Nova Acta Científica Compostelana (Bioloxía), **24**: 91-103 (2017) - ISSN 2340-0021

Artículo de investigación

Two new records of *Prochaetoderma* Thiele, 1902 (Mollusca, Caudofoveata, Prochaetodermatidae) on bathyal and abyssal bottoms of Galicia, NW Iberian Peninsula

Dúas novas citas de *Prochaetoderma* Thiele, 1902 (Mollusca, Caudofoveata, Prochaetodermatidae) nos fondos batiais e abisais de Galicia, NW da Península Ibérica

Marcos P. Señarís[1, 2]*, Oscar García-Álvarez[1] & Victoriano Urgorri[1, 2]

[1] Estación de Bioloxía Mariña da Graña,
Universidade de Santiago de Compostela, A Graña, 15590 Ferrol, Spain
[2] Departamento de Zooloxía e Antropoloxía Física, Facultade de Bioloxía,
Universidade de Santiago de Compostela, 15782 Santiago de Compostela, Spain
marcos.perez@usc.es; ogarcia-alvarez@edu.xunta.es; vituco.urgorri@usc.es

*: *Corresponding author*

(Recibido: 07/09/2017; Aceptado 07/11/2017; Publicado on-line: 01/12/2017)

Abstract

Prochaetodermatidae is one of the three families of class Caudofoveata (Mollusca). It consists of 39 species belonging to a single genus, *Prochaetoderma*. Only one species of this genus, *Prochaetoderma iberogallicum*, have been recorded on Galician bottoms, whereas six species are known from the Iberian Peninsula. The external anatomy and the radula of 26 specimens of *Prochaetoderma alleni* and one of *Prochaetoderma gauson* are studied in this paper. The specimens were collected during different oceanographic expeditions conducted by the Estación de Bioloxía Mariña da Graña of the Universidade de Santiago de Compostela on bathyal and abyssal bottoms off Galicia. Both species are recorded for the flrst time on Galician coasts; *P. gauson* is also a new record for the Iberian Peninsula.

Key Words: Caudofoveata, sclerites, new record, *Prochaetoderma*

Resume

Prochaetodermatidae é unha das tres familias que integran a clase Caudofoveata. Está composta por 39 especies dun único xénero, *Prochaetoderma*. Nos fondos de Galicia só fora citada unha especie deste xénero, *Prochaetoderma iberogallicum*, mentras que no ámbito da península Ibérica coñecíanse seis especies. Neste traballo estúdase a anatomía externa e a rádula de 26 exemplares de *Prochaetoderma alleni* e un de *Prochaetoderma gauson*, recollidos en diversas campañas oceanográflcas realizadas pola Estación de Bioloxía Mariña da Graña da USC en fondos batiais e abisais de Galicia. Ambas especies son citadas por primeira vez nas costas galegas e ademais *P. gauson* é unha nova cita para a península Ibérica.

Palabras Chave: Caudofoveata, escleritos, nova cita, *Prochaetoderma*

INTRODUCTION

Caudofoveata are vermiform molluscs with a post or peri oral buccal shield in their anterior region and an aculiferan mantle covered by sclerites of calcium carbonate, mostly scale-shaped. They show bilateral symmetry and circular cross-section. A bell-shaped pallial cavity lies at the posterior end, wherein a pair of ctenidia is located (Salvini-Plawen, 1985; Scheltema, 1985; Salvini-Plawen & García-Álvarez, 2014). They live on soft bottoms within a wide bathymetric range, 3-9000 m, in waters with low hydrodynamism and salinity not inferior to 28-30‰, although their abundance depends on local environmental conditions (Salvini-Plawen, 1975; Scheltema & Ivanov, 2009).

Prochaetodermatidae is one of the families of the class Caudofoveata; it is composed of a single genus, *Prochaetoderma* Thiele, 1902. Although some authors have proposed for this family a classiflcation in six genera (Scheltema, 1985; Scheltema & Ivanov, 2000; Ivanov & Scheltema, 2004) based on the typology of sclerites and/or the radula, the characters deflning these genera do not correspond to each other and partly overlap. Also, the synonymization of species in this family indicates that it is difflcult to distinguish among these genera (Scheltema & Ivanov, 2001; Salvini-Plawen & García-Álvarez, 2014; Señarís *et al.*, 2017a). Thus, species are treated here as belonging only to the genus *Prochaetoderma* (Salvini-Plawen & García-Álvarez, 2014). The genus *Prochaetoderma* is characterized by bearing a biserial radula with falciform teeth, where each pair of teeth has a reinforced basal region and a pair of reinforcing struts or jaws, spatulate and with a small and oval base, as well as by the lack of an external constriction between the anterior body region and the trunk (Salvini-Plawen, 1971, 1972, 1975; Salvini-Plawen & García-Álvarez, 2014).

The genus comprises 38 species, of which 6 have been cited in waters of the Iberian Peninsula: *Prochaetoderma alleni* (Scheltema & Ivanov, 2000), *Prochaetoderma clenchi* (Scheltema, 1985), *Prochaetoderma gladiatum* Salvini-Plawen, 1992, *Prochaetoderma iberogallicum* Salvini-Plawen, 1999, *Prochaetoderma turnerae* (Scheltema, 1985) and *Prochaetoderma yongei* Scheltema, 1985 (Scheltema, 1985; Salvini-Plawen *et al.*, 1998; Salvini-Plawen, 1999, 2009; Scheltema & Ivanov, 2000, 2001; Salvini-Plawen & García-Álvarez, 2011, 2014). Of these six species, only *P. iberogallicum* has been recorded on the Galician coast, NW Iberian Peninsula (Salvini-Plawen, 1999, 2009; Salvini-Plawen & García-Álvarez, 2011, 2014; Señarís *et al.*, 2017a).

In this paper, 26 specimens of *Prochaetoderma alleni* (Scheltema & Ivanov, 2000) and one of *Prochaetoderma gauson* (Scheltema, 1985), collected on Galician bottoms, are studied. The *habitus*, buccal shield, typology and morphology of the sclerites of each body region and radula are described both under optical microscope and scanning electron microscope (SEM). *P. alleni* is a new record for Galician coasts and *P. gauson* is a new record for the Iberian Peninsula.

MATERIAL AND METHODS

In recent years several oceanographic expeditions conducted by the Estación de Bioloxía Mariña da Graña of the Universidade de Santiago de Compostela (EBMG-USC) have been carried out on bathyal and abyssal bottoms off Galicia (NW Iberian Peninsula). In the expeditions DIVA-ARTABRIA I 2003, A SELVA 2008 and DIVA-ARTABRIA II 2008, the 27 specimens of Mollusca Caudofoveata of the family Prochaetodermatidae studied in this paper (Table I) were collected by using the dredges *naturalistic dredge* (DRN) and *epibenthic sledge* (EBS) on soft bottoms at a depth of 600 to 5346 m.

Samples were preserved in 70% ethanol neutralized with disodium tetraborate 10-hydrate (borax). Specimens were photographed and measured under a stereoscopic microscope (Olympus SZ40) with a camera Olympus C5050 and under an optical microscope (Olympus AX70) with a camera Olympus DP71 attached to it. For the study of sclerites under the optical microscope (Olympus AX70), samples were isolated by scraping and cleansed with 5% sodium hypochlorite. Subsequently, they were washed in distilled water, left to dry and mounted with Canada balsam. The preparation of sclerites for the study under SEM was similar to that carried out for the optical microscope, mounted on a SEM slide and left to dry.

Table I. Data on the specimens of *Prochaetoderma* studied. (EBS, *Epibenthic sledge*; DRN, *naturalistic dredge*; Nº. spec., number of specimens).
Taboa I. Datos sobre os exemplares de *Prochaetoderma* estudiados. (EBS, *Epibenthic sledge*; DRN, draga naturalista; Nº spec., número de exemplares).

Species	Expedition	Station and coordinates	Nº. spec.	Dredge	Depth (m)	Length (mm)
Prochaetoderma alleni	DIVA-ARTABRIA I 2003	EBS-600-2003-180903 43º48,587'N; 8º51,740'W	9	EBS	600	1,5-2,5
Prochaetoderma alleni	A SELVA 2008	15-2-DRN-2008-240708 43º56,478'N; 8º54,199'W	8	DRN	600 -900	1,5-2,8
Prochaetoderma alleni	DIVA-ARTABRIA II 2008	27-EBS-2008-290908 42º45,900'N; 9º41,680'W	9	EBS	1500	1,7-3,2
Prochaetoderma gauson	DIVA-ARTABRIA II 2009	03-EBS-2009-261009 42º44,716'N; 13º0,361'W	1	EBS	5346	3,12

For the study of the radula, the anterior region of the animal was cut and treated with 5% sodium hypochlorite so as to remove the organic matter and isolate the radula. It was then washed with distilled water and mounted with Canada balsam. In order to complete the radular study, serial histological sections were made from two specimens of *P. alleni*. Thus, specimens were decalcifled in EDTA, embedded in paraffln, cut in 5 µm sections with a microtome Microm HM 340E and stained in Mallory's trichrome (Gil-Mansilla *et al.*, 2008).

RESULTS

Class **Caudofoveata** Boettger, 1956
Family **Prochaetodermatidae**
Salvini-Plawen, 1968
Genus ***Prochaetoderma*** Thiele, 1902

Prochaetoderma alleni
(Scheltema & Ivanov, 2000)
Spathoderma alleni Scheltema & Ivanov, 2000
(Original combination)

Material examined. 26 specimens 1.5-3.2 mm long, collected at a depth of 600-1500 m: 9 specimens of the expedition DIVA-ARTABRIA I 2003, station EBS-600-2003-180903; 8 of the expedition A SELVA 2008, station 15-2-DRN-2008-240708 and 9 of the expedition DIVA-ARTABRIA II 2008, station 27-EBS-2008-290908 (Table I).

Distribution. From Iceland to the Bay of Biscay at a depth of 213-1175 m; western Iberian Peninsula at a depth of 600-1500 m (this paper); Bay of Cádiz and Mediterranean Sea: Alboran Sea, off Barcelona, Gulf of Naples, Corfu, western Malta, central Adriatic Sea and Aegean Sea at a depth of 50-2632 m (Scheltema & Ivanov, 2000; Ivanov & Scheltema, 2001; Salvini-Plawen & Öztürk, 2006; Salvini-Plawen, 2009; Salvini-Plawen & García-Álvarez, 2011, 2014).

Diagnosis. Translucent, small, up to 3.5 mm long, with wide trunk up to 1 mm in diameter and short tail. Buccal shield paired and small, with three semicircular rows of small sclerites. Oval or lanceolate sclerites ‡at and smooth in the anterior region. In the trunk and tail, sclerites are lanceolate, elongated, ‡at, smooth, longitudinally asymmetrical with marked waist and base wider than blade. Tassel with two types of acicular sclerites: small and straight on the one hand and long and curved on the other hand. Radula apparatus with two rows of small falciform teeth and two spatula-shaped reinforcing struts or jaws, base oval and small.

Description. *Habitus*. Animals 1.5-3.2 mm long and 0.3-1 mm wide. Brownish white when flxed in 70% alcohol. Paired buccal shield with two oval parts, between which the mouth is located. With four body regions: anterior, trunk, tail and tassel (Fig. 1A). Anterior region short, trunk long and tail short and narrow. In the terminal region, long and narrow tassel, where the ctenidia are located. Posterior index (tail + tassel) / trunk between 0.2 and 0.42.

Buccal shield. Small buccal shield comprising two oval parts (140 µm long x 85 µm wide each) between which the mouth is located (Fig. 1B). On the sides of the shield, three semicircular rows of sclerites oval, smooth, ‡at and increasing in size: in the flrst row 15-25 µm long x 10-15 µm wide, in the second row 20-40 µm x 15-20 µm and in the third row 40-60 µm x 20-30 µm (Fig. 1C).

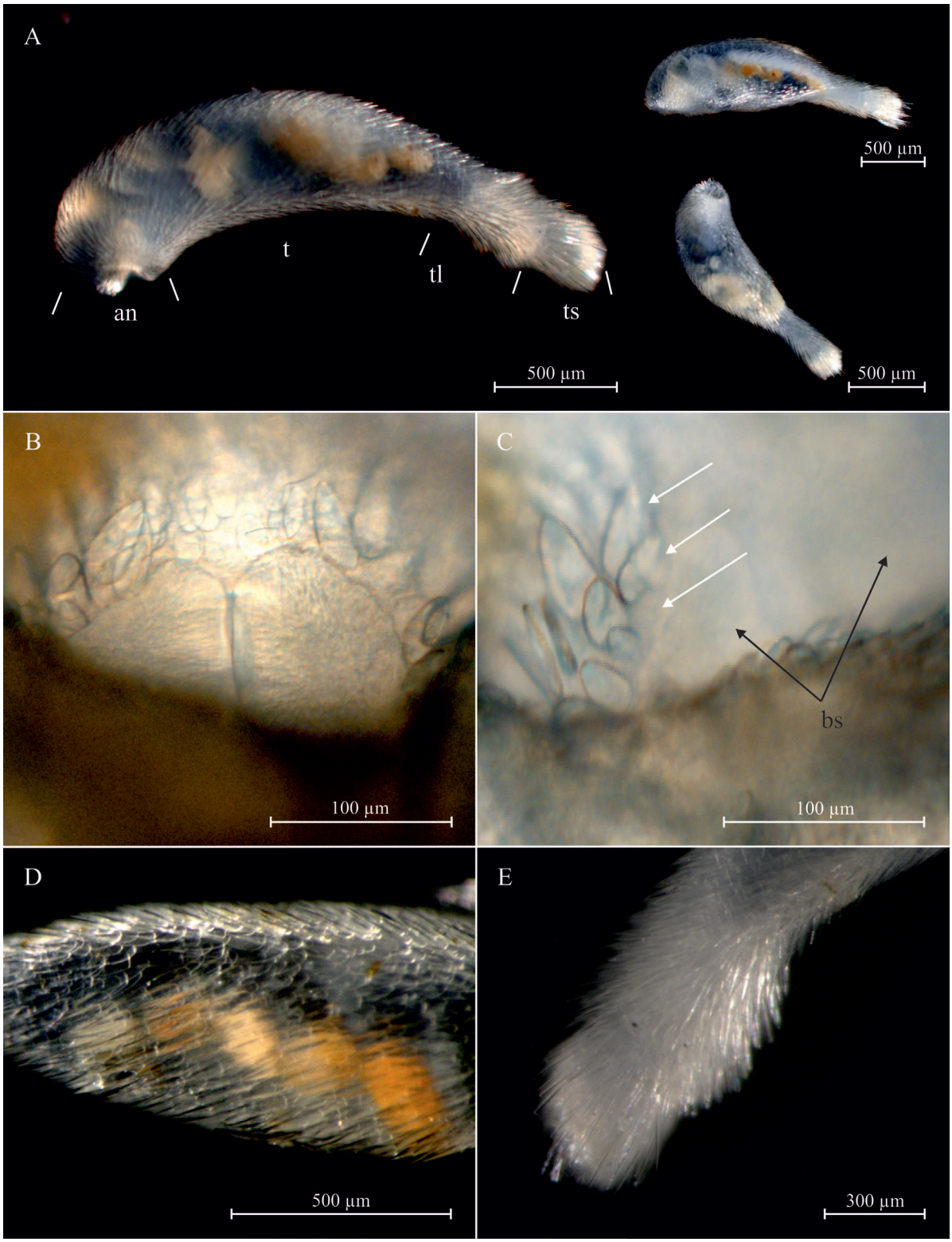

Figure 1. *Prochaetoderma alleni* (Scheltema & Ivanov, 2000). A. *Habitus* and body parts; B-C. Buccal shield, B. Frontal view, C. Lateral view, white arrows pointing to lateral rows of sclerites; D-E. Arrangement of sclerites; D. Trunk; E. Tail and tassel. (an, anterium; bs, buccal shield; t, trunk; tl, tail; ts, tassel)

Figura 1. *Prochaetoderm alleni* (Scheltema & Ivanov, 2000). A. *Habitus* e partes corporais; B-C. Escudo bucal, B. Vista frontal; C. Vista lateral, as frechas brancas marcan as fllas laterais de escleritos; D-E. Disposición dos escleritos; D. Tronco; E. Cola e borla. (an, anterior; bs, escudo bucal; t, tronco; tl, cola; ts, borla)

Sclerites. Trunk sclerites recumbent on the mantle and diagonal to the longitudinal axis (Fig. 1D), oblique to the mantle on the tail and tassel, slightly protruding outwards (Fig. 1E).

Five types of sclerites in the anterior region. One type small (25-35 µm long x 15-25 µm wide), round, smooth and ‡at (Fig. 2A). Second type larger (50-60 µm x 15-25 µm), lanceolate, smooth, ‡at with a straight side and a convex side (Fig. 2B). Third and fourth types in the same size (55-65 µm x 20-30 µm), the third being oval, smooth and ‡at (Fig. 2C) and the fourth lanceolate, with round waist and base (Fig. 2D). Fifth type (120-140 µm x 25-35 µm) lanceolate, elongated with waist and slightly asymmetrical (Fig. 2E).

Four types of sclerites in the trunk. The smallest (120-140 µm x 25-30 µm) are lanceolate, elongated, with waist and round base (Fig. 2F). Second type larger (160-180 µm x 45-55 µm), lanceolate, with wide and round base, and narrow blade (Fig. 2G). The third and fourth types are lanceolate, asymmetrical with elongated base. The largest (220-240 µm x 25-30 µm) have waist and base longer than the blade (Fig. 2H). The others are slightly smaller (210-230 µm x 25-30 µm), with blade longer than the base and a more marked waist (Fig. 2I).

Tail with three types of sclerites. First type (120-150 µm x 25-35 µm) lanceolate, smooth, ‡at, with narrow blade and round base (Fig. 2J). Second and third types are lanceolate, with well-marked waist, round base and elongated blade narrower than the base. These two types differ insofar that the smaller (210-230 µm x 25-35 µm) are less asymmetrical (Fig. 2K), whereas the larger (240-260 µm x 30-40 µm) are more asymmetrical and their blade is narrower than their base (Fig. 2L).

The tassel bears three types of sclerites, all acicular and smooth. They differ insofar that one type is smaller (135-155 µm x 7-9 µm), straight with the central region of the sclerite wide (Fig. 2M), the second type is slightly longer (150-200 µm x 10-15 µm) with a wider base (Fig. 2N) and the third type is the largest in the body (450-500 µm x 5-7 µm), curved and similarly wide along its entire length (Fig. 2O).

Radula apparatus. It comprises 11 rows of pairs of falciform teeth (Fig. 3A) 70-90 µm long with sclerotized distal end and a serrated membrane 50 µm long in the medial region (Fig. 3B-D). No central plate was observed. Reinforcing plates or jaws spatula-shaped with a small and oval base (Fig. 3E-F). These reinforcing struts or jaws were measured in 13 specimens by transparency, being 260-520 µm long with a jaw index (jaw length / body length) of 0.133-0.195, and an average of 0.175.

Remarks. The specimens studied show the typology of sclerites and all characters deflned by SCHELTEMA & IVANOV (2000) for *Prochaetoderma alleni*. These characters distinguish them from the rest of the species of the genus, particularly from the six remaining species of the genus present at the Iberian Peninsula. Five of those haved already been recorded, *Prochaetoderma turnerae* (Scheltema, 1985), *Prochaetoderma gladiatum* Salvini-Plawen, 1992, *Prochaetoderma iberogallicum* Salvini-Plawen, 1999, *Prochaetoderma clenchi* (Scheltema, 1985) and *Prochaetoderma yongei* Scheltema, 1985 and *Prochaetoderma gauson* (Scheltema, 1985) a new record in this paper.

P. gauson and *P. turnerae* can be found at depths of 4426-5346 m and 2124-5208 m respectively. They show two rows of sclerites on both sides of the buccal shield and elongated sclerites, with medial longitudinal groove and several V-shaped transverse grooves, whereas *P. alleni* can be found at a depth of 50-2632 m, bearing three rows of sclerites but no sclerites with longitudinal groove and V-shaped transverse grooves (SCHELTEMA, 1985; SCHELTEMA & IVANOV, 2000).

P. gladiatum and *P. iberogallicum* bear lanceolate, elongated and symmetrical sclerites, without waist and with round base, up to 350 µm long in *P. gladiatum* and 150 µm in *P. iberogallicum.* However, *P. alleni* bears asymmetrical sclerites with waist up to 240 µm long (SALVINI-PLAWEN, 1992, 1999; SCHELTEMA & IVANOV, 2000). Also, the reinforcing struts or jaws of *P. alleni* are smaller in relation with the body size than those of *P. iberogallicum*, as shown in the jaw index of *P. alleni,* 0.175, in contrast with that of *P. iberogallicum,* 0.20 (SEÑARÍS *et al.*, 2017a). *P. clenchi* and *P. alleni* bear similar sclerites, however, those of *P. clenchi* differ in being symmetrical, with a wider base, a narrower blade and a more marked waist (SCHELTEMA, 1985; SCHELTEMA & IVANOV, 2000). Finally, *P. yongei* bears smaller sclerites (largest 150 µm), lanceolate with a small keel on the blade (SCHELTEMA, 1985; SCHELTEMA & IVANOV, 2000).

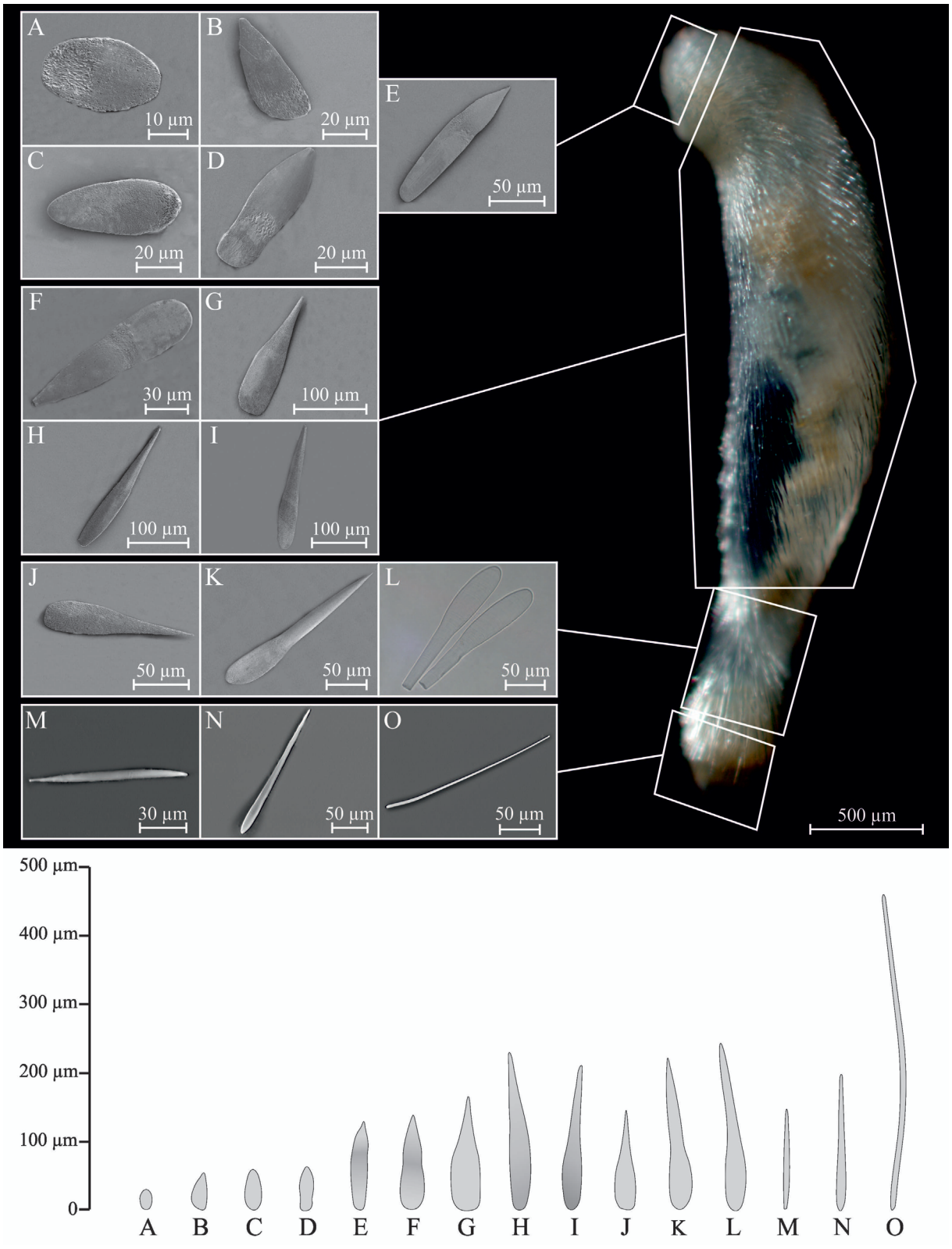

Figure 2. *Prochaetoderma alleni* (Scheltema & Ivanov, 2000), drawings and photographs under SEM and optical microscope of sclerites typical of each body region. A-E. Anterium; F-I. Trunk; J-L. Tail; M-O. Tassel.

Figura 2. *Prochaetoderma alleni* (Scheltema & Ivanov, 2000), debuxos e fotografías ao SEM e o microscopio óptico dos escleritos característicos en cada rexión corporal. A-E. Anterior; F-I. Tronco; J-L. Cola; M-O. Borla.

In the specimens studied, in addition to the characters already described for *P. alleni* in its original description (Scheltema & Ivanov, 2000), the presence of long, curved, acicular sclerites evenly wide along their entire length was observed on the tassel. This character has not been described in previous studies (Scheltema & Ivanov, 2000; Ivanov & Scheltema, 2001).

***Prochaetoderma gauson* (Scheltema, 1985)**
Chevroderma gauson Scheltema, 1985
(Original combination)

Material examined. 1 specimen 3.12 mm long, collected at a depth of 5346 m during the expedition DIVA-ARTABRIA II 2009, station 03-EBS-2009-261009 (Table I).

Distribution. West European Basin at a depth of 4426-4829 m (Scheltema, 1985; Scheltema & Ivanov, 2000); western Iberian Peninsula at a depth of 5346 m (this paper).

Diagnosis. Animals up to 4 mm long and 0.8 mm in diameter. Paired buccal shield with two semicircular rows of 3-4 small sclerites. Body with long sclerites protruding from the trunk, up to 500 µm long, lanceolate, narrow, with waist, a longitudinal groove and several V-shaped transverse grooves. Large radula with falciform teeth up to 130 µm long, central plate elongated up to 50 µm long, wide, thick, with a groove and blunt ends. Reinforcing struts or jaws spatula-shaped with discoidal base.

Description. *Habitus*. Animal 3.12 mm long, 0.3-0.6 mm wide. Opaque, brownish white when fixed in 70% alcohol. Buccal shield bearing two kidney-shaped parts between which the mouth is located. With four body regions: anterior, trunk, tail and tassel (Fig. 4A). Anterior region short, trunk long, tail wide and short, tassel as wide as tail with two ctenidia. Posterior index (tail + tassel) / trunk, 0.57.

Buccal shield. Small buccal shield, with two kidney-shaped parts (130 µm long x 84 µm wide each) between which the mouth is located (Fig. 4B). Two semicircular rows of sclerites on each side (25-45 µm long x 8-25 µm wide), oval and smooth. Four sclerites in the first row and three in the second (Fig. 4C).

Sclerites. Trunk sclerites lying on the mantle and diagonal to the longitudinal axis of the body, sclerites may protrude from the posterior region (Fig. 4D). Tail sclerites parallel to the longitudinal axis and slightly protruding from the mantle (Fig. 4E).

In the anterior region, sclerites are small (30-70 µm long x 10-20 µm wide). Two types: first type oval, smooth and flat, with or without a small longitudinal groove (Fig. 5A-B) and second type narrow and lanceolate, with a medial longitudinal groove (Fig. 5C-D).

Sclerites larger in trunk and tail (100-450 µm x 15-40 µm), lanceolate, narrow, elongated, slightly asymmetrical, with waist, base longer and wider than blade with sharp end, with a medial longitudinal groove and several V-shaped transverse grooves at regular intervals (Fig. 5E-I).

Three types of sclerites in the tassel. First type smaller (150-200 µm x 25-40 µm), lanceolate, with wide and round base, with a medial longitudinal groove and V-shaped transverse grooves (Fig. 5J). Second and third types acicular with a medial longitudinal groove and V-shaped transverse grooves. They differ in that the second type is smaller (175-225 µm x 13-17 µm) with a round base wider and shorter than the blade (Figure 5K), whereas the third type is larger (300-350 µm x 15-20 µm) and shows a long and narrow base (Fig. 5L).

Radula. With 7-8 rows of pairs of hook-shaped teeth 110-120 µm long, with a sclerotized distal end and a serrated membrane 50 µm long in the medial region (Fig. 6A-D). Reinforcing struts or jaws spatula-shaped and base almost discoidal (Fig. 6E-F), 610 µm long and 240 µm wide with a jaws index (jaws length / body length) of 0.195.

Remarks. The specimen studied shows the typology of sclerites and remaining characters already described for the species *Prochaetoderma gauson* (Scheltema, 1985) (Scheltema, 1985; Scheltema & Ivanov, 2000), which distinguish it from the remaining species of the genus, in particular from the remaining six species of the genus present at the Iberian Peninsula *Prochaetoderma alleni* (Scheltema & Ivanov, 2000), *Prochaetoderma turnerae* (Scheltema, 1985), *Prochaetoderma gladiatum* Salvini-Plawen, 1992, *Prochaetoderma iberogallicum* Salvini-Plawen, 1999, *Prochaetoderma clenchi* (Scheltema, 1985) and *Prochaetoderma yongei* Scheltema, 1985.

P. gauson differs from most of the Iberian species in the presence of lanceolate sclerites with

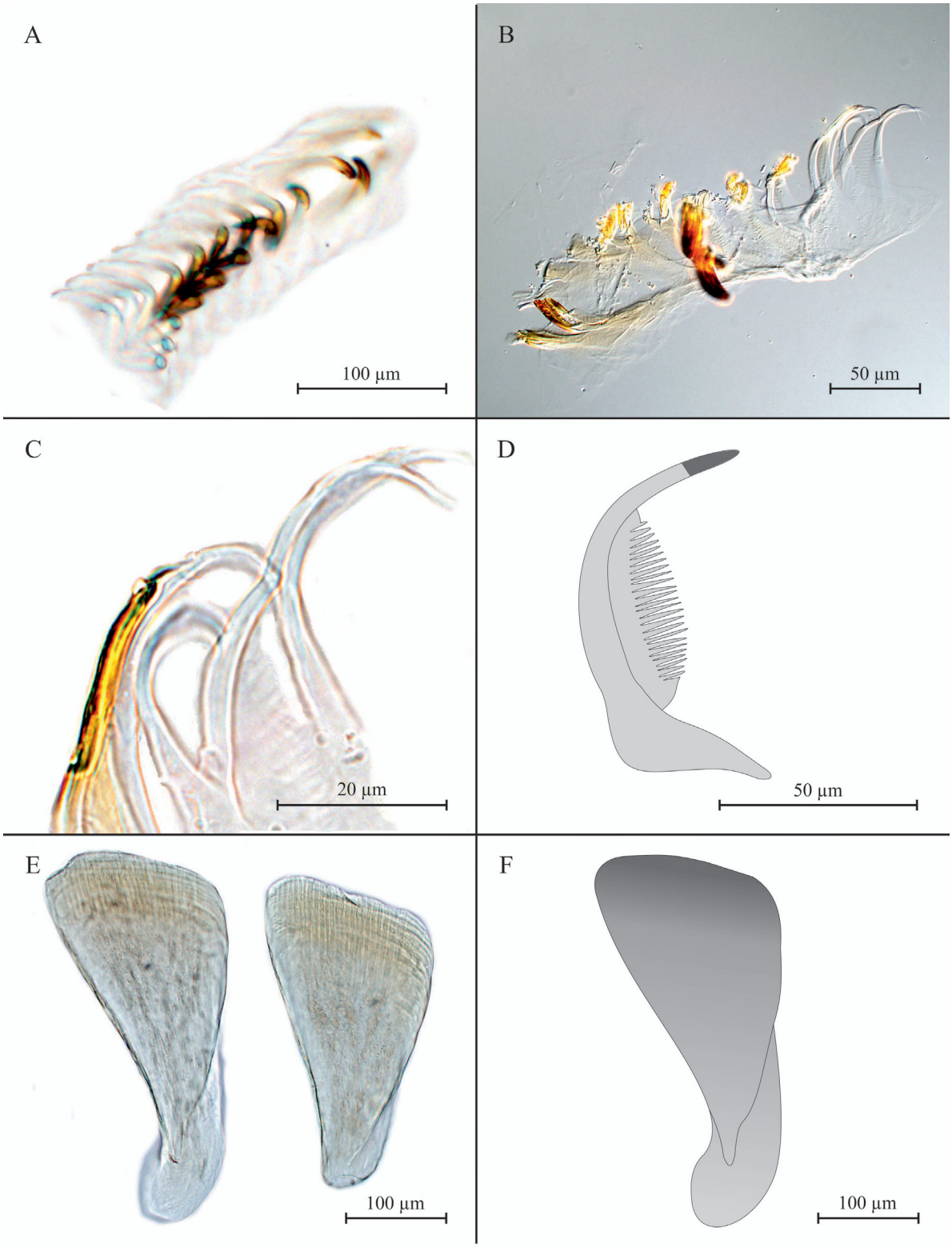

Figure 3. *Prochaetoderma alleni* (Scheltema & Ivanov, 2000), radular apparatus. A. Dorsal view under optical microscope; B. Lateral view under optical microscope; C. Teeth under optical microscope; D. Schematic drawing of a tooth; E. Photograph of reinforcing struts or jaws under optical microscope; F. Schematic drawing of a reinforcing strut or jaw.
Figura 3. *Prochaetoderma alleni* (Scheltema & Ivanov, 2000), aparato radular. A. Vista dorsal ao microscopio óptico; B. Vista lateral ao microscopio óptico; C. Dentes ao microscopio óptico; D. Debuxo esquemático dun dente; E. Fotografía ao microscopio óptico dos puntais de reforzo ou mandíbulas; F. Debuxo esquemático dun puntal de reforzo ou mandíbula.

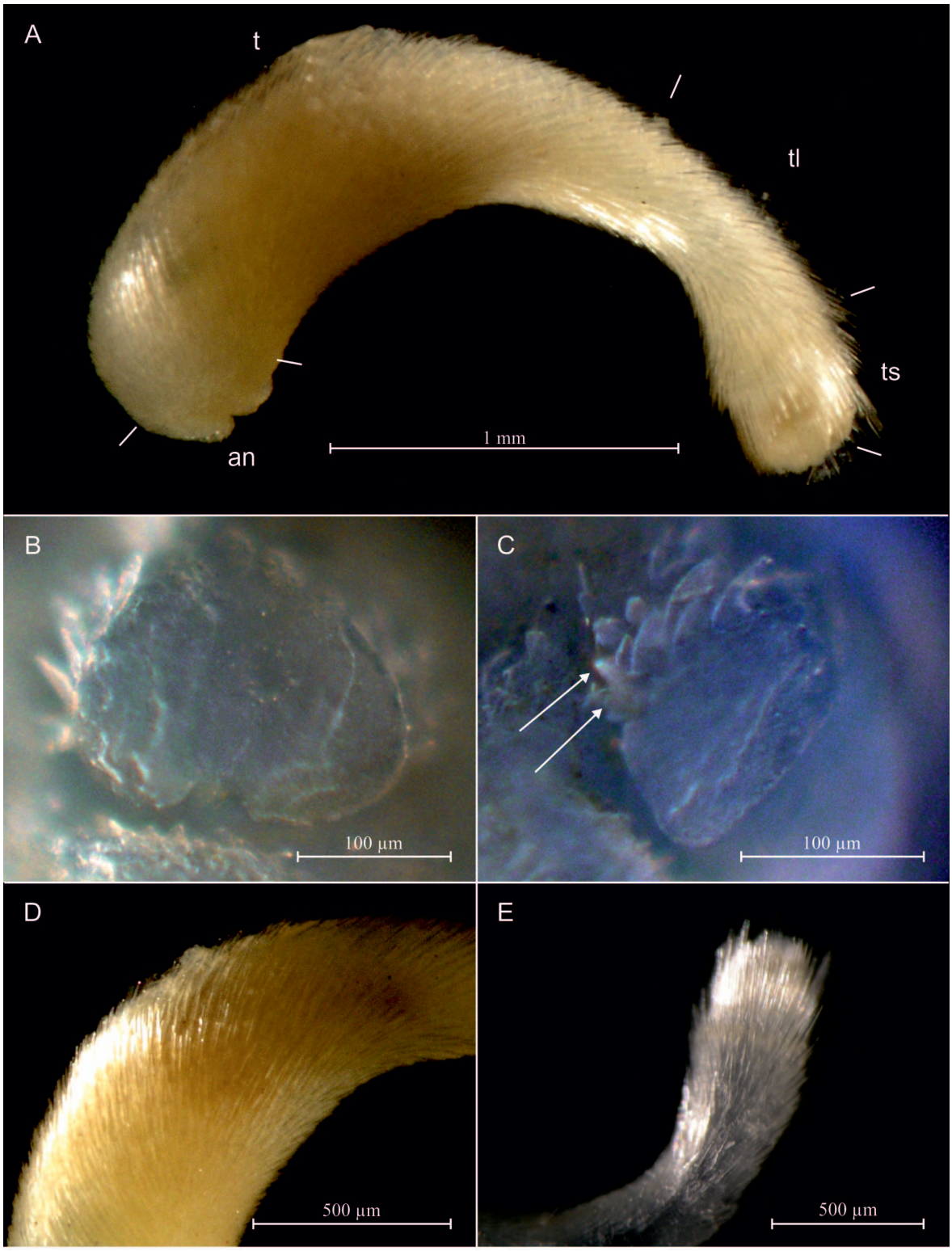

Figure 4. *Prochaetoderma gauson* (Scheltema, 1985) A. *Habitus* and body parts; B-C. Buccal shield under optical microscope, B. Frontal view, C. Lateral view, arrows pointing to semicircular rows of sclerites; D-E, Arrangement of sclerites, D. Trunk, E. Tail and tassel. (an, anterium; t, trunk; tl, tail; ts, tassel).
Figura 4. *Prochaetoderma gauson* (Scheltema, 1985) A. *Habitus* e partes corporais; B-C. Escudo bucal ao microscopio óptico, B. Vista frontal, C. Vista lateral, as frechas marcan as fllas semicirculares de escleritos; D-E, Disposición de escleritos, D. Tronco, E. Cola e borla. (an, anterior; t, tronco; tl, cola; ts, borla).

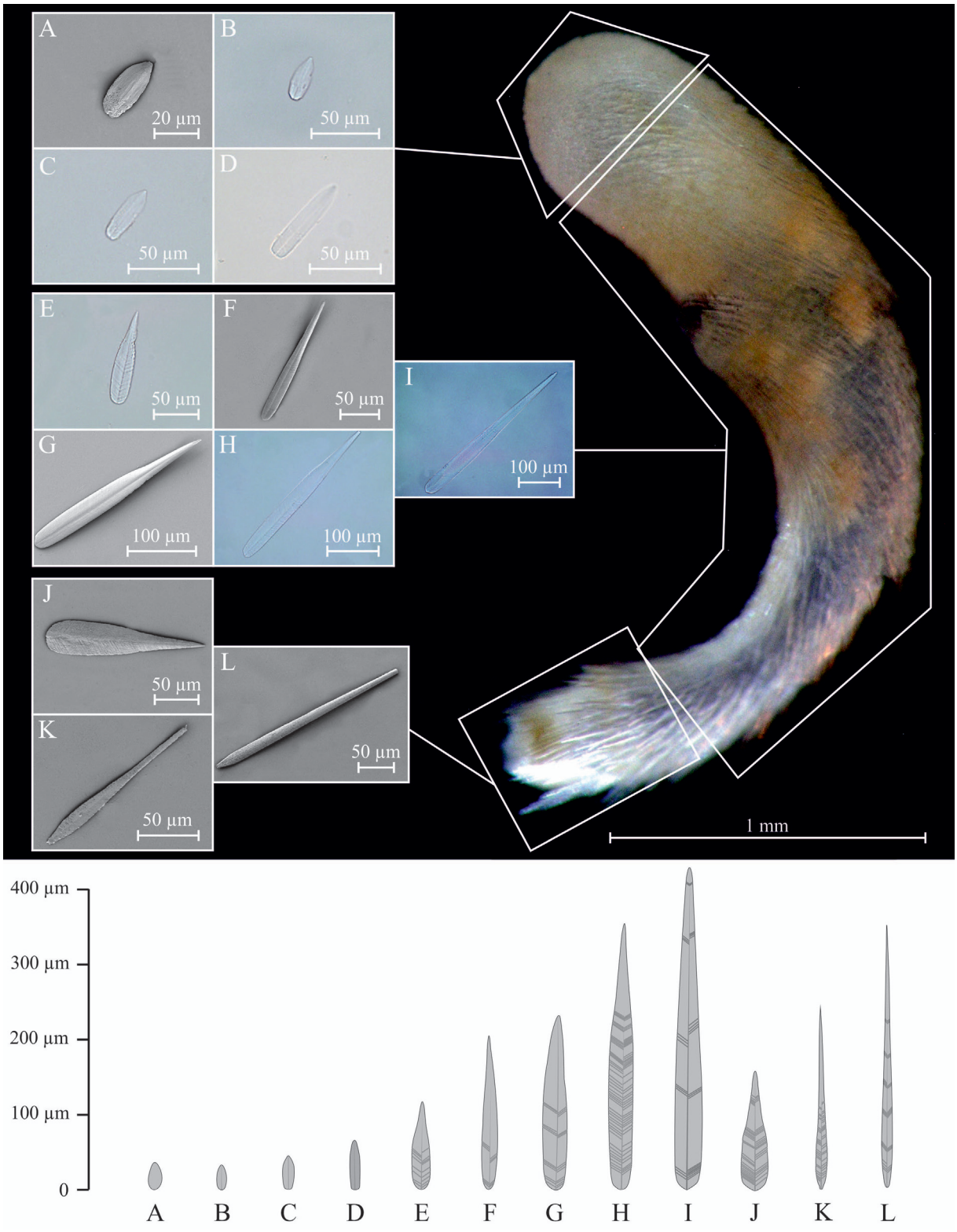

Figure 5. *Prochaetoderma gauson* (Scheltema, 1985), drawings and photographs under SEM and optical microscope of the sclerites typical of each body region. A-D. Anterium; E-I. Trunk and tail; J-L. Tassel.
Figura 5. *Prochaetoderma gauson* (Scheltema, 1985), Debuxos e fotografías ao SEM e ao microscopio óptico dos escleritos característicos en cada rexión corporal. A-D. Anterior; E-I. Tronco e cola; J-L. Borla.

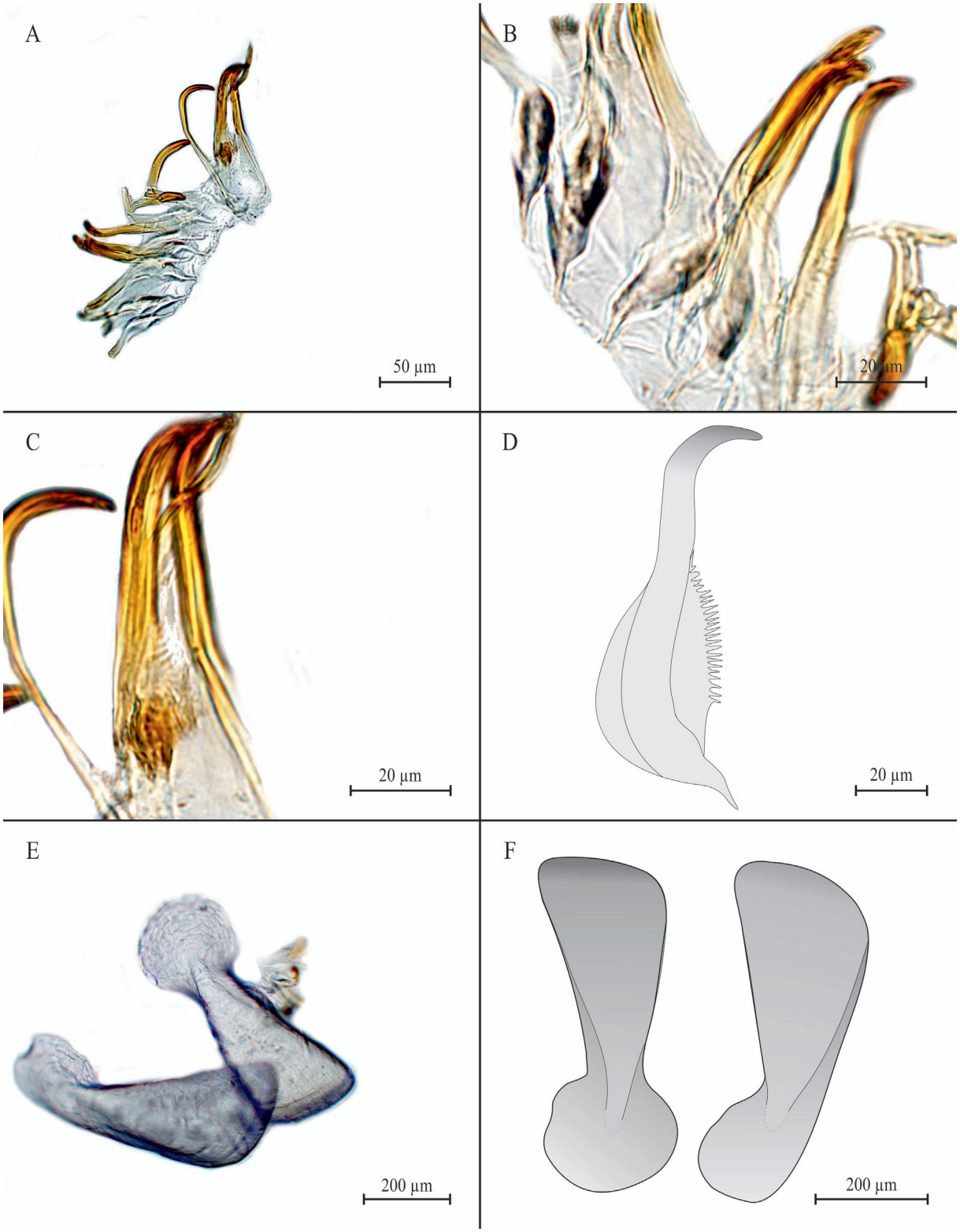

Figure 6. *Prochaetoderma gauson* (Scheltema, 1985), radular apparatus. A. Lateral view under optical miscroscope; B-C. Detail of teeth under optical microscope; D. Schematic drawing of a tooth; E. Photograph of reinforcing struts or jaws and radular teeth under optical microscope; F. Schematic drawing of reinforcing struts or jaws.

Figura 6. *Prochaetoderma gauson* (Scheltema, 1985), aparato radular. A. Vista lateral ao microscopio óptico; B-C. Detalle dos dentes ao microscopio óptico; D. Debuxo esquemático dun dente; E. Fotografía ao microscopio óptico dos puntais de reforzo ou mandíbulas e dos dentes radular; F. Debuxo esquemático dos puntais de reforzo ou mandíbulas.

longitudinal medial groove and several V-shaped transverse grooves. Only *P. turnerae* also shows this type of sclerites as well as similar body anatomy, especially in small specimens (Scheltema, 1985; Scheltema & Ivanov, 2000). However, both species differ as *P. gauson* presents a shorter posterior region with a posterior index (tail + tassel / trunk) of 0.57, whereas that of *P. turnerae* is longer with an index of 0.7-0.8 (Scheltema, 1985; Scheltema & Ivanov, 2000). The buccal shield of *P. gauson* is small (130 µm x 84 µm) with two semicircular rows of 3-4 sclerites (30-65 µm long each sclerite), whereas *P. turnerae* shows a larger buccal shield (170 µm x 140 µm) with two rows of 6-7 sclerites (80-100 µm long each sclerite) (Scheltema, 1985; Scheltema & Ivanov, 2000). *P. gauson* presents long sclerites on the trunk (up to 500 µm) and acicular sclerites with a wide base on the tassel, which contrast with the short sclerites of the trunk (up to 300 µm) and the acicular sclerites of the tassel of *P. turnerae* (Scheltema, 1985; Scheltema & Ivanov, 2000). Finally, *P. gauson* shows smaller radular teeth (110-120 µm) and reinforcing struts or jaws (610 µm x 240 µm) than the radular teeth (140 µm) and the reinforcing struts or jaws (700 µm x 300 µm) of *P. turnerae* (Scheltema, 1985; Scheltema & Ivanov, 2000).

The specimen studied was collected in the Iberian abyssal basin in W Galicia (NW Iberian Peninsula) at a depth of 5346 m, which extends the limit of its southern distribution in European bottoms. The presence of *P. gauson* in this geographical area is not an unexpected fact as *P. turnerae* is cited for the Bay of Biscay and the African coast and both species otherwise share the same geographical areas and bathymetric ranges (Scheltema, 1985; Scheltema & Ivanov, 2000).

DISCUSSION

The knowledge on Caudofoveata on Galician bottoms is very scarce. So far, the presence of only seven species was known: *Scutopus robustus* Salvini-Plawen, 1970, *Prochaetoderma iberogallicum* Salvini-Plawen, 1999, *Chaetoderma galiciense* Señarís, García-Álvarez & Urgorri, 2016, *Falcidens garcialvarezi* Señarís & Urgorri, 2016, *Falcidens urgorrii* Señarís & García-Álvarez, 2016, *Falcidens valdubrensis* Señarís, García-Álvarez & Urgorri, 2016 and *Falcidens vasconiensis* Salvini-Plawen, 1996 (Salvini-Plawen, 2009; Señarís *et al.*, 2012, 2014, 2016, 2017a, 2017b; Salvini-Plawen & García-Álvarez, 2014), whereas the number of species known at the Iberian Peninsula was 17, of which six belong to the genus *Prochaetoderma* (Salvini-Plawen & García-Álvarez, 2014; Señarís *et al.*, 2016, 2017a). After identifying the specimens of *Prochaetoderma alleni* and *Prochaetoderma gauson* collected on the bottoms of the Galician coast, the number of species known on the Galician coast increases to nine, whereas at the Iberian Peninsula, it increases to 18, including *P. gauson*, as *P. alleni* has already been recorded for the Bay of Biscay, Portugal, Cádiz, Alboran Sea and the western Mediterranean off Barcelona (Scheltema & Ivanov, 2000; Salvini-Plawen, 2009; Salvini-Plawen & García-Álvarez, 2011, 2014).

ACKNOWLEDGEMENTS

This communication is a contribution to the following projects carried out by the Estación de Bioloxía Mariña da Graña from the Universidade de Santiago de Compostela: PGIDT01PXI20008PR, PGIDIT05PXIC20001P, PGIDIT07PXB000120PR, A Selva-08 and ForSa-Gal-09 (Xunta de Galicia, Reginal Government); VEM2003-20070-C04-04, CGL2004-22429-E and CTM2004-00740 (MEC, Spanish Government).

REFERENCES

Gil-Mansilla, E., García-Álvarez, O. & Urgorri, V. (2008). Metodología para la recolección, conservación y el estudio de los moluscos solenogastros. *Reseñas Malacológicas,* 13:1-31.

Ivanov, D.L. & Scheltema, A.H. (2001). Distribution of known Caudofoveate species (Mollusca, Aplacophora) around Iceland. *Ruthenica,* 11 (1): 1-6.

Ivanov, D.L. & Scheltema, A.H. (2004). *Dacryomica plana*, gen. et sp. nov., a Prochaetodermatid Aplacophora from a Pacific Seamount. *The Veliger,* 47 (1): 1-5.

Salvini-Plawen, L.V. (1971). Schild- und Furchenfüβer (Caudofoveata und Solenogastres). *Die Neue Brehm-Bücherei,* 441: 1-95.

Salvini-Plawen, L.V. (1972). Die Caudofoveata des Mittelmeeres und das Genus *Scutopus* (Mollusca, Aculifera). In: Battaglia, B. (ed.), *Fifth European marine biology symposium:* 27-51. Padova: Piccin.

Salvini-Plawen, L.V. (1975). *Mollusca Caudofoveata: Marine invertebrates of Scandinavia.* Universitetsforlagen, Oslo. 55 pp.

Salvini-Plawen, L.V. (1985). Early evolution and the primitive groups. In: Trueman, E. R. & Clark, M. R. (eds.), *The Mollusca, vol. 10. Evolution:* 59-150. Academic Press, Orlando.

Salvini-Plawen, L.V. (1992). On certain Caudofoveata from the VEMA-Expedition. *Proceedings of the Ninth International Malacological Congress:* 317-333. Unitas Malacologica. Leiden.

Salvini-Plawen, L.V. (1999). Caudofoveata (Mollusca) from off the northern coast of the Iberian Peninsula. *Iberus,* 17 (2): 77-84.

Salvini-Plawen, L.V. (2009). Geographical notes on Iberian Caudofoveata (Mollusca). *Iberus,* 27 (2): 107-112.

Salvini-Plawen, L.V. & García-Álvarez, O. (2011). Clase Caudofoveata. In: Gofás, S., Moreno, D. & Salas, C. (eds.), *Moluscos marinos de Andalucía:* 57-64. Servicio de Publicaciones e Intercambio Científlco, Universidad de Málaga, Málaga.

Salvini-Plawen, L.V. & García-Álvarez, O. (2014). Mollusca Caudofoveata. In: Mollusca, Solenogastres, Caudofoveta, Monoplacophora. García-Álvarez, O., Salvini-Plawen. L.v., Urgorri, V. & Troncoso, J.S. In: Ramos, M. Á. *et al* (eds.), *Fauna Ibérica vol. 38:* 165-218. Museo Nacional de Ciencias Naturales. CSIC, Madrid.

Salvini-Plawen, L.V. & Öztürk, B. (2006). New records of Caudofoveata (*Falcidens gutturosus*, *Prochaetoderma raduliferum*) and of Solenogastres (*Eleutheromenia carinata*, spec. nov.) from the eastern Mediterranean sea. *Spixiana,* 29 (3): 217-224.

Salvini-Plawen, L.V., Steiner, G. & Todt, C. (1998). Notes on marine meiofauna from muddy bottoms off Málaga (Spain). *Graellsia,* 54: 124-127.

Scheltema, A.H. (1985). The aplacophoran family Prochaetodermatidae in the North American basin, including *Chevroderma* n.g. and *Spathoderma* n.g. (Mollusca; Chaetodermomorpha). *The Biological Bulletin,* 169 (2): 484-529.

Scheltema, A.H. & Ivanov, D.L. (2000). Prochaetodermatidae of the eastern Atlantic ocean and Mediterranean sea (Mollusca; Aplacophora). *Journal of Molluscan Studies,* 66 (3): 313-362.

Scheltema, A.H. & Ivanov, D.L. (2001). Eastern atlantic Prochaetodermatidae revisited: The nonsynonymy of *Prochaetoderma boucheti* Scheltema & Ivanov (Aplacophora). *Journal of Molluscan Studies,* 67 (3): 396-398.

Scheltema, A.H. & Ivanov, D.L. (2009). A natural history of the deep-sea Aplacophoran *Prochaetoderma yongei* and its relationships to confamilianls (Mollusca, Prochaetodermatidae). *Deep-Sea Research Part II,* 56 (19-20): 1856-1864.

Señarís, M.P., García-Álvarez, O. & Urgorri, V. (2014). Morphology of *Falcidens vasconiensis* (Mollusca, Caudofoveata, Chaetodermatidae), including a 3Dreconstruction of the internal anatomy. *Journal of Natural History,* 48 (45-48): 2871-2884.

Señarís, M.P., García-Álvarez, O. & Urgorri, V. (2016). Four new species of Chaetodermatidae (Mollusca, Caudofoveata) from bathyal bottoms of the NW Iberian Peninsula. *Helgoland Marine Reseach,* 70(28): DOI 10.1186/s10152-016-0475-6.

Señarís, M.P., García-Álvarez, O., Urgorri, V. & Pedrouzo, L. (2017a). Morphology of *Prochaetoderma iberogallicum* Salvini-Plawen, 1999 and its validity vs *Prochaetoderma boucheti* Scheltema & Ivanov, 2000. *Thalassas,* 33 (2): 117-132

Señarís, M.P., García-Álvarez, O. & Urgorri, V. (2017b). The habitus of *Scutopus robustus* Salvini-Plawen, 1970 (Caudofoveata, Limifossoridae), a rare mollusc from the NW Iberian Peninsula. *Marine Biodiversity,* 47 (2): 377-378.

Señarís, M.P., García-Álvarez, O., Urgorri, V., Barrio, L., Cobo, M.C., Pedrouzo, L., Losada, M.T., Díaz-Agras, G. & Candás, M. (2012). Nuevos datos sobre *Falcidens vasconiensis*, Salvini-Plawen, 1996 (Mollusca, Caudofoveata) del NW de la Péninsula Iberica. *Revista De Investigación Marina,* 19 (6): 427-428.