....	13
- Enlarged aciculae present on segments 2–6 .....	14
13. Blades of compound chaetae distinctly bidentate; aciculae of chaetigers 6 and 7 more slender than on chaetigers 2–5 but larger than on chaetiger 8 .....	<i>S. bidentata</i>
- Blades of compound chaetae indistinctly bidentate; aciculae of chaetiger 6 much more slender than those of chaetigers 2–5 .....	<i>S. websteri</i>
14. All simple dorsal chaetae with hyaline hood .....	<i>S. aequiseta</i>
- Simple dorsal chaetae with hyaline hood from chaetiger 7 onwards .....	<i>S. campoyi</i>
15. Simple dorsal chaetae unidentate .....	16
- Simple dorsal chaetae bidentate .....	<i>S. verrilli</i>
16. With 2 pairs of eyes .....	<i>S. reducta</i>
- With 3 pairs of eyes and an additional pair of eyespots .....	<i>S. cryptopalpa</i>

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