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# Three new species of *Syllis* Savigny in Lamarck, 1818 (Annelida: Syllidae) from the south coast of South Africa

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## Abstract

Over the last five decades, only two new species of *Syllis* (Syllidae, Annelida) have been described from South Africa, suggesting a greatly underestimated richness and the expectation that many more indigenous species still remain undescribed. In this paper, we describe three new species from algal turf along a rocky shore on the south coast of South Africa. All three species are characterised by having pseudo-simple chaetae by loss of blade and enlargement of shafts together with compound heterogomph bidentate falcigers. *Syllis zahri* **sp. nov.** (up to 5 mm long) is characterised by light pink to light brown colouration on its prostomium and anterior chaetigers, dark transverse bars that fade towards the posterior region, superior anterior chaetae having short spines and posterior parapodia with distally hollow aciculae. *Syllis jaylani* **sp. nov.** (up to 7 mm long) is narrow anteriorly, relatively wider at midbody and tapers posteriorly toward the pygidium, has a pharyngeal tooth slightly back from the anterior margin, strongly bidentate chaetae with teeth perpendicular to the main shaft, thin sinuose bidentate ventral simple chaetae with a serrated edge and pseudo-simple chaetae with a serrated edge in anterior parapodia. *Syllis bunaa* **sp. nov.** (up to 9 mm long) shows a characteristic dark brown colouration on its prostomium and anterior region, is distinctly rounded dorsally, and has unidentate or minutely bidentate chaetae, up to three pseudo-simple chaetae on parapodia along the whole body and posterior ventral simple chaetae that are thick with rounded tips or sinuose with a serrated inner edge.

**Key words:** Polychaete, diversity, algal turf, intertidal, pseudo-simple chaetae, South coast, taxonomy

## Introduction

With over 700 species, Syllidae (Annelida) is one of the most common and geographically widespread polychaete families in benthic environments (Aguado *et al.* 2012; San Martín & Aguado, 2014). They also inhabit a wide range of substrates (cf. San Martín & Aguado, 2014; San Martín & Worsfold, 2015), but particularly algal turf (cf. Magnino & Gaino, 1998; Oug, 2001; San Martín, 2005; Serrano *et al.* 2006; Cacabelos *et al*. 2007; Mikac & Musco, 2010; San Martín & Aguado, 2014). Syllids are easily recognized by a synapomorphic feature, i.e., a well-defined proventricle, usually situated in the anterior of the gut (Day, 1967; San Martín & Aguado, 2014). *Syllis* Savigny in Lamarck, 1818 is the most diverse genus of Syllidae, comprising more than 140 nominal species (Gil *et al*. 2017). This genus is further recognized by having distinctly separate palps, ventral cirri, three antennae, and distinctly jointed tentacular (two pairs) and dorsal cirri (Day, 1967; Licher, 1999).

Fifty-nine valid species of Syllidae are known to occur in South Africa (Day 1967, Simon *et al*., 2014). Among them, only 22 are described from South Africa, most of them belonging to the subfamily Syllinae and to the genus *Syllis* (Sedick, 2018). Species of *Syllis* are often the most common representatives of Syllidae in benthic communities, and in relatively well studied regions like Australia, more than 30 species have been described (Álvarez-Campos *et al.* 2015a). By contrast, a recent taxonomic re-examination of the family in South Africa revealed only ten valid species, most of which are not described from the region (Sedick, 2018). In fact, the recently described *Syllis amicarmillaris* Simon, San Martín & Robinson, 2014 and *Syllis unzima* Simon, San Martín & Robinson, 2014 (Simon *et al.* 2014) represent the first new species described from South Africa since *Syllis benguellana* Day, 1963. These three are the only species originally described from South African coasts. This suggests that diversity of endemic species has probably been largely underestimated.

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In this paper, we describe three species of *Syllis* new to science, which were collected from algal turf at Mossel Bay on the south coast of South Africa, representing only the second set of descriptions of new syllid species from South Africa in more than 50 years.

## Material and methods

Scrape samples (10 x 10 cm) were collected from algal turf at the lower intertidal of the rocky shore at Mossel Bay along the south coast of South Africa in October 2015. Specimens were sorted under a dissecting microscope (Leica MZ75) and relaxed in 7% $MgCl_2$ in tap water before fixing in 4% formalin in seawater, and storing in 70% ethanol. Fixed individuals were stained with aqueous methyl green and morphological features were examined under either a dissecting microscope or a Leica DM 1000 compound microscope. All photographs were taken of preserved specimens using a Leica EC3 camera attached to either microscope. Permanent slides were prepared by placing sections of the fixed parapodia and chaetigers in Aquatex© mounting fluid. Morphological line drawings were prepared using a camera lucida attached to the compound microscope. Associated camera software, Leica LAS EZ V1.5.0, was used to take length and width measurements of specimens on each photograph. Width measurements of specimens were taken at middle proventricular segments, without parapodia.

Specimens were deposited at the Iziko South African Museum, Cape Town (SAMC).

## Results

### SYSTEMATICS

**Order: Phyllodocida Dales, 1962**

**Family: Syllidae Grube, 1850**

**Subfamily: Syllinae Grube, 1850**

**Genus: *Syllis* Savigny in Lamarck, 1818**

**Type-species: *Syllis monilaris* Savigny in Lamarck, 1818**

***Syllis zahri* sp. nov.**
(Figures 1 and 2)
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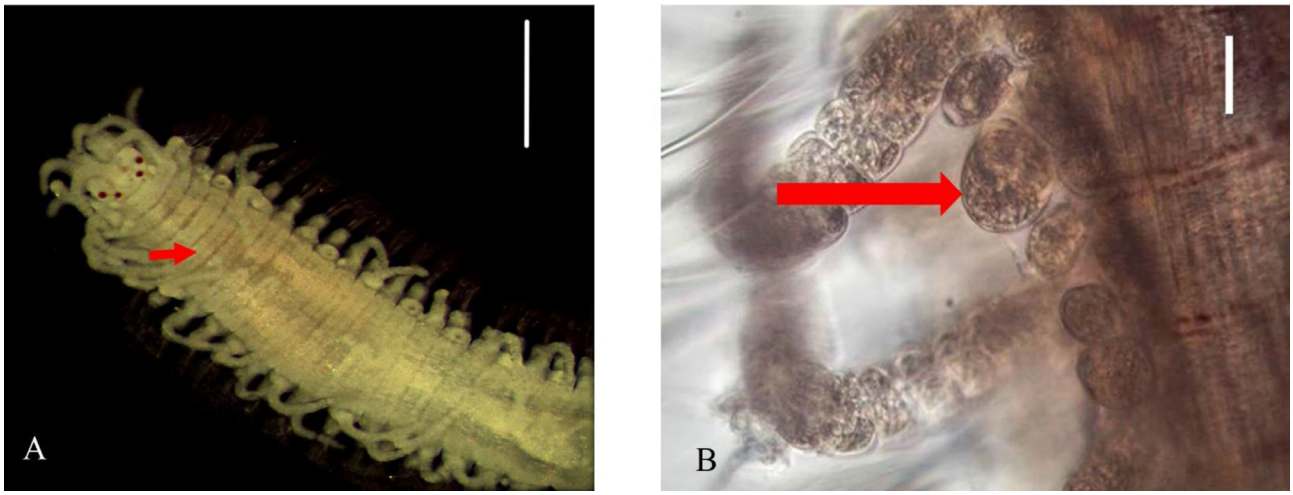


**FIGURE 1.** *Syllis zahri* **sp. nov.** paratype, preserved specimen (SAMC-A089054). **A)** anterior end, dorsal view, arrow pointing to faint median pigment across dorsum. **B)** epibiotic protozoans indicated by arrow. Scale bars: A = 500 µm; B = 200 µm.

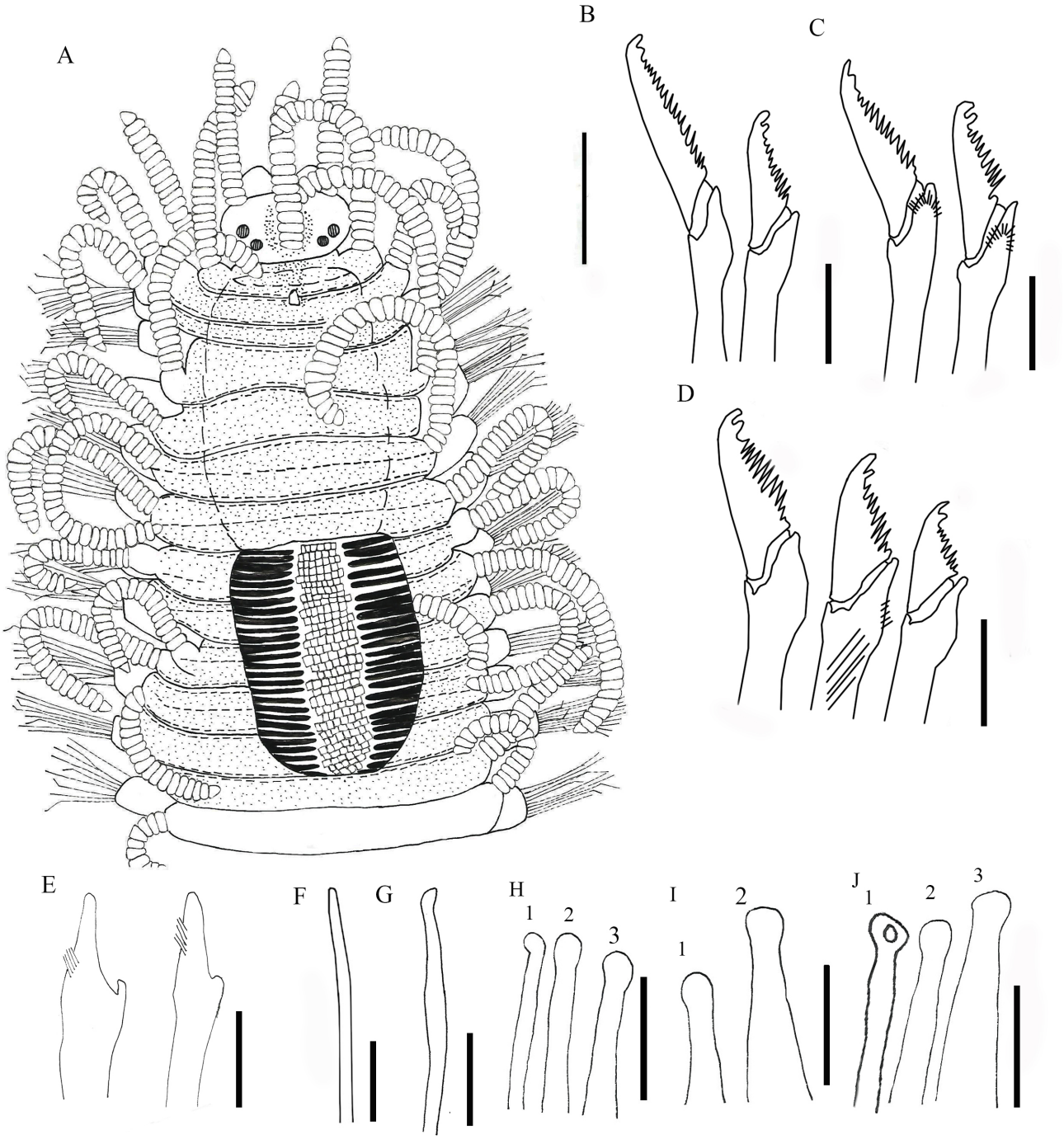


**FIGURE 2.** *Syllis zahri* **sp. nov.** paratype (SAMC-A089054). (**A)** Anterior end, dorsal view; (**B)** anterior body falcigers; (**C)** midbody falcigers; (**D)** posterior body falcigers, **(E)** pseudo-simple chaetae; (**F)** straight dorsal simple chaeta with rounded tip, posterior body; (**G)** straight ventral simple chaeta with curved tip, posterior body; (H-J) aciculae on anterior, midbody and posterior parapodia, respectively. Chaetae in 2B–D: Left = dorsalmost, Right = ventralmost. Scale bars: A = 200 μm; B–D = 10 μm; E–F = 20 μm; G–I = 15 μm.

**Material examined.** 15 specimens. Mossel Bay (34°11'6.396"S; 22°9'34.649"E), South Africa, algal turf, lower intertidal, rocky shore; S. Sedick coll., October 2015, Holotype (SAMC-A089053) and two Paratypes: (SAMC-A089054). One specimen and permanent slides of anterior, midbody and posterior parapodia, **Additional material examined**. 12 complete specimens (SAMC-A089054), data as for Holotype and Paratypes.

**Description.** Holotype complete specimen 3 mm long, 0.3 mm wide for 44 chaetigers (additional material 2.3

- 5.2 mm for 34 - 53 chaetigers). Body cylindrical, short and broad, tapering posteriorly. In live and preserved specimens, anterior segments light pink to light brown, with two thin dark brown bars running across dorsum at anterior and posterior margins of each of anterior chaetigers (Fig. 1A); median transverse bands in some (Figs 1A, 2A). Prostomium oval, with two pairs of red eyes; anterior pair larger than posterior pair, in wide trapezoidal arrangement (Fig. 1A). Palps basally fused, broadly triangular. Antennae, tentacular and dorsal cirri distinctly articulated (Fig. 2A). Median antenna inserted between posterior eyes, longer than combined length of prostomium and palps (Fig. 2A), 16–21 articles long. Lateral antennae longer than palps, arising from anterior margin of prostomium, in front of anterior pair of eyes, with about 14–20 articles (Fig. 2A). Peristomium shorter than subsequent chaetigers; two pairs of tentacular cirri, dorsal pair with 17–30 articles, ventral pair with 13–20 (Fig. 2A). Dorsal cirri slender, subequal to or longer than body width; alternate in length; long dorsal cirri with 19–27 articles on anterior parapodia, up to 33 in larger specimens; in holotype dorsal cirri with 25 & 21; 14 & 15 and 17 & 17 articles on left and right parapodia of chaetigers 1 to 3, respectively; up to 21 articles in midbody. Ventral cirri short, not extending beyond parapodial lobe, digitiform. Parapodia conical usually raised or distally rounded on one side, with up to nine, seven, and six compound heterogomph falcigers in anterior, mid- and posterior body, respectively. Anterior parapodia with 7–10 chaetae each, 7–9 in midbody, 6–8 in posterior. Blades of falcigers minutely to strongly bidentate along length of body, proximal tooth about half the length of distal tooth in anterior chaetigers, becoming subequal in mid- and posterior body (Figs 2B-D); dorso-ventral gradation in blade length, in anterior parapodia 34 µm to 25 µm (Fig. 2B), in midbody 36 µm to 27 µm (Fig. 2C) and in posterior 30 µm to 22 µm (Figs 2D). Fine teeth on falciger blades throughout body, gradation in length, top-most teeth shortest, bottom-most longest. Pseudo-simple chaetae formed by loss of blade and enlargement of shaft may be present only in anterior or only in midbody or throughout length of body. Solitary pseudo-simple chaetae on each parapodium, of two sizes (Fig. 2E), rounded tips, with short spines on one margin, often broader than compound chaetae. Solitary dorsal capillary simple chaetae straight, with rounded tip, smooth on margin (Fig. 2F); solitary ventral capillary simple chaetae slightly curved (Fig. 2G), unidentate, smooth on margin, only present on most posterior chaetigers. Up to three aciculae per parapodium anteriorly, two in midbody, one or two in posterior parapodia. Anterior aciculae straight, narrow and club-shaped (Fig. 2H 1), or broad and distally rounded (Fig. 2H 2, 3); in midbody distally rounded but narrow or broad (Fig. 2I 1, 2, respectively), posteriorly straight and hollow (Fig. 2J 1), knobbed (Fig. 2J 2) or broad and distally rounded (Fig. 2J 3). Pharynx usually 5–8 chaetigers long (up to 11 chaetigers long in larger individuals); mid-dorsal tooth triangular, located on anterior margin. Proventricle 5–8 chaetigers long, with about 23 muscle rows. Two anal cirri, with14–22 articles. Pygidium with small median stylus.

Numerous protozoans present on dorsum and grooves between dorsal cirri (Fig. 1B, indicated by arrow), present along body, but more concentrated anteriorly.

**Habitat.** Algal turf, lower intertidal, rocky shore.

**Distribution.** Mossel Bay, South Africa.

**Etymology.** From the Arabic word meaning “pink”, referring to the general colour of the worm.

***Syllis jaylani* sp. nov.**

(Figures 3A and 4)

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**Material examined.** 17 specimens. Mossel Bay (34°11’6.396”S; 22°9’34.649”E), South Africa, algal turf, lower intertidal, rocky shore); S. Sedick, coll., October 2015, Holotype (SAMC-A089055) and four Paratypes (SAMC-A089056), plus slides of anterior, midbody and posterior parapodia. **Additional material examined**. Same data as for holotype and paratypes; eight complete and 4 incomplete specimens (SAMC-A089056).

**Description.** Holotype 4 mm long, 0.4 mm wide, for 53 chaetigers (additional material 3–7 mm for 48–58 chaetigers). Body yellowish, translucent, without colour pattern in live and preserved specimens (Figs 3A); subcylindrical in cross section, midbody and posterior body slightly wider than anterior body, tapered at pygidium. Prostomium oval (Fig. 3A); two pairs of round red eyes, equal in size, in trapezoidal arrangement (Figs 3A, 4A). Two smaller eyespots sometimes on anteriormost region of prostomium, well in front of anterior eyes. Median antenna longer than palps and prostomium together, originating between posterior pair of eyes (Fig. 4A), with 16–23 articles. Lateral antennae shorter than median antenna but longer than prostomium, originating in front of anterior

pair of eyes, with 8–18 articles (Fig. 4A). Palps triangular, longer than broad, basally fused, slightly longer than prostomium. Peristomium similar in length to subsequent chaetigers; dorsal tentacular cirri with 11–21 articles, ventral tentacular cirri with 8–25 (Fig. 4A). Dorsal cirri subequal to body width or slightly longer; 12–20 articles in anterior segments, up to 30 in larger specimens; 19–25 articles in midbody, up to 30 in largest specimens; in holotype first three pairs with 19 & 19, 15 & 16, and 15 & 13 articles on left and right parapodia of chaetigers 1 to 3, respectively; up to 18 articles in midbody cirri in most (8–30 in some specimens). Ventral cirri shorter than parapodial lobes, digitiform. Parapodia broadly conical, at times appearing slightly raised on one side. Anterior parapodia with 7–12 compound chaetae, 6–10 on midbody parapodia, 4–8 on posterior parapodia. Compound heterogomph bidentate falcigers throughout, with both teeth perpendicular or at an angle to main shaft, proximal tooth subequal to distal tooth anteriorly, becoming progressively shorter than distal tooth in mid- and posterior body (Figs 4B, D, F). Dorso-ventral gradation in length of blades; 38 µm to 26 µm in anterior, 43 µm to33 µm in midbody; 26 µm to23 µm posterior. Teeth on falciger blades fine to moderately fine becoming longer toward the end of the blade. Longer falciger blades on anterior body may have shorter teeth. One or two pseudo-simple chaetae by loss of blades and enlargement of shafts per parapodium on anterior and midbody parapodia, similar to falciger shafts, sub-distally broad, tapering to rounded pointed, or sub-distally narrow, tapering into sharper point, short spines on outer margin edge (Fig. 4C, E). Solitary dorsal capillary simple chaetae on posterior parapodia, straight, thin, pointed (Fig. 4G 1). Solitary ventral capillary simple chaetae thin, sinuose, bidentate with serrated inner edge (Fig. 4G 2), on posterior-most parapodia. Up to three or four aciculae on each parapodium in anterior body, of several types: almost club- shaped (Fig. 4H 1), distally rounded (Fig. 4H 2, 3), acuminate (Fig. 4H 4), distally bent at an angle (Fig. 4H 5), and sub-distally rounded (Fig. 4H 6, 7). Two to three aciculae in each midbody parapodium; broad, sub-distally rounded (Fig. 4I 1) or acuminate, angled on one side (Fig. 4I 2). One or two aciculae posteriorly, of four types; acuminate, narrow point (Fig. 4J 1) or rounded point (Fig. 4J 2, 3, 4). Pharynx extending through 6–8 chaetigers (10–12 in larger individuals), mid-dorsal conical tooth inserted well back from anterior margin (Fig. 4A). Proventricle extends through 7–10 chaetigers, with 37 muscle cell rows (Fig. 4A). Two anal cirri, with 7–14 articles. Pygidium rounded with no median stylus.

**Habitat.** Algal turf, lower intertidal, rocky shore.

**Distribution.** Mossel Bay, South Africa.

**Etymology.** This species is named after Ayesha Jaylani, the late grandmother of the primary author.

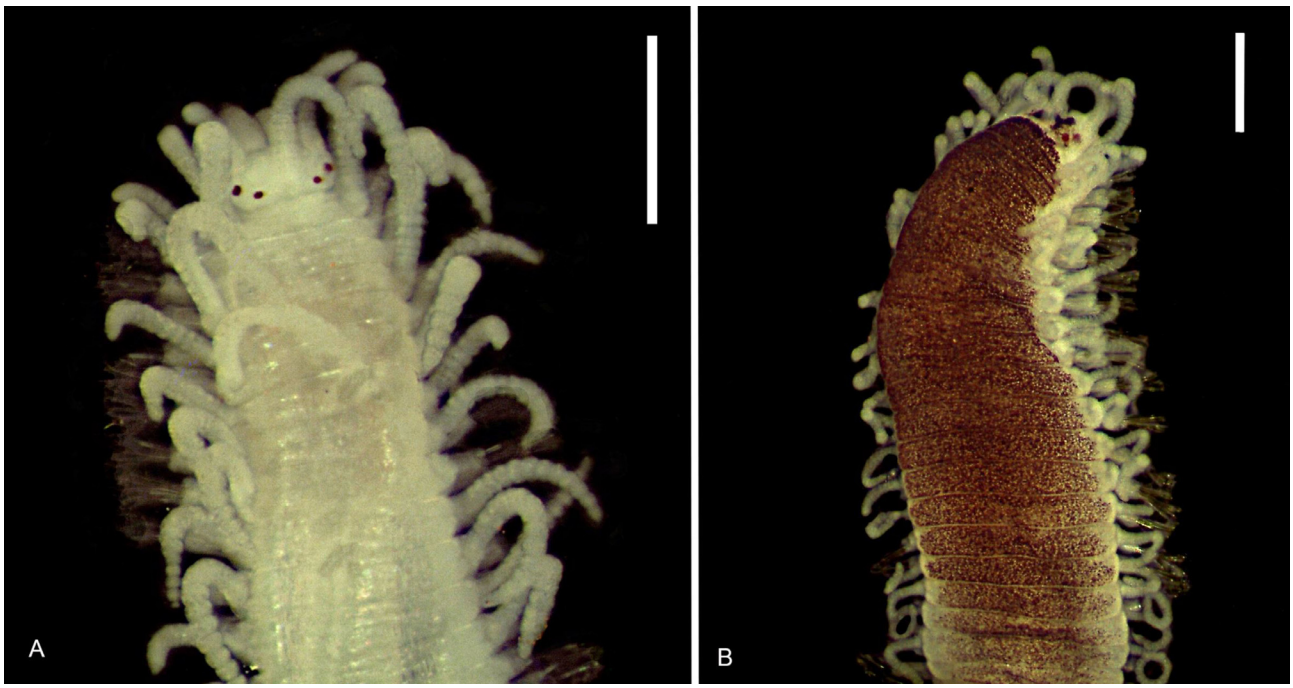


**FIGURE 3. A)** *Syllis jaylani* **sp. nov.** holotype, preserved specimen (SAMC-089056), Anterior end, dorsal view. **B)** *Syllis bunaa* **sp. nov.**, holotype, preserved specimen (SAMC- A089058), anterior end, dorsal view. Scale bar 3A = 200 µm, 3B = 500 µm,

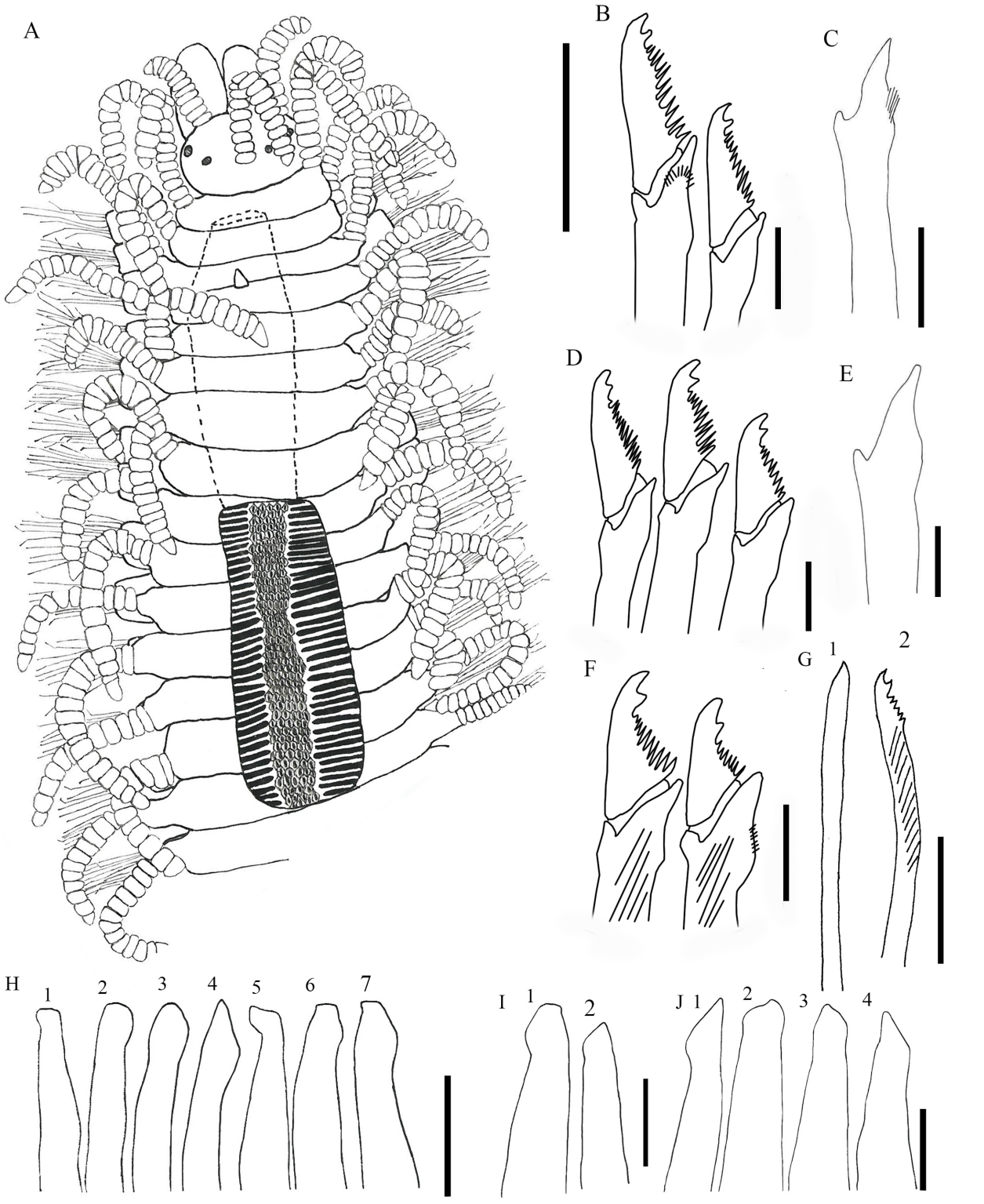


**FIGURE 4.** *Syllis jaylani* **sp. nov.** paratype (SAMC-089056), **(A)** Anterior end, dorsal view, **(B)** anterior falcigers with **(C)** solitary subtriangular pseudo-simple chaeta, **(D)** midbody falcigers with **(E)** single subtriangular pseudo-simple chaetae, **(F)** posterior falcigers with **(G)** posterior simple chaetae straight and pointed dorsally (1), sinuose, bidentate with serrated inner edge (2), on **(H-J)** aciculae on anterior, midbody and, posterior parapodia, respectively. Arrangement of chaetae in 4B, D, F: Left = dorsal-most, Right = ventral-most. Scale bars: A = 500 μm, B, D, F, H–J = 10 μm, C, E, G = 20 μm.

***Syllis bunaa* sp. nov.**
(Figures 3B and 5)
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**Material examined.** 20 specimens. Mossel Bay (34°11'6.396"S; 22°9'34.649"E), South Africa, algal turf, lower intertidal, rocky shore, S. Sedick coll., October 2015. Holotype (SAMC-A089057) and four Paratypes, plus one slide of anterior, mid-body and posterior parapodia (SAMC-A089058). **Additional material examined**. 15 specimens, same data as for Holotype and Paratypes.

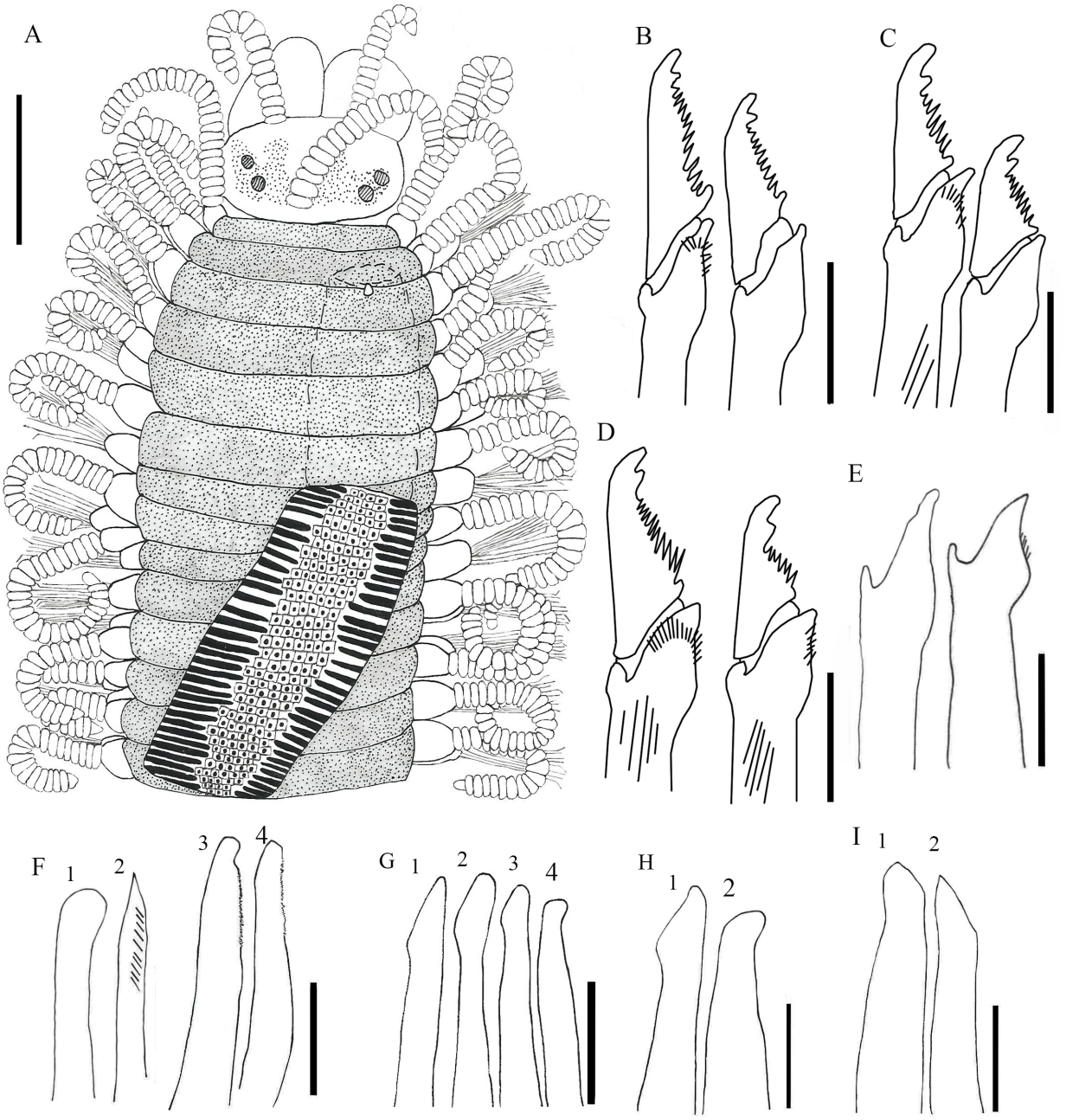


**FIGURE 5.** *Syllis bunaa* **sp. nov.**, paratype (SAMC-A089058), **(A)** anterior end, dorsal view, **(B)** anterior body falcigers, **(C)** midbody falcigers, **(D)** posterior body falcigers **(E)** pseudo-simple chaetae, **(F)** posterior ventral simple chaetae (1), posterior dorsal simple chaetae (2–4), **(G-I)** aciculae on anterior, midbody, and posterior parapodia, respectively. Chaetae in 5B–D: Left = dorsal-most, Right = ventral-most. Scale bars: A = 200 µm, B–D = 10 µm, E = 20 µm, F–J = 10 µm.

**Description.** Holotype complete specimen, robust, 6 mm long, 0.4 mm wide for 61 chaetigers (additional material 2–9 mm for 49–61 chaetigers). Body cylindrical, dorsally swollen, appearing rounder in cross section anteriorly than posteriorly, becoming less swollen toward posterior body (Fig. 3B). Dark brown pigmentation, almost completely opaque on prostomium and anterior segments, fading toward posterior end, both *in vivo* and preserved specimens. Dark chocolate to light brown pigmentation that may extend to inner dorsal margins of palps. Intersegmental brown bars, starting just after proventricle, fading toward posterior. Prostomium oval; two pairs of similarly-sized red rounded eyes, in trapezoidal arrangement (Figs 3B, 5A). Median and lateral antennae, dorsal and tentacular cirri distinctly articulated (Figs 3B, 5A). Median antenna longer than palps and prostomium together, originating from middle of prostomium, with 17–23 articles (Fig. 5A). Lateral antennae longer than palps, arising from anterior margin of prostomium, with 13–17 articles (Fig. 5A). Palps basally fused, ovate, similar in length to prostomium. Peristomium shorter than subsequent segments; two pairs of tentacular cirri, dorsal pair with 14–24 articles, ventral pair with 13–18. Dorsal cirri shorter than or subequal to body width, long dorsal cirri with 13–20 articles anteriorly, up to 27 articles in larger specimens, 12–19 articles on midbody parapodia, up to 34 in largest specimens. In holotype dorsal cirri with 27 & 25, 11 & 18, and 21 & 19 articles on left and right parapodia of chaetigers 1 to 3, respectively, up to 22 articles in midbody. Ventral cirri short, not extending beyond parapodial lobes. Parapodia conical, slender. Anterior parapodia each with 6–13 compound chaetae, 6–10 in mid-body, 5–8 in posterior parapodia. Compound chaetae heterogomph bidentate falcigers, with moderately long, thin spines on blades, fine spines on basal margin in some chaetae (Fig. 5B–D). Proximal tooth always shorter than distal tooth, becoming progressively smaller in mid- to posterior body (Figs 5B-D). Dorso-ventral gradation in length of blades; 26 µm to 24 µm in anterior; 30 µm to 23 µm in midbody; 24 µm to 22 µm in posterior. On anterior body, length of teeth on falciger blades appear uniform in length but top-most teeth shorter, especially on longer falciger blades. On mid- and posterior body, a clear gradation in length of teeth exists, bottom-most teeth longest. Chaetae with shorter falciger blades may have shorter teeth. Pseudo-simple chaetae by loss of blades and enlargement of shafts differ from shafts of compound falcigers in having broad, narrow shaft, rounded tip or narrow shaft with wide pointed tip (Fig. 5E). Up to three pseudo-simple chaetae may be present in anterior and mid-body only, or along the whole body. Solitary dorsal capillary simple chaetae on posterior parapodia, straight, thick with rounded tip (Fig. 5F 1). Solitary ventral capillary chaetae thin and pointed (Fig. 5F 2) or thick with serrations along inner edge of chaetal shaft (Fig. 5F). Up to three aciculae in each anterior body parapodium of four types: narrow, acuminate, rounded point (Fig. 5G, 1, 2, 3) or distally bent (Fig. 5G 4). Two aciculae in each mid-body parapodium; broad, acuminate, rounded point (Fig. 5H 1) or bent, rounded tip (Fig. 5H 2). One or two aciculae in each posterior body parapodium: broad, acuminate, with rounded tips (Fig. 5I 1) or narrow, pointed tip (Fig. 5I 2). Pharynx extends through 5–8 chaetigers; mid-dorsal pharyngeal tooth small, teardrop shaped, located on anterior margin of pharynx. Proventricle extends through 5–8 chaetigers, with about 26 muscle cell rows (Fig. 5A). Two anal cirri, with 9–16 articles. Pygidium rounded, no median stylus.

**Habitat.** Algal turf, lower intertidal, rocky shore.

**Distribution.** Mossel Bay, South Africa.

**Etymology.** From the Arabic word meaning "brown", referring to the distinctive brown colour of the worm.

**Discussion:**

***Presence of pseudo-simple chaetae in Syllis:***

While there are many examples of species belonging to other genera that have pseudo-simple chaetae, the presence of these secondarily simple chaetae is not a synapomorphic feature of *Syllis* (Álvarez-Campos *et al*. 2015a). Pseudo-simple chaetae are formed by loss of the chaetal blade and partial fusion of the blade to the shaft and is most likely a result of adaptation to the surrounding environment (Álvarez-Campos *et al*. 2015b). For example, *Haplosyllis* Langerhans 1879 (Martin *et al*. 2002, Lattig and Martin 2011); *Parahaplosyllis* Hartmann-Schroder 1990 (Álvarez-Campos *et al*. 2013) and *Haplosyllides floridana* Augener 1922 all have pseudosimple chaetae, and usually occupy specialized habitats, including sponges and gorgonians (Martin *et al*. 2002, Lattig and Martin 2011), algae, ascidians and sponges (Álvarez-Campos *et al*. 2013), respectively. Within *Syllis*, only five species possess this feature: *Syllis amica* Quatrefages, 1866, *Syllis amicarmillaris*, *Syllis elongata* (Johnson 1901), *Syllis ferrani* Alós and San

Martín 1987 and *Syllis magdalena* Wesenburg-Lund, 1962, but none occupy specialized habitats and show varying levels of similarity to the three species described here (Alós and San Martín 1987, Wesenburg-Lund 1962).

*Syllis amica* (in Day 1967) is most similar to *S. zahri* **sp. nov.** as both have dorsal cirri that are sub equal to body width and knob-shaped aciculae, but they differ as *S. amica* is longer (60 mm) with a shorter proventricle (5 chaetigers), has short unidentate or minutely bidentate compound chaetae and stout simple chaetae that are obliquely truncate. *Syllis amica* and *S. bunaa* **sp. nov.** are similar in length of the dorsal cirri and presence of pseudo-simple chaetae only. This species differs from *S. bunaa* **sp. nov.** in being much longer with a shorter proventricle, having unidentate or minutely bidentate chaetae and having knob-shaped aciculae. *Syllis amica* shows lowest levels of similarity to *S. jaylani* **sp. nov.** with the presence of pseudo-simple chaetae being the only main character that the two species have in common. These species differ in that *S. amica* is longer, has an anterior pharyngeal tooth and shorter proventricle, longer dorsal cirri (15–25 articles), unidentate or minutely bidentate chaetae and the presence of knobbed aciculae (Day 1967).

*Syllis amicarmillaris* (Simon *et al*. 2014) resembles *S. zahri* **sp. nov.** in having similar numbers of compound chaetae and lengths of chaetae in mid- and posterior body, and in the presence of pseudosimple chaetae. However, *S. amicarmillaris* is longer (32mm), has no distinct colour pattern, fusiform dorsal cirri, longer median antennae, shorter lateral and tentacular cirri, distally bilobed parapodia, longer pharynx, proventricle and anal cirri. *S. amicarmillaris* and *S. jaylani* **sp. nov.** resemble each other in the absence of colour pattern, length of median antennae, number of chaetae in mid and posterior body and sinuose bidentate simple chaetae. Additionally, the pharynx and proventricle of large individuals of *S. jaylani* may be similar in length (10 chaetigers) to *S. amicarmillaris* but with fewer muscle rows (37 and 50 muscle rows, respectively). These two species differ in length, where *S. amicarmillaris* is longer, has longer lateral antennae but shorter tentacular cirri and parapodia that are bi-lobed instead of conical. *Syllis amicarmillaris* resembles *S. bunaa* **sp. nov.** in the length of the lateral antennae and in the length of falcigers in the midbody. They differ with respect to length, with *S. amicarmillaris* being longer, with longer median antenna, pharynx, proventricle and anal cirri and shorter dorsal cirri and parapodial lobes that are bilobed instead of conical and slender. Furthermore, chaetae of *S. amicarmillaris* are unidenatae or minutely bidentate and not strongly bidentate as in *S. bunaa* **sp. nov.**, while the former species also has more chaetae per chaetiger in the anterior region but fewer in the mid- to posterior body. Similarly, *S. amicarmillaris* has more aciculae that are acuminate rather than distally bent as in *S. bunaa* **sp. nov.** *Syllis bunaa* **sp. nov.** can also be distinguished from living specimens of *S. amicarmillaris* by its distinct brown pigmentation.

*Syllis elongata* (Johnson 1901) is similar to *S. zahri* **sp. nov.** in the length of the median antennae and anal cirri, but *S. elongata* is longer (58.5 mm), has shorter dorsal and tentacular cirri and longer pharynx and proventricle. *Syllis elongata* and *S. jaylani* **sp. nov.** resemble one another in the distinct lack of colour pattern, length of tentacular cirri and proventricle. *Syllis elongata* differs from *S. jaylani* **sp. nov.** in being longer, having shorter dorsal cirri, and longer pharynx and anal cirri. *Syllis bunaa* **sp. nov.** and *S. elongata* are similar in the length of the tentacular cirri and proventricle only. These two species differ in the length of the median antenna (10–15 articles in *S. elongata*, 17–23 articles in *S. bunaa* **sp. nov.**) and dorsal cirri (16–18 articles in *S. elongata*, 13–27 articles in *S. bunaa* **sp. nov.**); shorter in *S. elongata*, the pharynx (12 chaetigers long in *S. elongata*, 5–8 chaetigers long in *S. bunaa* **sp. nov.**) and anal cirri (16–17 articles in *S. elongata*, 9–16 articles in *S. bunaa* **sp. nov.**).

*Syllis ferrani* is similar to *S. zahri* **sp. nov.** in the presence of bidentate compound falcigers only, but differ in that *S. ferrani* is much longer (20 mm), having longer median (28 articles) and lateral (18 articles) antennae and longer tentacular and dorsal cirri (20–21 articles and 28–24 articles, respectively). *Syllis jaylani* **sp. nov.** resembles *S. ferrani* in the length of the tentacular cirri and the presence of bidentate falcigers. *Syllis ferrani* differs from the new species by being longer in length, having a longer median and lateral antennae and longer anal cirri. *Syllis bunaa* **sp. nov.** is similar to *S. ferrani* in the length of the lateral antennae, the length of the dorsal tentacular cirri and the presence of compound bidentate falcigers. *Syllis ferrani* differs from S. *bunaa* **sp. nov.** in total body length, length of median antenna and length of dorsal and anal cirri (Alós and San Martín, 1987).

*Syllis magdalena* has longer dorsal cirri, shorter unidentate compound chaetae than *S. zahri* **sp. nov.**, *S. jaylani* **sp. nov.** and *S. bunaa* **sp. nov.** and a prostomium that is separated from the peristomium by a transversal pit (Licher, 1999).

### *Comparisons of the three new species*

*Syllis zahri* **sp. nov.** is characterized by its light pink to light brown colouration on prostomium and anterior segments and dark bars along anterior and posterior margins of anterior chaetigers that fade progressively toward the posterior of the animal that is visible in living and newly preserved specimens. Superior anterior chaetae show short spines and aciculae on posterior parapodia are distally hollow.

The colour pattern resembles that of *Syllis gracilis* Grube, 1840; *Syllis vittata* Grube, 1840, *Syllis prolifera* Krohn, 1852, *Syllis corallicola* Verrill, 1900, *S. unzima* and *Syllis warrnamboolensis* (Hartmann-Schroder 1987); all have dark cross bars on anterior or midbody segments which may vary in extent, frequency and colour within each species (Grube, 1840; Krohn 1852; San Martín, 1992; Licher, 1999; Simon *et al.* 2014). *Syllis zahri* **sp. nov.**, is also similar to *S. gracilis* and *S. prolifera* in having bidentate or minutely bidentate chaetae while *S. vittata* and *S. unzima* have unidentate to sub-bidentate falciger blades and, *S. corallicola* strongly bidentate falcigers (Verrill, 1900). The latter three species also differ from *S. zahri* in having distally hooked chaetae and short, stout inferior chaetae with short spines along one margin, respectively (Grube 1840; Day 1967; San Martín 1992; Licher, 1999; Simon *et al*. 2014), whereas *S. zahri* **sp. nov.** has chaetae that do not appear to be distally hooked and has moderately long spines on inferior chaetae that have narrow shafts and blades in anterior and mid body but become wider in posterior (Fig. 2B-D).

*Syllis zahri* **sp. nov.** closely resembles descriptions of *S. prolifera* from South Africa (Day, 1967) and the Mediterranean Sea, Aegean Sea and the North Atlantic (Licher 1999) with respect to globular shaped palps, strongly bidentate chaetae with fine spines along one margin of the shaft head, a dorso-ventral gradation in blade length and width, ventral simple chaetae that are S-shaped and bidentate and distally hollow aciculae on posterior parapodia. However, the new species differs from the description by Day (1967) in having broadly triangular palps with a more quadrangular prostomium, and ventral cirri that extend beyond the parapodial lobe. *Syllis prolifera* as described by Day (1967) and Licher (1999) also differs from the new species in the absence of secondarily simple chaetae, having no pigmentation, shorter spines on the margin of superior chaetal blades, thicker solitary dorsal simple chaetae and aciculae that are more anvil shaped than round.

*Syllis zahri* **sp. nov.** is similar to *S. unzima* in having distally hollow aciculae on parapodia (Simon *et al.* 2014), but the former species has transverse bars that only extend into the midbody region and has unidentate, distally hooked chaetae that are shorter in mid- (20–17 μm) and posterior (17–16 μm) body. *Syllis zahri* **sp. nov.** also resembles *S. corallicola* only with respect to the presence of transverse bars in anterior to midbody segments; but in the new species these bars are light pink to dark brown rather than red and not accompanied by double circles as in *S. corallicola* , dorsal and ventral simple chaetae are curved and strongly bidentate instead of the straight and unidentate dorsal and ventral simple chaetae present *Syllis corallicola* also has longer antennae and dorsal cirri (about 40 articles long) (Verill 1900) than *S. zahri* **sp. nov.**

Protozoans were observed on *S. zahri* **sp. nov.** Protozoans have previously been observed in intersegmental furrows positioned close to the base of parapodia of *S. prolifera* from the Spanish Mediterranean coast (Álvarez-Campos *et al*. 2014) and Hawai'i (as *S. microoculata* (Hartmann-Schröder, 1965)) where they were mistaken for papillae. Similarly, protozoans were also detected on the ventral side of posterior segments; around the prostomium; on nuchal organs, mouth opening and on anterior dorsal cirri of *Typosyllis macropectinans* Hartmann-Schröder, 1982, *S. magdalena* and *S. elongata*, respectively. These protozoans do not appear to impair or harm these syllids, although ciliate protozoans have been observed to have degrading effects on crustaceans (Morado *et al*. 1999; Gómez-Gutiérrez *et al*. 2003; Álvarez-Campos *et al.* 2014).

*Syllis jaylani* **sp. nov.** is recognized by its strongly bidentate chaetae with both primary and secondary teeth perpendicular to the main shaft, and ventral simple chaetae thin, sinuose, bidentate and with a serrated edge along one margin. Pseudo-simple chaetae also have a fine serrated edge along one margin in anterior parapodia. The pharyngeal tooth is distinctly back from the anterior margin. Individuals have a visibly narrower anterior and slightly wider midbody and posterior that tapers towards the pygidium.

This species is most similar to *Syllis hyalina* Grube, 1863 and *Syllis variegata* Grube, 1860 from South Africa (Day, 1967), and *S. prolifera* from the Mediterranean Sea (Álvarez-Campos *et al.* 2014). *Syllis jaylani* **sp. nov.** resembles *S. hyalina* in having two ocular specks positioned on the anterior of the prostomium and strongly bidentate compound chaetae with distal and proximal teeth perpendicular to the main shaft. However, in *S. jaylani* **sp. nov.,** the dorsal cirri are longer (12–21 articles) than *S. hyalina* (6–12 articles), the body is shorter (4–7 mm compared

to 35 mm in *S. hyalina*), the antennae are longer than *S. hyalina* (10–15 articles) and a proventricle that is up to ten chaetigers long which is longer than in *S. hyalina* (Day, 1967).

*Syllis jaylani* **sp. nov.** is similar to *S. prolifera* with respect to the strongly bidentate compound chaetae where distal and proximal teeth are perpendicular to the main shaft but with shorter spines on the chaetal blade and in the shorter spines along the sub distal margin of superior chaetae. The new species differs from live specimens of *S. prolifera* in the absence of a colour pattern on the body, length of dorsal cirri, length of antennae and length of proventricle.

*Syllis variegata* is similar to the new species in the length of the proventricle, extending through 8–10 segments whereas *S. jaylani* **sp. nov.** has a proventricle that extends through 7–10 chaetigers, but *S. jaylani* **sp. nov.** has no body colour pattern, a shorter pharynx (8 chaetigers) and dorsal cirri more similar in length to its body width (12–21 articles) than in *S. variegata* (20–40 articles).

*Syllis prolifera* from the Mediterranean Sea is the only one of the aforementioned species that has a pharyngeal tooth that is distinctly posterior to the anterior margin as in *Syllis jaylani* **sp.nov.** This character is present in many syllid species such as *Syllis antoniae* Salcedo-Oropeza, San Martín & Solís-Weiss, 2012; *S. busseltonensis* (Hartmann-Schröder, 1982), *S. rubicunda* Aguado, San Martín & Nishi, 2008, *S. vivipara* Krohn, 1869 and *S. unzima* (Licher, 1999; Aguado *et al*. 2008; Salcedo-Oropeza *et al.* 2012, Simon *et al*. 2014). *Syllis busseltonensis* and *S. jaylani* **sp. nov.** both have strongly bidentate chaetae and similarly shaped aciculae (Licher, 1999) but *S. jaylani* **sp. nov.**, is smaller, with palps narrower and longer than prostomium, shorter antennae, and a straight, long pharynx. *Syllis jaylani* **sp. nov.** and *S. antoniae* are similar in the length of the pharynx and the general shape of the posterior ventral simple chaetae (Salcedo-Oropeza *et al.* 2012), but differ in that *S. jaylani* **sp. nov.** has a shorter one and has an oval prostomium. *Syllis jaylani* **sp.nov.** and *S. rubicunda* have palps that are triangular and slightly longer than the prostomium, ventral cirri that do not extend beyond the parapodial lobes, 12 heterogomph bidentate falcigers on anterior parapodia and a pharyngeal tooth that is slightly back from the anterior pharyngeal margin (Aguado *et al*. 2008), but the former has a slender tapered body and lacks colour, has shorter antennae, dorsal cirri and tentacular cirri that are thinner and lack spinning glands. *Syllis jaylani* **sp. nov.** differs from *S. vivipara* in having bidentate chaetae and being much shorter in length with no distinct colour pattern (San Martín, 1992).

Living individuals of *S. bunaa* **sp. nov.** are characterized by a dark brown pigmentation on prostomium and distinctly dorsally rounded anterior region. This species is similar to *S. amicarmillaris*, *S. amica*, *S. gracilis* (Day, 1967; Licher, 1999; Simon *et al.* 2014), *Syllis zahri* **sp. nov.** and *Syllis jaylani* **sp. nov**. *Syllis bunaa* **sp. nov.** resembles *S. jaylani* **sp. nov.** in the length of the antennae and the number of aciculae along the body, but differs in having an anterior pharyngeal tooth close to the anterior margin of the pharynx and unidentate or minutely bidentate chaetae. *Syllis bunaa* **sp. nov.** resembles *S. gracilis* in the shape of superior anterior dorsal falcigers with chaetal blades being bidentate with a shorter distal tooth but differs in pigmentation pattern and in having pseudo-simple chaetae by loss of blades, instead of by fusion of blades and shafts as in *S. gracilis*, and in the shape of dorsal simple chaetae on posterior body (Day, 1967; Licher, 1999; Maltagliati *et al.* 2000; Álvarez-Campos *et al.* 2017). *Syllis bunaa* **sp. nov.** resembles *Syllis magdalena* Wesenberg-Lund, 1962 in their chocolate brown pigmentation only (Licher, 1999), but differs in having palps ovate and similar in length to the prostomium, a shorter pharynx, proventricle with fewer muscle rows, and unidentate chaetae (Licher, 1999).


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