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THE ORBINIIDAE (ANNELIDA: POLYCHAETA) OF THE BIOSHELF PROJECT, ANDAMAN SEA, THAILAND

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ABSTRACT

A total of 176 specimens of Orbiniidae are reported from the collections made during the Thai–Danish BIOSHELF Project in 1996–97 in the Thai sector of the Andaman Sea. Twelve species (seven named) are reported from this material, of which *Leitoscoloplos mackiei*, *L. papillatus*, *Scoloplos* (*Leodamas*) *brevithorax* and *S.* (*Scoloplos*) *pseudosimplex* are newly described. The diagnosis of *Leitoscoloplos* Day, 1977 is slightly emended. A member of the genus *Pettibonella* Solís-Weiss and Fauchald, 1989 is reported for the first time since its original description. SEM photographs are provided for eight species.

INTRODUCTION

Orbiniids are common inhabitants of sandy and muddy bottoms throughout the oceans, although they are poorly represented in the deep sea. They are relatively non-selective deposit feeders that work their way through the sediment consuming large amounts of bottom material, probably deriving nourishment from the meiofauna, diatoms, bacteria and detritus it contains.

The orbiniid body is very elongate, containing a high number of segments, usually over 200 in adults. It is divided into a short, often flattened and broad anterior thorax, usually containing less than 30 setigers, and a long, almost cylindrical and considerably narrower abdomen (*e.g.*, Fig. 12C). The characteristic feature of orbiniids is the "migration" of neuropodia from a lateral position on the thorax to an almost dorsal position on the abdomen. Orbiniids fragment readily, but abdominal fragments are easily recognizable by the fact that the noto- and neuropodia of both sides of a segment, as well as the pair of branchiae between them, point in a dorsal direction (Fig. 7D), leaving well over half of the circumference of the body smooth, without any appendages.

The prostomium is conical, with an acute tip in most genera, distally blunt in genera such as *Naineris* de Blainville, 1828, *Protoscoloplos* Day, 1954, and *Pettibonella* Solís-Weiss and Fauchald, 1989. The peristomium is a short ring without appendages. The mouth opening is on the ventral side between the prostomium and peristomium and there is a pair of lateral nuchal organs developed as slits containing sensory cilia, either at the same border or displaced completely onto the peristomium.

In most genera the segment following the peristomium is the first setiger, but in genera with a blunt prostomium this segment is asetigerous. Noto- and neuropodial setal fascicles are developed from the first setiger except in *Uncorbinia* Hartmann-Schröder, 1979, where the first four setigers lack notopodia.

Notopodia are relatively simple throughout the body, containing two short rows of long, crenulate capillary setae, in abdominal setigers usually accompanied by a few furcate setae. Crenulate capillaries have a large number of broad, transverse teeth that give them a characteristic appearance in transmitted light; similar setae occur in Nephtyidae.

Notopodia have a cirriform or leaf-like postsetal lobe (in the older literature, *e.g.*, in Eisig 1914, called a dorsal cirrus); the setiger at which this lobe first appears and its shape, especially on the abdomen, are species-diagnostic characters.

In contrast to the notopodia, the neuropodia of orbiniids vary greatly within the family and provide a number of characters important for both generic and specific identification. On the thorax neurosetae are arranged in up to five rows in each fascicle, one of the few cases among polychaetes where setae occur in more than two rows. Thoracic neurosetae may consist entirely of crenulate capillaries, usually shorter and less "crenulate" than the notosetae as in *Leitoscoloplos* Day, 1977 (Figs. 2B, 4C). In most genera a number of shorter, slightly broader, distally rounded hooks occur, often to the near exclusion of capillary setae (Figs. 7B, 8B, 10B). These hooks have also been called uncini or subuluncini in the literature. They have a number of transverse ridges, the number varying in a systematic way within a fascicle, and a distal hood on one side; the hood is often lost due to wear. Dorsal and/or anterior hooks are sometimes larger than the others, they are smoother in appearance, having less developed transverse ridges, and the hood is often worn away; when strongly developed such hooks have an acicular or spine-like appearance (Fig. 9B, C). In the genus *Phylo* Kinberg, 1866, most thoracic neuropodia have one or two huge, often distally barbed spines which develop within a special setal sac that is clearly visible in mounted parapodia. These spines are dorsoanteriorly placed within the fascicle.

Thoracic neuropodia have a postsetal lobe developed as a transverse ridge. Papillae are usually developed on this ridge, at least on the most posterior thoracic setigers. One or more papillae may also be present in a transverse row, ventral and somewhat posterior to the neuropodia: the subpodal papillae. This row is not necessarily continuous with the row of papillae on the postsetal lamella (podal papillae) and is completely absent in most species of *Naineris*, *Protoscoloplos*, *Leitoscoloplos* and *Scoloplos* de Blainville, 1828. The number, shape and distribution of both types of papillae is of importance in the identification of genera and species. The number of podal and subpodal papillae is particularly high in *Orbinia* de Quatrefages, 1866 and *Phylo*, where the subpodal papillae of posterior thoracic and anterior abdominal setigers may extend almost to the ventral midline of the body.

In most genera abdominal neuropodia are radically different in appearance from those of the thorax. They are elongate cylinders with setae emerging at the tip, usually flanked by an inner (presetal) and an outer (postsetal) lobe. One or both lobes may be absent. Abdominal neurosetae are crenulate and/or non-crenulate capillaries, in genera such as *Protoscoloplos* and *Pettibonella* accompanied by a small number of shorter, stouter, distally curved hooks (Fig. 5D), similar in appearance to the rostrate hooks of maldanids (without the "beard" present in that family) or the long-shafted uncini of some terebellomorph polychaetes.

Podal papillae do not generally carry on to the abdomen, although one of them can continue as a lobe at the lateral base of the neuropodium, with a considerable gap to subpodal papillae, when present. The lobe at the base of the neuropodium has often been referred to in the literature as a ventral cirrus, but it is doubtful that it is homologous to the ventral cirri of other aciculate polychaetes. When subpodal papillae occur in the thorax they are commonly found on the anterior setigers of the abdomen as well.

Orbiniids have single or multiple acicula in all notopodia and the neuropodia of the abdomen. Abdominal acicula are often emergent, *i.e.*, with a tip that is exposed, especially in the neuropodia (*e.g.*, the subgenus *Scoloplos* (*Leodamas*) Kinberg, 1866; Figs. 7D, 8D).

Branchiae are present as paired elongate, triangular, laterally ciliated lobes on the dorsum between the notopodia. In a given species they begin at a certain segment or narrow range of segments and are usually present to the end of the body. The segment at which branchiae begin can be thoracic or abdominal and is a diagnostic character. For example, in the subgenus *Scoloplos* (*Leodamas*) they usually begin on setiger 6, although 5 and 7 have also been reported.

Juvenile orbiniids have fewer thoracic setigers than adults and their branchiae begin further forward on the body. The number of thoracic

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setigers can only grow by the transformation of abdominal setigers into thoracic ones. In specimens where this transformation is taking place it can be difficult to determine the number of thoracic setigers. The shape of the neuropodia usually gives the clearest indication of the extent of the thorax. In *Pettibonella* this change is almost imperceptible (Fig. 5C) and the extent of the thorax is most easily identified by changes in the neuropodial setal complement.

In his classical monograph on the morphology and systematics of the Orbiniidae, Eisig (1914) reported a few species from the Indian Ocean. Fauvel (1932) listed 6 species from India, which then grew to 8 thirty years later (Fauvel 1953) and 9 twenty years after that (Hartman 1974), the latter two works covering a wider area than just India. For some reason, Hartman did not include *Naineris kalkudaensis* de Silva, 1965, described from Sri Lanka, in her list.

Soota and Nageswara Rao (1977) reported *Naineris laevigata* (Grube, 1855) from the Andaman Islands. No specimens of *Naineris* were found in the present study, but the genus has been reported from the Thai portion of the Andaman Sea by Phasuk (1992), along with five named species of orbiniids. The present report describes twelve species from the BIOSHELF surveys, 1996–97, seven of which are named.

MATERIALS AND METHODS

Information on the BIOSHELF Project and how material was treated during collections in 1996 and 1997 can be found in Aungtonya, Thaipal and Tendal (2000). Specimen width was measured at setiger 10 and excludes setae and neuropodial postsetal lobes. All descriptions are based on specimens from the BIOSHELF Project unless otherwise indicated.

For SEM observations specimens were dehydrated via a graded ethanol and acetone series, critical-point dried using CO_2, mounted on aluminium stubs and subsequently sputter-coated with gold. Observations were performed with a JEOL JSM-840 scanning electron microscope.

The list of examined material provided for each species includes only specimens from BIOSHELF stations; the number of specimens from any given station and information on where they have been deposited follows in parentheses. Fragments are only mentioned when the sample included no anterior ends. A more detailed list of the BIOSHELF stations is provided in Aungtonya and Eibye-Jacobsen (2002).

The following abbreviations are used for institutions: PMBC (Phuket Marine Biological Center, Phuket, Thailand) and ZMUC (Zoological Museum, Copenhagen).

SYSTEMATIC SECTION

Orbiniidae Hartman, 1942

***Leitoscoloplos* Day, 1977**, emended

Type species: *Haploscoloplos bifurcatus* Hartman, 1957: 277–279; by original designation.

Remarks: *Leitoscoloplos* was erected as a replacement name for *Haploscoloplos* Monro, 1933 when it was found that *Scoloplos cylindrifer* Ehlers, 1904, the type species of *Haploscoloplos*, actually has some hooks among the thoracic neurosetae. Day (1977) erected *Leitoscoloplos* for species similar to *Scoloplos* in which all thoracic neurosetae are capillaries, conforming to the original definition of *Haploscoloplos*.

Leitoscoloplos was reviewed by Mackie (1987). Both of the new species described below fall outside of *Leitoscoloplos* as defined by him, as they have too many podal and subpodal papillae, respectively. However, they conform in all other characters to the general morphology of this genus; describing new genera for them (two would be necessary) would undoubtedly cause *Leitoscoloplos* to be paraphyletic. Thus, Mackie's definition is extended to allow for the presence of up to six podal papillae and seven subpodal papillae.

Leitoscoloplos mackiei n. sp.
Figs. 1A–D, 2A–D

Material examined: BIOSHELF st. A-2/BC, 9°30′ N, 97°51′ E, 61 m, sandy mud, fine sand and shell fragments, 18 Apr 1996 (holotype, PMBC

Figure 1 *Leitoscoloplos mackiei* n. sp.: A–D. Parapodia of setigers 3, 9, 15 and 20 (= abdominal setiger 3). Setae omitted for clarity; extent of noto- and neurosetal fascicles indicated. – PMBC 18770. Scale = 0.1 mm.

18768; 1 paratype, PMBC 18769); st. A-2/OS, 9°32´ N, 97°50´ E, 66 m, sandy mud, 18 Apr 1996 (1 paratype, PMBC 18770); st. H-1/OS, 7°45´ N, 98°16´ E, 31 m, mud, 9 May 1996 (4 paratypes, ZMUC-POL-1219; 1 paratype on SEM stub, ZMUC-POL-1220; 1 paratype on SEM stub, ZMUC-POL-1221); st. H-2/OS, 7°45´ N, 98°15´ E, 56 m, soft mud, 9 May 1996 (1 paratype, PMBC 18771); st. PB-5/BC, 7°52´ N, 98°48´ E, 21 m, sand with shell fragments, 22 Apr 1997 (1 paratype, PMBC 18772).

Description: Up to at least 16 mm long and 1.6 mm wide, with at least 82 setigers; holotype 7.5 mm long and 1.6 mm broad, with 32 setigers, posteriorly incomplete. Prostomium conical and very acute, about 1½ times as long as broad. Peristomium uniannular, slightly longer than first setiger (Fig. 2A).

Thorax with 16–18 setigers, in holotype with 17 setigers. Branchiae from setiger 11 or 12, very small at first, continuously growing until about setiger 23. Well developed branchiae strap-like, elongate, with drawn-out tip pointing medially. Notopodial postsetal lamellae begin on setiger 1, well developed by setiger 8. All notosetae crenulate capillaries. Interramal cirri present on setigers 16–30 on holotype, generally starting on second to last thoracic setiger (Fig. 2D). Neuropodial postsetal lamellae on holotype with one papilla on setigers 2–4, two on setigers 5–6, three on setigers 7–8, four on setigers 9–10, five on setigers 11–13, six on setiger 14, five on setigers 15–16, and four on setiger 17 (Fig. 1A–C, paratype). Smaller specimens with fewer papillae (Fig. 2C). Last thoracic setiger with 1 subpodal papilla, absent in smaller specimens. Thoracic neuropodia with up to four rows of crenulate capillaries, shorter than in notopodia (Fig. 2B). Thoracic hooks absent.

Notopodial postsetal lamellae on middle of abdomen as long as branchiae but much narrower. Notosetae crenulate capillaries; furcate setae not

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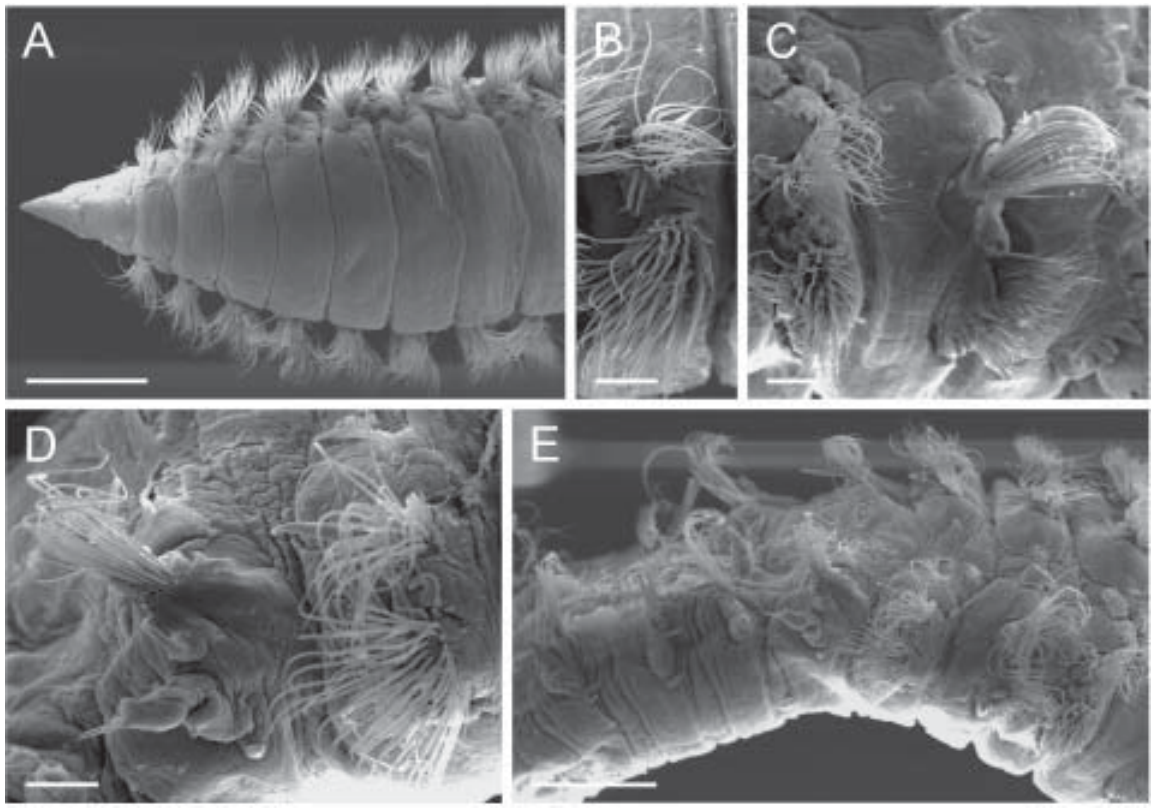

Figure 2 *Leitoscoloplos mackiei* n. sp.: A. Anterior end, dorsal view. B. Parapodium of setiger 7, lateral view (anterior at right). C. Parapodia of setigers 13 (right) to 15, lateral view. Note numerous podal papillae. D. Last thoracic (right) and first abdominal setigers (= setigers 16 and 17). Note interramal cirri. E. Transition from thorax (right) to abdomen, lateral view. – SEM micrographs. ZMUC-POL-1220. Scales = 0.5 mm (A, E) and 0.1 mm (B–D).

observed. Interramal cirri present on 10–13 anterior abdominal setigers (Fig. 2D–E). Abdominal neuropodia with two rounded lobes, inner lobe broader and slightly longer than outer lobe. All neurosetae capillaries, weakly crenulated. First 4–5 abdominal setigers with "ventral cirrus" (Figs. 1D, 2D). Holotype with one subpodal papilla on setiger 18 (= first abdominal setiger), two on setigers 19–25, and one on setigers 26–27; smaller specimens with only one subpodal papilla (Fig. 2D), present on fewer setigers. Lateral flange poorly developed throughout abdomen. Posterior end unknown.

Paratype from st. A-2/BC a male, containing sperm in middle abdominal setigers.

Remarks: *Leitoscoloplos mackiei* n. sp. is unique within the genus in having up to six papillae on the thoracic neuropodial postsetal lamellae. According to Mackie (1987) a maximum of three podal papillae may occur in *Leitoscoloplos*, although no specific species is mentioned as having more than two. *L. mackiei* most closely resembles *L. bajacaliforniensis* León-González and Rodríguez, 1996 in the number of thoracic setigers (17) and the setiger at which branchiae begin (12).

However, *L. bajacaliforniensis* has only one papilla on the thoracic neuropodial postsetal lobes and subpodal papillae are absent.

Gallardo (1968: 92) reported *Leitoscoloplos* cf. *fragilis* (Verrill, 1873) from Vietnam (as *Haploscoloplos*), with some similarities to the species described here. Gallardo's description is somewhat unclear, but apparently 17 thoracic setigers were present, branchiae began on setiger 13, thoracic neuropodial postsetal lamellae had a maximum of three papillae, "ventral cirri" and subpodal papillae were present on the abdomen and interramal cirri were present from the first abdominal setiger. According to Mackie (1987: 16), who studied Verrill's type material, thoracic branchiae are absent in *L. fragilis*. Gallardo's material appears to belong to an undescribed species.

Distribution: Known only from the Thai sector of the Andaman Sea, Indian Ocean. Found at depths of 21–66, m in various combinations of sand and mud.

Etymology: This species is named after Dr. Andrew S.Y. Mackie (National Museum of Wales, Cardiff) in recognition of his important and precise contributions to our knowledge of orbiniid polychaetes, especially members of the genus *Leitoscoloplos*.

Leitoscoloplos papillatus n. sp.
Figs. 3A–D, 4A–D

Material examined: BIOSHELF st. A-2/OS, 9°32′ N, 97°50′ E, 66 m, sandy mud, 18 Apr 1996 (2, PMBC 18773); st. C-2/BC, 9°00′ N, 97°53′ E, 65 m, muddy sand, 20 Apr 1996 (1, PMBC 18774); st. C-2/OS, 9°00′ N, 97°53′ E, 64 m, muddy sand, 20 Apr 1996 (3, PMBC 18775); st. E-2/BC, 8°30′ N, 98°00′ E, 63 m, muddy sand, 22 Apr 1996 (1, PMBC 18776); st. H-1/BC, 7°45′ N, 98°16′ E, 32 m, sandy mud, 9 May 1996 (1 paratype, PMBC 18777); st. H-1/OS, 7°45′ N, 98°16′ E, 31 m, mud, 9 May 1996 (holotype, PMBC 18778; 15 paratypes, PMBC 18779; 5 paratypes, ZMUC-POL-1222; 1 paratype on SEM stub, ZMUC-POL-1223; 1 paratype on SEM stub, ZMUC-POL-1224); st. H-2/BC, 7°45′ N, 98°15′ E, 59 m, soft mud, 9 May 1996 (1, PMBC 18780); st. H-2/OS, 7°45′ N, 98°15′ E, 56 m, soft mud, 9 May 1996 (1, PMBC 18781); st. I-1/OS, 7°30′ N, 98°57′ E, 38 m, mud, 3 May 1996 (5, ZMUC-POL-1225); st. I-2/OS, 7°30′ N, 98°29′ E, 60 m, sandy mud, 3 May 1996 (2, PMBC 18782); st. J-2/OS, 7°15′ N, 98°51′ E, 61 m, soft mud, 4 May 1996 (1, PMBC 18783); st. J-3/BC, 7°15′ N, 98°34′ E, 79 m, muddy sand, 4 May 1996 (1, PMBC 18784); st. PB-2/BC, 8°00′ N, 98°39′ E, 17 m, sand with shell fragments, 22 Apr 1997 (2, PMBC 18785).

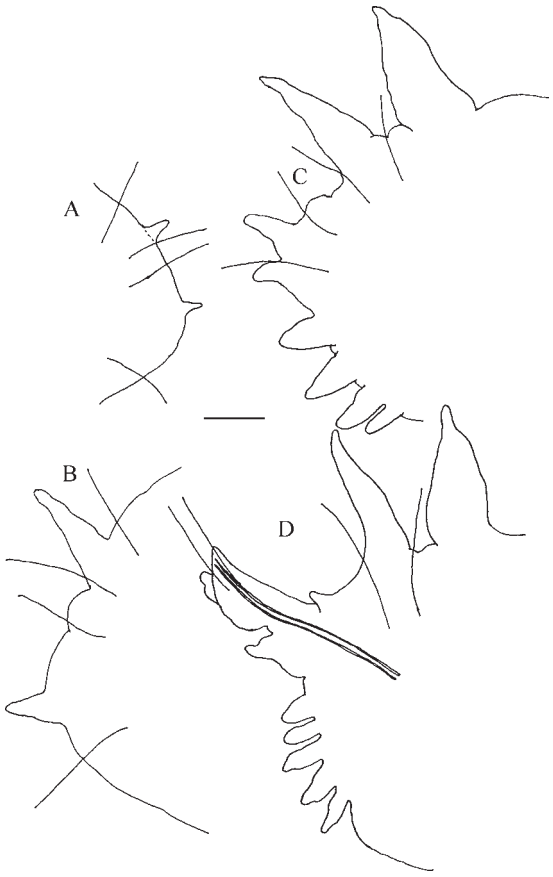

Figure 3 *Leitoscoloplos papillatus* n. sp.: A–D. Parapodia of setigers 3, 9, 15 and 17 (= abdominal setiger 2). Setae omitted for clarity, extent of noto- and neurosetal fascicles indicated. – PMBC 18779. Scale = 0.1 mm.

Description: Up to at least 18 mm long and 1.1 mm wide, with at least 62 setigers; holotype 16.5

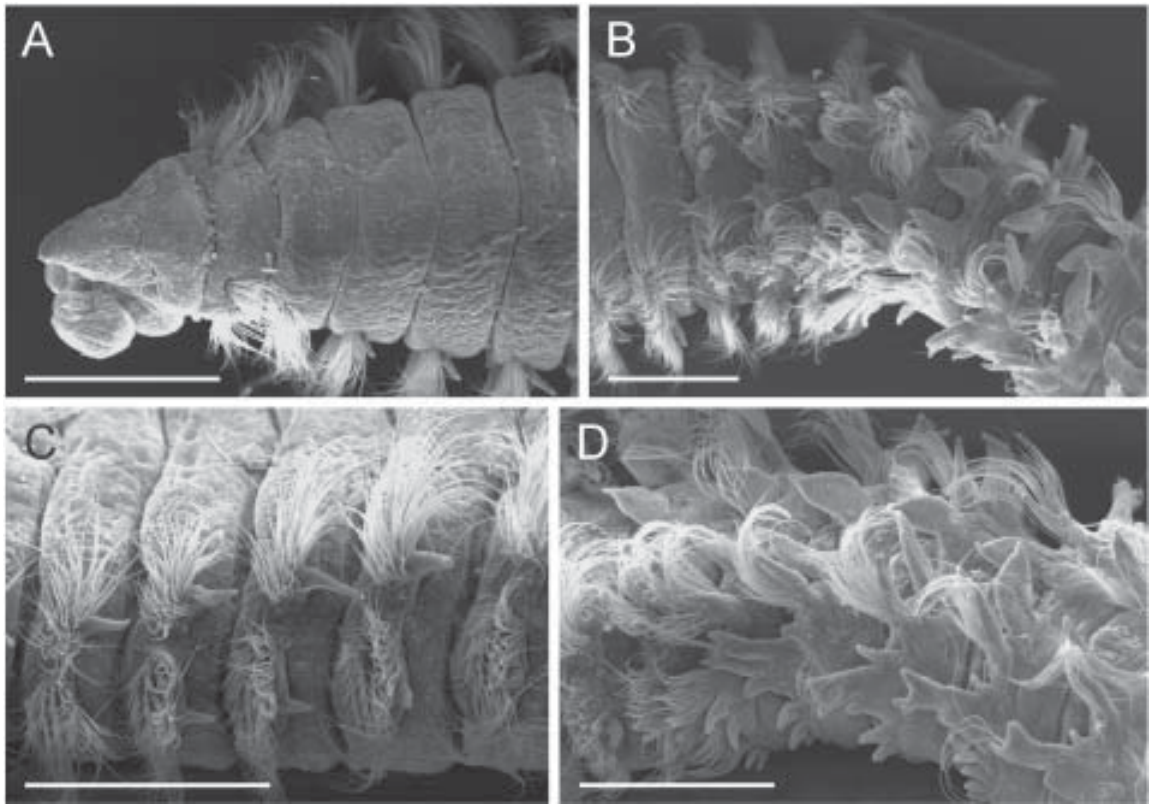

Figure 4 *Leitoscoloplos papillatus* n. sp.: A. Anterior end, dorsal view (tip of prostomium damaged). B. Transition from thorax (left) to adbomen, dorsal view. Branchiae on setiger 11 (first branchial setiger) lost, scars visible. C. Setigers 7 (left) to 11, lateral view, showing elongate podal papillae. D. Transition from thorax (left) to abdomen. Note subpodal papillae on all setigers and interramal cirri on abdominal setigers. – SEM micrographs. ZMUC-POL-1224. All scales = 0.5 mm.

mm long and 1.1 mm broad, with 57 setigers, posteriorly incomplete. Prostomium conical and acute, about 1½ times as long as broad (Fig. 4A). Peristomium uniannular, slightly longer than first setiger.

Thorax with 14–15 setigers (13 in juveniles), in holotype with 15 setigers. Branchiae from setiger 11 (9–10 in juveniles), well developed from the start but growing continuously to beginning of abdomen. Branchiae on thorax relatively broad, triangular with drawn-out tip, on abdomen more elongate, with drawn-out tip that points medially (Fig. 4B). Notopodial postsetal lamellae miniscule on setiger 1, very small on setiger 2, clearly visible from setiger 3 (Fig. 4A), well developed by setiger 9 (Fig. 4C). All notosetae crenulate capillaries. Neuropodial postsetal lamellae on holotype with one papilla on setigers 1–13, two on setigers 14–15. Setiger 13 with 1, setiger 14 with 2, and setiger 15 with 3 subpodal papillae on holotype (Fig. 3A–C, paratype); thoracic subpodal papillae may be absent in juveniles. Thoracic neuropodia with up to four rows of crenulate capillaries (Fig. 4C), shorter than in notopodia. Thoracic hooks absent.

Notopodial postsetal lamellae on abdomen elongate, cirriform, with blunt tip, 4–5 times as long as broad. Notosetae crenulate capillaries; furcate setae not observed. Interramal cirri on holotype very small on setiger 16, well developed on setigers 17–19 (Fig. 4D, paratype), placed on

medial base of neuropodium, small on setigers 20–21 and absent thereafter; completely absent in juveniles. Abdominal neuropodia with two rounded lobes, inner lobe broadest, outer lobe slightly longer and more clearly defined (Fig. 4D). All neurosetae capillaries, weakly crenulated. First 3–4 abdominal setigers with "ventral cirrus" (Figs. 3D, 4D). Subpodal papillae present on up to 10 anterior abdominal setigers, first four with up to 7 papillae (in juveniles up to 3), with abrupt increase in number at transition between thorax and abdomen (Fig. 4D). Lateral flange well developed throughout abdomen, after disappearance of subpodal papillae with an obvious ventral lobe. Posterior end unknown.

Holotype a male, containing sperm in middle abdominal setigers.

Remarks: *Leitoscoloplos papillatus* n. sp. is unique within the genus in having up to seven subpodal papillae. According to Mackie (1987), the species with the highest number of subpodal papillae is *L. panamensis* (Monro, 1933), with up to four on anterior abdominal setigers. The two species are similar in the shape of the abdominal noto- and neuropodial postsetal lobes, but *L. panamensis* differs from *L. papillatus* n. sp. in having 17 thoracic setigers, branchiae beginning on setiger 9, interramal cirri on 12–16 setigers (rather than only 4–6), two podal papillae on last 8 thoracic setigers (rather than last 2), and a smaller number of subpodal papillae.

L. papillatus is similar to *Scoloplos* (*Scoloplos*) *simplex* Hutchings, 1974 (type locality: New South Wales) in the number of thoracic setigers and the distribution of branchiae. According to Day (1977) the thoracic neuropodial hooks of *S.* (*S.*) *simplex* are few in number, short, and easily overlooked. In the present specimens from the Andaman Sea such hooks are definitely absent and the material includes apparently mature specimens.

Distribution: Known only from the Thai sector of the Andaman Sea, Indian Ocean. Found at depths of 17–79 m, in various combinations of sand and mud.

Etymology: This species is named for its exceptionally high number of subpodal papillae.

Leitoscoloplos sp. A

Material examined: BIOSHELF st. E-1/BC, 8°30′ N, 98°06′ E, 42 m, muddy sand, 22 Apr 1996 (1, PMBC 18786); st. H-1/OS, 7°45′ N, 98°16′ E, 31 m, mud, 9 May 1996 (1, ZMUC-POL-1226).

Description: The largest specimen (ZMUC-POL-1226) is 6.3 mm long and 1.1 mm wide, with 21 setigers, posteriorly incomplete. PMBC 18786 with 30 setigers, posteriorly incomplete.

Thorax with 15–16 setigers. Branchiae from setiger 9, very small at first, well developed from about setiger 14, elongate. Notopodial postsetal lamellae begin on setiger 3, from last thoracic setiger asymmetrical, with prominent lateral bulge. All notosetae crenulate capillaries. Neuropodial postsetal lamellae with one papilla from setiger 3 to end of thorax, elongate cirriform by setiger 5. Subpodal papillae absent, but on setigers 10–19 (setigers 8–19 on PMBC 18786) with neuropodial pouches. Thoracic neuropodia with crenulate capillaries only. Interramal cirri absent.

Abdominal neuropodia with two rounded lobes, outer lobe short and blunt, inner lobe slightly longer and broader, pointing medially. Posterior end unknown.

Remarks: This is the first report of the occurrence of neuropodial pouches in the genus *Leitoscoloplos*. However, it cannot be ruled out that these specimens are juveniles of a species of *Scoloplos* in which thoracic neuropodial hooks have not yet developed. Both *S.* (*S.*) *marsupialis* Southern, 1921 and *S.* (*S.*) *tumidus* Mackie, 1991, two species with neuropodial pouches, occur in shallow water along the Andaman Sea coast of Thailand (pers. obs., unpubl.). However, in the first species only the last two thoracic setigers have pouches and in the second species thoracic pouches are rare and then only present on the last thoracic setiger (Mackie 1991). In the species reported here neuropodial pouches are present on the 7–8 last thoracic setigers. It thus seems clear that this species is undescribed, but more complete material is needed to ascertain whether it should be referred to *Leitoscoloplos* or *Scoloplos*.

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Leitoscoloplos sp. B

Material examined: BIOSHELF st. E-1/BC, 8°30′ N, 98°06′ E, 42 m, muddy sand, 22 Apr 1996 (1, PMBC 18787).

Remarks: The present specimen is a posteriorly incomplete juvenile, 4.0 mm long and 0.3 mm wide, with 26 setigers. It has 9 thoracic setigers and branchiae beginning on setiger 13. Setigers 10–14 with 1–2 subpodal papillae. This specimen cannot be referred to any of the other three species of *Leitoscoloplos* reported here because thoracic branchiae are absent.

Orbinia de Quatrefages, 1866

Type species: *Aricia cuvieri* Audouin and Milne Edwards, 1833: 397; by subsequent designation (Hartman 1957: 256).

Orbinia sp. A

Material examined: BIOSHELF st. RN-3/BC, 7°30′ N, 98°17′ E, 72 m, muddy sand, 8 May 1996 (1, PMBC 18788).

Description: Specimen 12.5 mm long and 0.9 mm wide, with 49 setigers, posteriorly incomplete (abdominal fragment with 22 setigers also present).

Thorax with 15 setigers, branchiae beginning on setiger 10. Thoracic notopodial postsetal lamellae from setiger 3, very small at first, well developed by setiger 12. All notosetae crenulate capillaries. Thoracic neuropodial postsetal lamella with one papilla on setigers 2–11, two on setigers 12–13, three on setiger 14, and four papillae on setiger 15. Subpodal papillae absent on setigers 1–13, four present on setiger 14, and six on setiger 15. Most thoracic neurosetae crenulate capillaries, but about 8 hooks present in ventral part of fascicle; hooks distally narrowed but not acute, with about 8 transverse ridges and hood. Interramal cirri absent.

Abdominal neuropodia bilobed, with inner lobe longer and broader. Neurosetae include "flail" setae (*sensu* Day 1967). Seven subpodal papillae present on setiger 16, four on setiger 17, three on setiger 18, two on setigers 19–24, and one from setiger 25 to about 30. Subpodal papillae on setigers at transition from thorax to abdomen reach very far down on ventral surface. Lateral flange present. Posterior end unknown.

Remarks: This specimen has a superficial resemblance to *Leitoscoloplos papillatus* n. sp., but the number of podal and subpodal papillae is significantly greater, even though the animal is much smaller than the larger specimens of *L. papillatus*. Similarly, thoracic neuropodial hooks occur in this specimen but are absent in *L. papillatus*.

The specimen reported here differs from *Orbinia vietnamensis* Gallardo, 1968 in having a greater number of podal and subpodal papillae, in having branchiae that are considerably longer than broad, and in lacking interramal cirri. *O. vietnamensis* was reported from 7 stations in the BIOSHELF study area by Phasuk (1992: 83). This material has been studied (PMBC 12339–12345) but all lots have previously been dried and are in such poor condition that it is impossible to determine the number of thoracic setigers or even confirm the presence of subpodal papillae.

The BIOSHELF specimen most closely resembles *Orbinia hartmanae* Day, 1977 (type locality: Queensland, Australia), but differs from that species in several characters. More material is necessary before an accurate comparison can be made.

Pettibonella Solís-Weiss and Fauchald, 1989

Type species: *Pettibonella multiuncinata* Solís-Weiss and Fauchald, 1989: 785–788, fig. 6a–m, table 1; by monotypy and original designation.

Pettibonella sp. A

Fig. 5A–D

Material examined: BIOSHELF st. C-1/BC, 9°00′ N, 98°03′ E, 40 m, muddy sand with shell fragments, 20 Apr 1996 (1, PMBC 18789); st. E-20m/BC, 8°30′ N, 98°12′ E, 21 m, muddy sand,

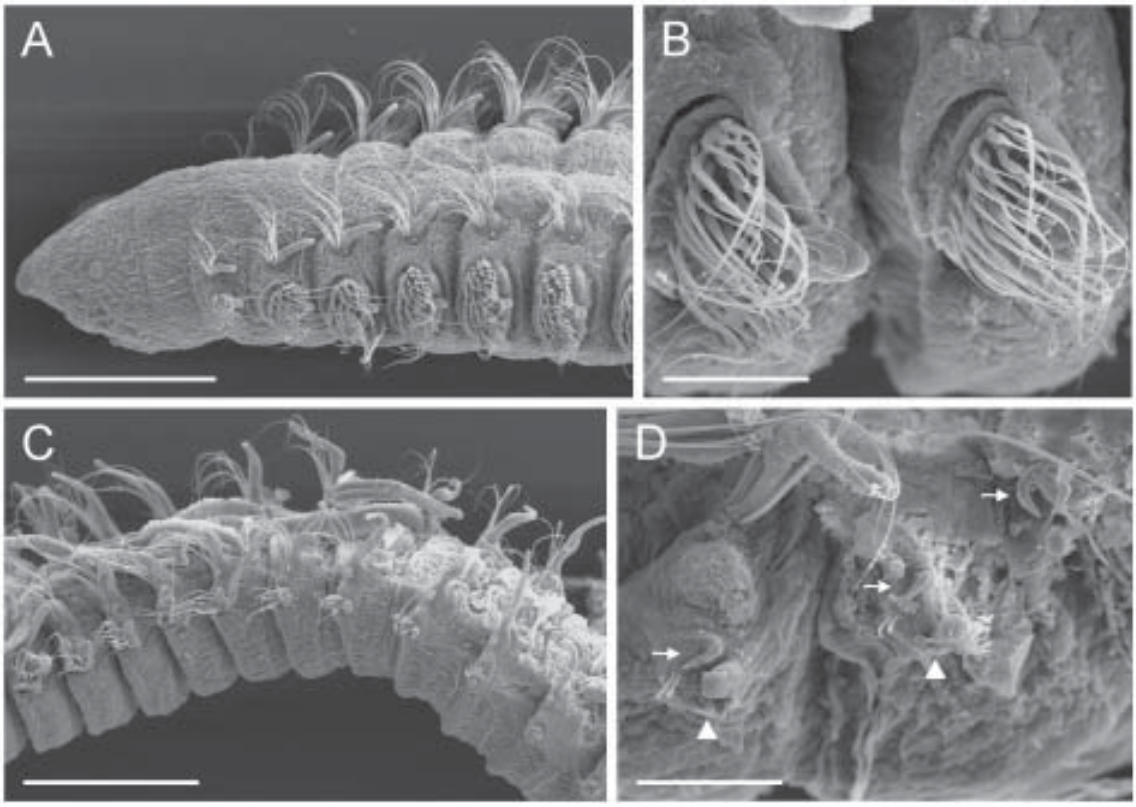

Figure 5 *Pettibonella* sp. A: A. Anterior end, dorsolateral view. Note well developed notopodial postsetal lamellae present from first setiger. B. Neuropodia of setigers 12 and 13, lateral and slightly anterior view. Ventral hooks not visible. C. Transition from thorax (left) to abdomen. Note elongate, bipartite branchiae. D. Neuropodia of setigers 31 (left) to 33, slightly damaged but showing large dorsal and smaller ventral hooks (arrows and arrowheads, respectively). – SEM micrographs. ZMUC-POL-1228. Scales = 0.5 mm (A, C) and 0.1 mm (B, D).

22 Apr 1996 (1, ZMUC-POL-1227; 1 on SEM stub, ZMUC-POL-1228).

Description: Up to at least 14.2 mm long and 0.9 mm wide, with at least 58 setigers (ZMUC-POL-1227, posteriorly incomplete). Prostomium conical but distally rounded, with one pair of small eyes. Segment after peristomium without setae, *i.e.*, two asetigerous rings between prostomium and first setiger, poorly separated on dorsal side (Fig. 5A).

Thorax with about 17–18 setigers, transition to abdomen very weak. Branchiae from setiger 10, from setiger 13 highly elongate and subdivided into "normal" basal half with lateral ciliation and reddish-brown pigmented distal half without cilia, with numerous internal, paired lamellae transverse to axis of branchia, each lamella laterally ending in small papilla on surface. Notopodial postsetal lamellae digitiform, elongate, well developed from setiger 1 (Fig. 5A), increasing in length to beginning of abdomen, here at least 5 times as long as broad. All notosetae crenulate capillaries. All neuropodial postsetal lamellae with one digitiform papilla, up to about 2½ times as long as broad (Fig. 5B). Subpodal papillae absent. Thoracic neuropodia with up to five rows of crenulate capillaries (Fig. 5B) and a few short ventral hooks (not seen on figures here).

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Transition to abdomen marked only by decrease in size of neuropodium and number of neurosetae; neuropodia only slightly further dorsad on abdomen than on thorax (Fig. 5C). Branchiae very long, clearly subdivided (Fig. 5C). Notopodial postsetal lamellae elongate, cirriform. Notosetae crenulate capillaries; furcate setae not observed. Interramal cirri absent. Anterior abdominal neuropodia with one small, distally curved, ventral hook in addition to crenulate capillaries which gradually decrease in number to two by setiger 23–25; from this point one large, distally curved dorsal hook and two smaller, distally less curved ventral hooks, with tips pointing towards one another (Fig. 5D). Entire neuropodial lobe reduced to postsetal papilla. "Ventral cirri", subpodal papillae and lateral flanges absent. Posterior end unknown.

ZMUC-POL-1228 a male with sperm in abdominal setigers.

Remarks: The genus *Pettibonella* was erected by Solís-Weiss and Fauchald (1989) for a new species from Belize, *P. multiuncinata*. This is the first report of the genus since the original description. As pointed out by Solís-Weiss and Fauchald, *Pettibonella* differs from *Protoscoloplos* Day, 1954 in having eyes, thoracic neuropodial hooks, distinct thoracic notopodial postsetal lobes, and two types of "swan-shaped" hooks in abdominal neuropodia rather than only one.

The species treated here is very similar to the type species, but differs in having 17–18 rather than 15 thoracic setigers, fewer hooks in thoracic neuropodia, and more elongate notopodial postsetal lamellae on the abdomen.

The available material of this species is insufficient to describe it as new. One specimen is now mounted on an SEM stub, another is in the process of regenerating the anterior end, and the third specimen has lost a great number of branchiae and is much smaller than the other two.

Scoloplos de Blainville, 1828

Type species: *Lumbricus armiger* O.F. Müller, 1776: 215; by original designation.

Subgenus *Leodamas* Kinberg, 1866

Type species: *Leodamas verax* Kinberg, 1866: 251–252; by monotypy.

Scoloplos (*Leodamas*) *brevithorax* n. sp.

Figs. 6A–D, 7A–D

Material examined: BIOSHELF st. A-2/OS, 9°32′ N, 97°50′ E, 66 m, sandy mud, 18 Apr 1996 (1, PMBC 18790), st. C-3/BC, 9°00′ N, 97°43′ E, 79 m, sandy mud, 20 Apr 1996 (1, PMBC 18791); st. H-1/BC, 7°45′ N, 98°16′ E, 32 m, sandy mud, 9 May 1996 (4, PMBC 18792); st. H-1/OS, 7°45′ N, 98°16′ E, 31 m, mud, 9 May 1996 (16 paratypes, PMBC 18793); st. H-2/BC, 7°45′ N, 98°15′ E, 59 m, soft mud, 9 May 1996 (holotype, PMBC 18794; 13 paratypes, PMBC 18795); st.

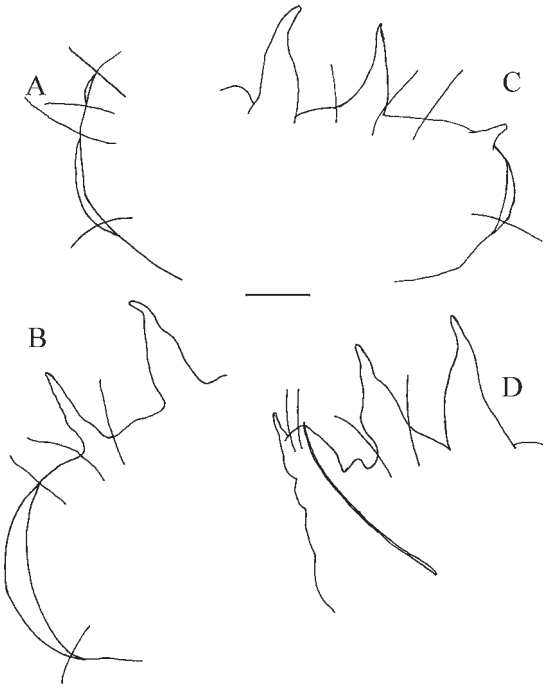

Figure 6 *Scoloplos* (*Leodamas*) *brevithorax* n. sp.: A–D. Parapodia of setigers 2, 9, 15 and 20 (= abdominal setiger 4). Setae omitted for clarity; extent of noto- and neuropodial fascicles indicated. – PMBC 18795. Scale = 0.1 mm.

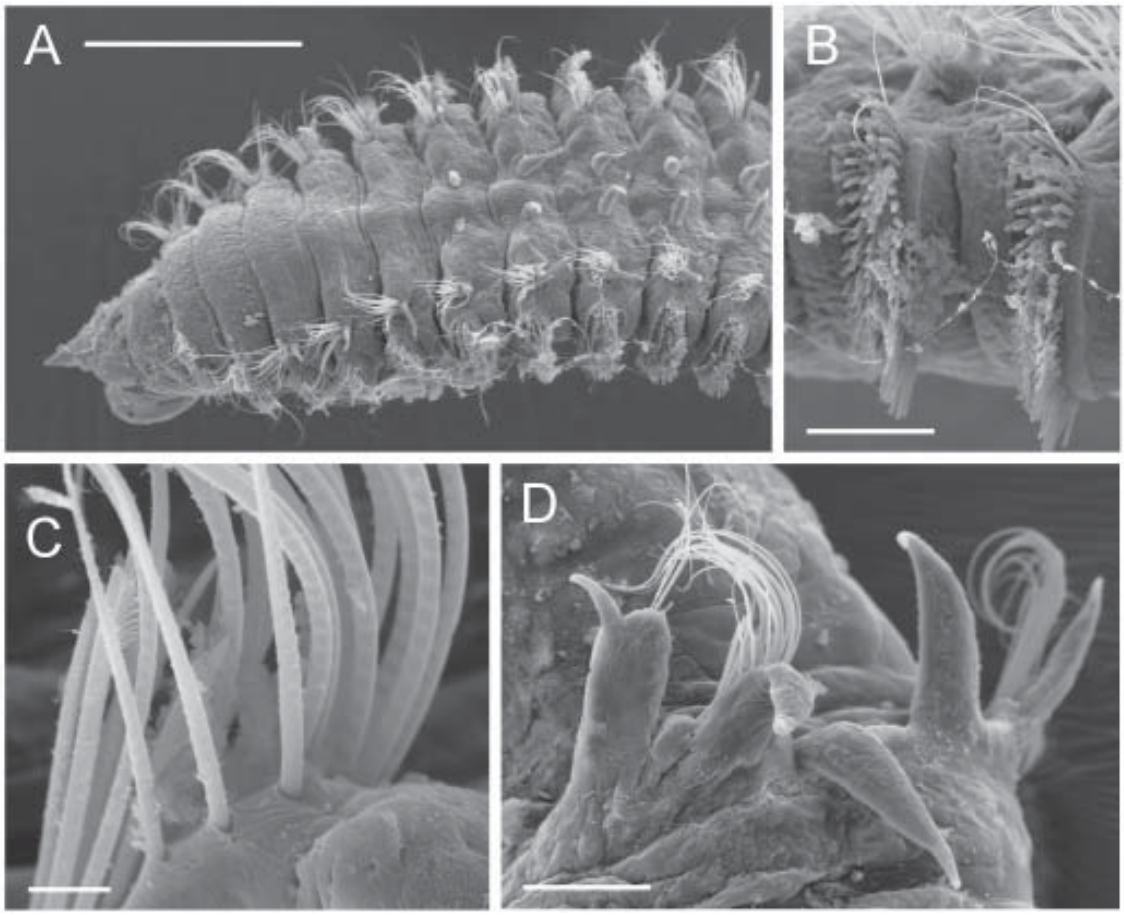

Figure 7 *Scoloplos* (*Leodamas*) *brevithorax* n. sp.: A. Anterior end, dorsolateral view. Branchiae of setiger 6 lost, scars visible. B. Neuropodia of setigers 8 (left) and 9, lateral view. Note slightly enlarged dorsal hooks. C. Notosetae of setiger 24, posterior view. Note furcate setae. D. Parapodia and branchiae of setiger 25, posterior view (neuropodium of right side not visible). Note emergent aciculum on left neuropodium. – SEM micrographs. ZMUC-POL-1231. Scales = 0.5 mm (A), 0.1 mm (B, C) and 10 μm (D).

H-2/OS, 7°45′ N, 98°15′ E, 56 m, soft mud, 9 May 1996 (16 paratypes, ZMUC-POL-1229; 1 paratype on SEM stub, ZMUC-POL-1230; 1 paratype on SEM stub, ZMUC-POL-1231); st. K-20m/BC, 7°00′ N, 99°24′ E, 21 m, mud with shell fragments, 6 May 1996 (1, PMBC 18796); st. L-1/BC, 6°45′ N, 99°21′ E, 38 m, sandy mud with shell fragments, 6 May 1996 (1, PMBC 18797); st. PB-2/BC, 8°00′ N, 98°39′ E, 17 m, sand with shell fragments, 22 Apr 1997 (1, ZMUC-POL-1232); st. PB-4/BC, 7°52′ N, 98°41′ E, 32 m, sand with shell fragments, 22 Apr 1997 (1, PMBC 18798); st. PB-5/BC, 7°52′ N, 98°48′ E, 21 m, sand with shell fragments, 22 Apr 1997 (3, PMBC 18799); st. PB-7/BC, 7°45′ N, 98°41′ E, 29 m, sand with shell fragments, 22 Apr 1997 (1, PMBC 18800).

Description: Up to at least 20.5 mm long and 1.0 mm wide, with at least 72 setigers (holotype, posteriorly incomplete). Prostomium elongate triangular, distally very acute, about 1½ times as long as broad (Fig. 7A). Peristomium uniannular, slightly longer than first setiger.

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Thorax with 15–17 setigers, holotype with 17 (juveniles with as few as 13). Branchiae from setiger 6, well developed from start but growing steadily to setiger 17. Fully developed branchiae relatively small, elongate triangular, about 4 times as long as broad, very acute, with drawn-out tip (Fig. 7D). Notopodial postsetal lamellae miniscule on setiger 2 (Fig. 6A), on setiger 3 elongate digitiform, acute, and 3–4 times as long as broad (Fig. 7A); lamellae growing continuously to end of thorax, symmetrical (Fig. 6B, C). All notosetae crenulate capillaries. Interramal cirri absent. Neuropodial postsetal lamellae well developed, with one digitiform papilla, about twice as long as broad, on last 1–2 thoracic setigers. Subpodal papillae absent. Neuropodia of middle thoracic setigers with many hooks in four rows and a few crenulate capillaries in dorsal part of fascicle. Hooks curved, with 5–12 transverse ridges, distally blunt and with hood. Dorsal hooks of anterior row slightly larger than other hooks, especially on middle setigers of thorax, with hoods (Fig. 7B).

Notopodial postsetal lamellae on abdomen slightly asymmetrical, with medial swelling, about 3½ times as long as broad. Notosetae crenulate capillaries and furcate setae with slightly unequal tines (Fig. 7C). Notopodia often with 2 or 3 very thin, slightly emergent acicula. Interramal cirri absent. Abdominal neuropodia without inner lobe, outer lobe digitiform, acute, 3–4 times as long as broad (Figs. 6D, 7D). "Ventral cirri", subpodal papillae and lateral flange absent, lateral notch present. Neurosetae include about 3 short anterior and 5 longer, posterior capillaries. Neuropodia with one very thin, slightly emergent aciculum (Fig. 7D). Posterior end unknown.

Remarks: *Scoloplos* (*Leodamas*) *brevithorax* n. sp. is characterized by its relatively narrow thorax, low number of thoracic setigers (however, fewer are present in *S.* (*L.*) *gracilis* Pillai, 1961, see below), very thin and only slightly emergent acicula in abdominal noto- and neuropodia, and by the morphology of abdominal neuropodia. It should be noted that the abdominal neuropodia of *S.* (*L.*) *dubia* Tebble, 1955 (see below) have a very similar shape, but in that species the emergent neuroacicula are very different. *S.* (*L.*) *brevithorax* is similar to *S.* (*L.*) *rubra orientalis* Gallardo, 1968 in having rudimentary notopodial postsetal lamellae on setigers 1 and 2, whereas they are easily visible from setiger 1 in *S.* (*L.*) *gracilis* and *S.* (*L.*) *dubia*.

Distribution: Known only from the Thai sector of the Andaman Sea, Indian Ocean. Found at depths of 17–79 m, in various combinations of sand and mud.

Etymology: This species is named after the dimensions of the thorax, which is relatively narrow compared to specimens of similar size (measured as length of first 20 setigers) in the three other species of *Scoloplos* (*Leodamas*) present in the BIOSHELF material.

Scoloplos* (*Leodamas*) *dubia Tebble, 1955
Fig. 8A–D

Scoloplos dubia Tebble, 1955: 143–144, fig. 26a–c.
Scoloplos (*Leondamas* [sic]) ? *dubia*. – Gallardo 1968: 93–94, pl. 39, figs. 4–5, pl. 40, figs. 1–3.
Scoloplos (*Leodamas*) *rubra australiensis* Hartmann-Schröder, 1979: 131–132, figs. 276–282. **New synonymy**.

Material examined: BIOSHELF st. E-20m/BC, 8°30′ N, 98°12′ E, 21 m, muddy sand, 22 Apr 1996 (2 fragments, PMBC 18801); st. E-20m/OS, 8°30′ N, 98°12′ E, 20 m, muddy sand, 22 Apr 1996 (2, PMBC 18802); st. G-1/BC, 8°00′ N, 98°14′ E, 42 m, sandy mud, 24 Apr 1996 (1, PMBC 18803); st. H-1/BC, 7°45′ N, 98°16′ E, 32 m, sandy mud, 9 May 1996 (1 frag., PMBC 18804); st. H-2/BC, 7°45′ N, 98°15′ E, 59 m, soft mud, 9 May 1996 (12 frag., PMBC 18805); st. H-2/OS, 7°45′ N, 98°15′ E, 56 m, soft mud, 9 May 1996 (4 frag., PMBC 18806); st. I-3/BC, 7°30′ N, 98°10′ E, 79 m, sand with shell fragments, 2 May 1996 (2 frag., PMBC 18807); st. J-1/BC, 7°15′ N, 99°03′ E, 43 m, sandy mud with shell fragments, 4 May 1996 (1, PMBC 18808); st. K-20m/OS, 7°00′ N, 99°24′ E, 22 m, mud with shell fragments, 6 May 1996 (2, ZMUC-POL-1233); st. RN-2/BC, 7°26′ N, 98°19′ E, 75 m, sand with

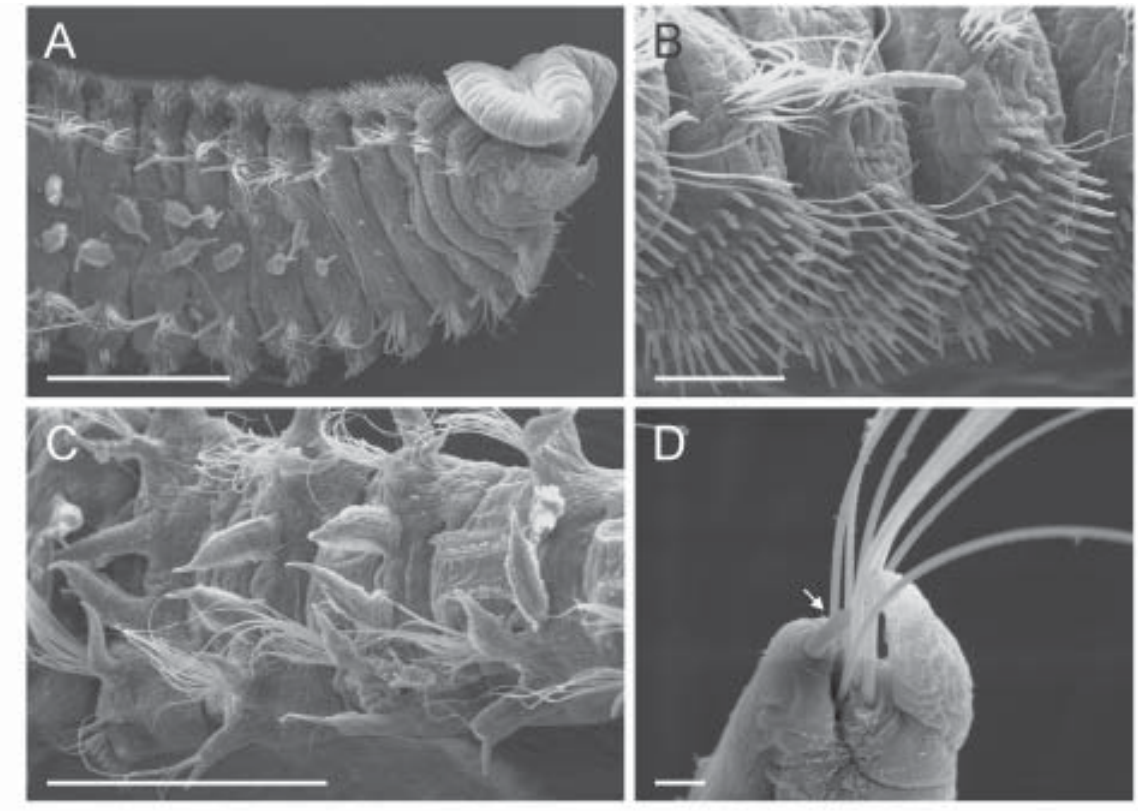

Figure 8 *Scoloplos* (*Leodamas*) *dubia*: A. Anterior end, dorsal view. B. Parapodia of setigers 3–5, lateral and slightly anterior view. C. Transition from thorax (left) to abdomen at setigers 20–23. D. Neuropodium of setiger 42, anterior view, showing outer lobe at right and partially hidden emergent, recurved aciculum at left (arrow). – SEM micrographs. ZMUC-POL-1235. Scales = 0.5 mm (A, C), 0.1 mm (B) and 10 μm (D).

shell fragments, 8 May 1996 (1, ZMUC-POL-1234); st. RN-3/BC, 7°30′ N, 98°17′ E, 72 m, muddy sand, 8 May 1996 (2 frag., PMBC 18809); st. RY-3/BC, 7°36′ N, 98°25′ E, 49 m, muddy sand, 8 May 1996 (5 frag., PMBC 18810); st. PB-2/BC, 8°00′ N, 98°39′ E, 17 m, sand with shell fragments, 22 Apr 1997 (3 frag., PMBC 18811); st. PB-3/BC, 7°51′ N, 98°32′ E, 22 m, sand with shell fragments, 23 Apr 1997 (3, PMBC 18812); st. PB-4/BC, 7°52′ N, 98°41′ E, 32 m, sand with shell fragments, 22 Apr 1997 (6 frag., PMBC 18813); st. PB-5/BC, 7°52′ N, 98°48′ E, 21 m, sand with shell fragments, 22 Apr 1997 (2, PMBC 18814); st. PB-6/BC, 7°45′ N, 98°32′ E, 30 m, sand with shell fragments, 22 Apr 1997 (1 on SEM stub, ZMUC-POL-1235; 1 on SEM stub, ZMUC-POL-1236; 2 frag., ZMUC-POL-1237); st. PB-7/BC, 7°45′ N, 98°41′ E, 29 m, sand with shell fragments, 22 Apr 1997 (2, PMBC 18815); st. PB-8/BC, 7°45′ N, 98°52′ E, 19 m, sand with shell fragments, 22 Apr 1997 (2, PMBC 18816).

Description: Up to at least 53 mm long and 1.7 mm wide, with at least 117 setigers (ZMUC-POL-1234, posteriorly incomplete). Prostomium elongate triangular, subdistally narrowed and

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distally drawn out to acute tip, almost twice as long as broad. Peristomium uniannular, about twice as long as first setiger (Fig. 8A).

Thorax with 21 setigers (juveniles with as few as 18). Branchiae from setiger 6, well developed from start but growing steadily to about setiger 15. Fully developed branchiae about 3½ times as long as broad, with drawn-out tip (Fig. 8A, C). Notopodial postsetal lamellae well developed from setiger 1, growing continuously to about setiger 13, where they are very elongate and thin, 6–7 times as long as broad (Fig. 8B). All notosetae crenulate capillaries. Interramal cirri absent. Neuropodial postsetal lamellae well developed, with one digitiform papilla, 1½–2 times as long as broad, on last thoracic setiger. Subpodal papillae absent. Thoracic neuropodia with a few crenulate capillaries in dorsal part of fascicle and many hooks in five rows, posterior row only ventrally developed (Fig. 8B). Hooks slightly curved, with 5–6 transverse ridges, distally blunt and with hood. Dorsal hooks of anterior row not noticeably larger than other hooks.

Notopodial postsetal lamellae change shape abruptly near transition to abdomen, slightly asymmetrical, with lateral swelling, as long as branchiae (Fig. 8C). Notosetae crenulate capillaries and furcate setae with slightly unequal tines. Emergent acicula not observed in notopodia. Interramal cirri absent. Abdominal neuropodia initially without inner lobe, outer lobe digitiform, acute, 3–4 times as long as broad (Fig. 8C, D); inner lobe developed as low, rounded mound on more posterior setigers. "Ventral cirri", subpodal papillae and lateral flange absent, small lateral notch present. Neurosetae include about 3 short anterior and 2–3 longer, posterior capillaries (Fig. 8D). Neuropodia initially with one straight, slightly emergent aciculum, from about abdominal setiger 10 aciculum thicker and distally curved almost 90°, from abdominal setiger 16 very large and distally curved almost 180° (ZMUC-POL-1234; see also Fig. 8D); in smaller specimens acicula curved from about abdominal setiger 20, with typical shape from around abdominal setiger 45. Strongly curved hooks present to about 85 setigers from posterior end. Pygidium with two long dorsolateral and two short ventrolateral cirri.

Remarks: *Scoloplos* (*Leodamas*) *dubia* was originally described from Ghana. The specimens reported here differ from Tebble's original description in two respects: branchiae are present from setiger 6 rather than 7 and according to Tebble's fig. 26c the abdominal notopodial postsetal lamellae are elongate triangular, without a lateral swelling. It is possible that in referring to setiger 7 ("the 7th foot") Tebble meant segment 7, *i.e.*, setiger 6.

This species was reported from Vietnam by Gallardo (1968), although with doubt because only abdominal fragments were present. They were identified on the basis of the very characteristic neuropodial acicula.

Hartmann-Schröder (1979) described *S.* (*L.*) *rubra australiensis* from NW Australia, apparently differing from the nominal subspecies in having fewer thoracic setigers and abdominal neuropodial acicula that are more strongly curved. However, these acicula have never been reported as being more than slightly bent in *S.* (*L.*) *rubra*, whereas Hartmann-Schröder's figs. 280 and 282 clearly show that her specimens have acicula of the same type as those described here for *S.* (*L.*) *dubia*.

Distribution: Ghana, Andaman Sea, NW Australia, Vietnam. Among BIOSHELF stations found at depths of 19–79 m in sandy and muddy substrates, with or without shell fragments.

Scoloplos* (*Leodamas*) *gracilis Pillai, 1961
Fig. 9A–D

Scoloplos (*Leodamus* [sic]) *gracilis* Pillai, 1961: 22–24, fig. 7m–o, fig. 8a–f.
Scoloplos (*Leodamas*) *gracilis*. – Gallardo 1968: 94, pl. 40, figs. 4–11.

Material examined: BIOSHELF st. H-1/BC, 7°45′ N, 98°16′ E, 32 m, sandy mud, 9 May 1996 (2, PMBC 18817); st. H-1/OS, 7°45′ N, 98°16′ E, 31 m, mud, 9 May 1996 (5, ZMUC-POL-1238; 1 on SEM stub, ZMUC-POL-1239; 1 on SEM stub, ZMUC-POL-1240; 1 juv. on SEM stub, ZMUC-POL-1241); st. I-20m/OS, 7°30′ N, 99°01′ E, 21 m, mud, 3 May 1996 (1, PMBC 18818); st. I-1/OS, 7°30′ N, 98°57′ E, 38 m, mud, 3 May 1996

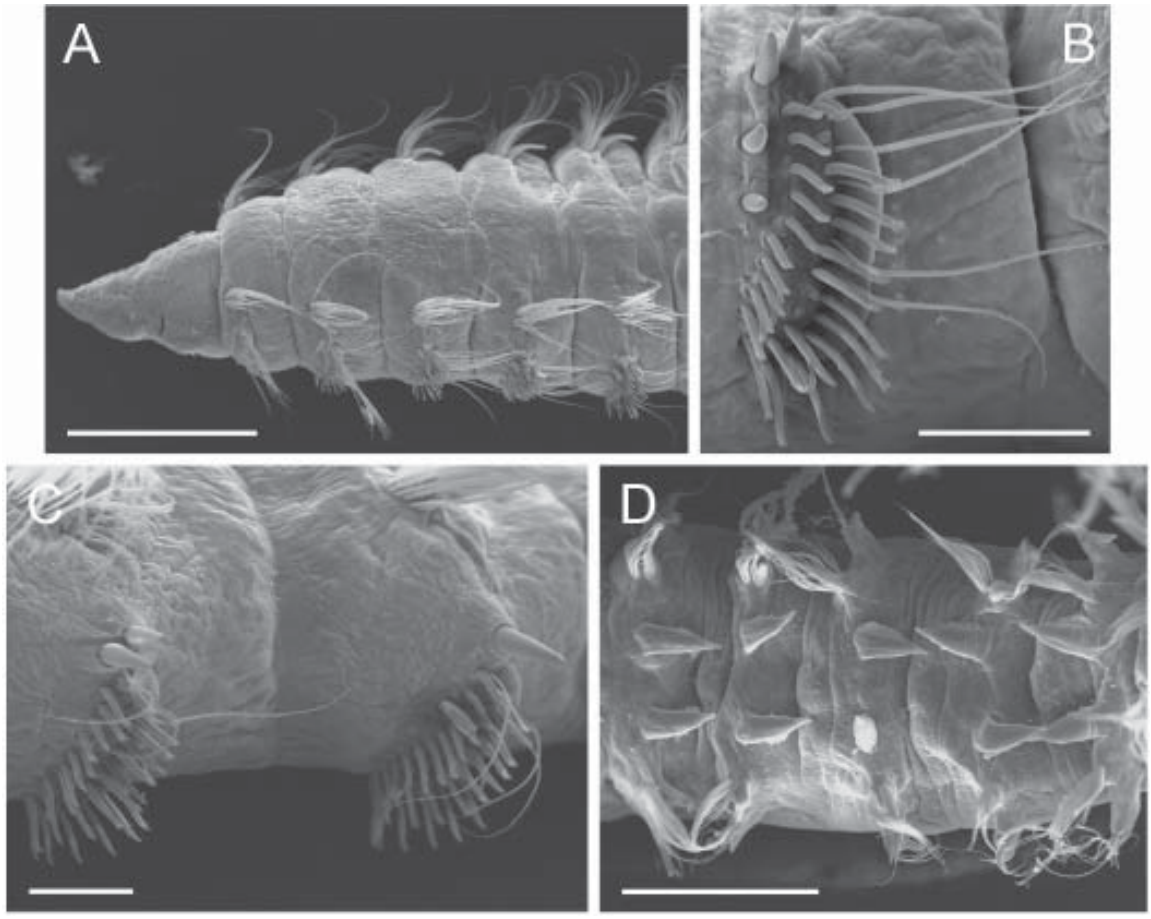

Figure 9 *Scoloplos* (*Leodamas*) *gracilis*: A. Anterior end, dorsolateral view. B. Neuropodium of setiger 5, lateral view, anterior at left. Note four enlared spines in anterior row of neurosetae. C. Neuropodia of setigers 11 (left) and 12, lateral and slightly anterior view. Note reduction in number of enlarged spines. D. Transition from thorax (setiger 17, at left) to abdomen, dorsal view. – SEM micrographs. ZMUC-POL-1240. Scales = 0.5 mm (A,D) and 0.1 mm (B, C).

(1, PMBC 18819); st. K-20m/BC, 7°00´ N, 99°24´ E, 21 m, mud with shell fragments, 6 May 1996 (3, PMBC 18820); st. PB-8/BC, 7°45´ N, 98°52´ E, 19 m, sand with shell fragments, 22 Apr 1997 (1, PMBC 18821).

Description: Up to 41.5 mm long and 1.0 mm wide, with 195 setigers (ZMUC-POL-1238, complete). Prostomium elongate triangular, distally acute, about 1½ times as long as broad. Peristomium uniannular, slightly longer than first setiger (Fig. 9A).

Thorax with 15 setigers, occasionally 16 or even 17 (juveniles with 13). Branchiae from setiger 6 (Fig. 9A, far right), well developed from start, growing steadily to end of thorax. Fully developed branchiae relatively small, elongate triangular, 3–4 times as long as broad, very acute, with drawn-out tip (Fig. 9D), on posterior abdomen very elongate, about 6 times as long as broad. Notopodial postsetal lamellae clearly visible from setiger 1 (Fig. 9A), fully developed by setiger 10, symmetrical, elongate, evenly tapering and acute, 3–4 times as long as broad. All notosetae crenulate

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capillaries. Interramal cirri absent. Neuropodial postsetal lamellae well developed, with one very short papilla on 1–2 last thoracic setigers. Subpodal papillae absent. Neuropodia of middle thoracic setigers with many hooks in three or four rows, posterior row also with 4–7 crenulate capillaries (Fig. 9B); anterior row dorsally displaced, with up to 4 greatly enlarged, smooth, spine-like hooks with reduced hoods, starting on setiger 2 and by end of thorax reduced to 1–2 dorsalmost hooks (Fig. 9B, C). Other hooks slightly curved, with 5–11 transverse ridges, distally blunt and with hood; hooks of posterior row longest, with most transverse ridges.

Notopodial postsetal lamellae on abdomen symmetrical, evenly tapering, relatively small. Notosetae crenulate capillaries and furcate setae with almost equal tines. Emergent acicula not observed in notopodia. Interramal cirri absent. Abdominal neuropodia without inner lobe, outer lobe triangular with broad base, acute, 1½–2 times as long as broad. "Ventral cirri", subpodal papillae and lateral flange absent, weak lateral notch present. Neurosetae weakly crenulated capillaries. Neuropodia with one or two large, straight, emergent acicula, of similar shape and size as dorsalmost spine in posterior thoracic neuropodia, pointing dorsad and medially (Fig. 9D), present throughout abdomen although gradually decreasing in size. Pygidium with two short, digitiform cirri, about 4 times as long as broad (damaged specimen, according to Pillai 1961 with 4 short anal cirri).

Remarks: *Scoloplos* (*Leodamas*) *gracilis* is easily recognizable by the presence of large, spine-like hooks in the thoracic neuropodia which appear to continue on to the abdomen as an emergent aciculum. Of the four species of the subgenus reported here, this is the species in which the emergent acicula of anterior abdominal setigers are largest, although smaller than the distally recurved acicula of middle abdominal setigers in *S.* (*L.*) *dubia*.

The specimens from the BIOSHELF Project would appear to disagree with the original description in two respects. Pillai (1961) stated that the emergent acicula in abdominal neuropodia are colourless, whereas they are light brown in the animals studied here. Secondly, Pillai stated that the "ventral cirrus is quite distinct"; however, his fig. 8f clearly shows that this refers to the outer lobe of the notopodium, not to a "ventral cirrus" as the concept is used in, *e.g.*, *Leitoscoloplos*. There are thus no significant differences between Pillai's specimens and those reported here. This also applies to Gallardo's (1968) report of this species from Vietnam.

S. (*L.*) *gracilis* has previously been reported from 19 stations in the BIOSHELF study area by Phasuk (1992: 83). A small portion of this material was studied and found to contain a mixture of *S.* (*L.*) *gracilis* and *S.* (*L.*) *brevithorax* n. sp. (*e.g.*, PMBC 12621, from st. 1023, contains two specimens, one of each).

Distribution: Sri Lanka, Andaman Sea, Vietnam. Among BIOSHELF stations found at depths of 19–38 m in sandy and muddy substrates, with or without shell fragments.

Scoloplos* (*Leodamas*) *rubra orientalis
Gallardo, 1968
Fig. 10A–B

Scoloplos (*Leodamas*) *rubra orientalis* Gallardo, 1968: 94–95, pl. 41, figs. 1–5, pl. 42, fig. 1.

Material examined: BIOSHELF st. C-1/BC, 9°00′ N, 98°03′ E, 40 m, muddy sand with shell fragments, 20 Apr 1996 (1, ZMUC-POL-1242); st. C-3/BC, 9°00′ N, 97°43′ E, 79 m, sandy mud, 20 Apr 1996 (1 on SEM stub, ZMUC-POL-1243; 1 fragment, ZMUC-POL-1244); st. H-1/OS, 7°45′ N, 98°16′ E, 31 m, mud, 9 May 1996 (1, PMBC 18822); st. PB-5/BC, 7°52′ N, 98°48′ E, 21 m, sand with shell fragments, 22 Apr 1997 (1, PMBC 18823).

Description: Up to at least 14.0 mm long and 1.7 mm wide, with at least 50 setigers (widest specimen: PMBC 18822), all specimens posteriorly incomplete. Prostomium elongate triangular, subdistally narrowed and distally drawn out to acute tip, almost twice as long as broad. Peristomium uniannular, longer than first setiger (Fig. 10A).

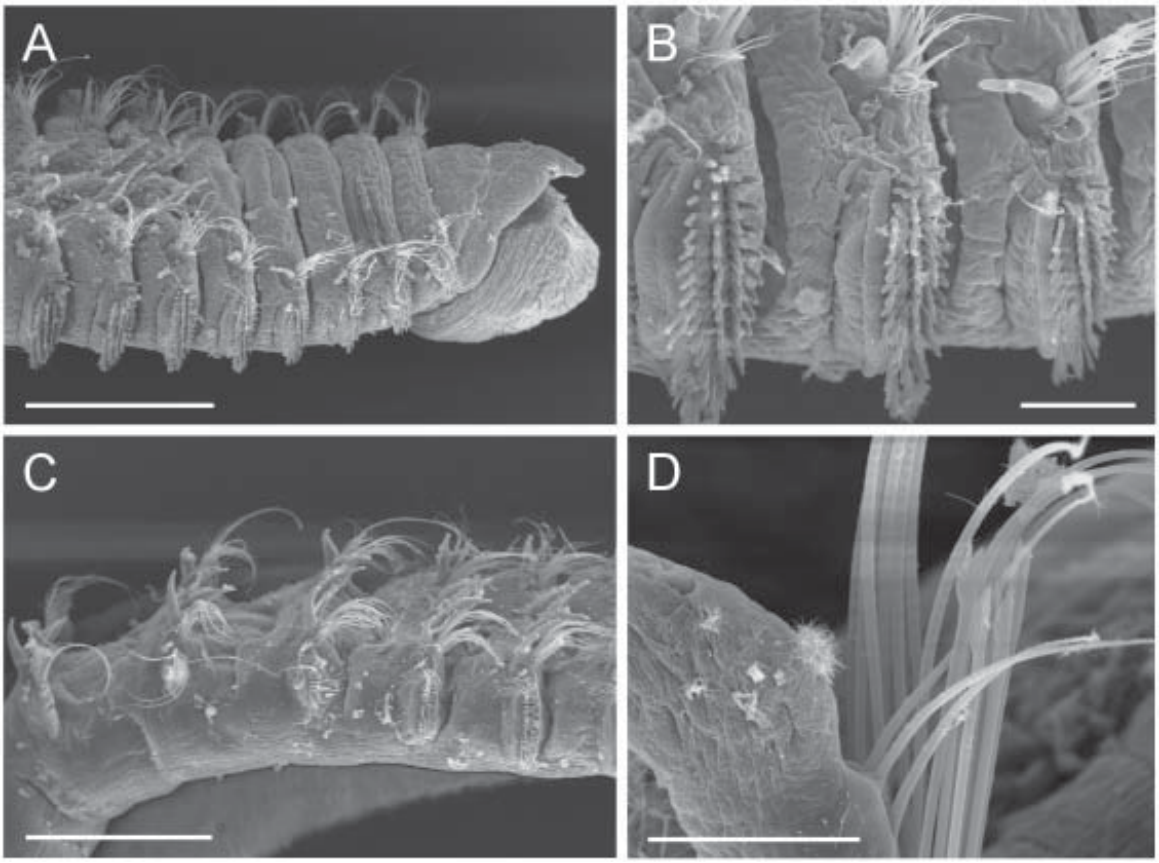

Figure 10 *Scoloplos* (*Leodamas*) *rubra orientalis*: A. Anterior end, dorsolateral view. B. Parapodia of setigers 4 (right) to 6, lateral view. C. Transition from thorax (setigers 19–21, at right) to abdomen, lateral view. D. Notopodium of setiger 27, posterior view. Note furcate setae. – SEM micrographs. ZMUC-POL-1243. Scales = 0.5 mm (A, C), 0.1 mm (B) and 50 μm (D).

Thorax with 18–21 setigers. Branchiae from setiger 6 (Fig. 10A), well developed from start, growing steadily to about setiger 14. Fully developed branchiae elongate triangular, 3–4 times as long as broad, very acute, with drawn-out tip. Notopodial postsetal lamellae miniscule on setiger 2, on setiger 3 elongate digitiform, acute, and 3–4 times as long as broad (Fig. 10A, B); lamellae growing continuously to about setiger 17, symmetrical. All notosetae crenulate capillaries. Interramal cirri absent. Neuropodial postsetal lamellae well developed, with one dorsally displaced papilla, slightly longer than broad, on 2–3 last thoracic setigers (Fig. 10C). Subpodal papillae absent. Neuropodia of middle thoracic setigers with many hooks in five rows (posterior row in ventral half of fascicle only) and 1–2 crenulate capillaries in dorsal part of fascicle (Fig. 10B); middle rows with up to 25 hooks. Hooks slightly curved, with 5–9 transverse ridges, distally blunt and with hood. Hooks of anterior row slightly larger than others, especially on middle setigers of thorax, with hoods.

Notopodial postsetal lamellae become slightly asymmetrical on abdomen, with lateral swelling, as long as gills. Notosetae crenulate capillaries and

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furcate setae with almost equal tines (Fig. 10D). Emergent acicula not observed in notopodia. Interramal cirri absent. Abdominal neuropodia without inner lobe, outer lobe digitiform, acute, 3–4 times as long as broad. "Ventral cirri", subpodal papillae, lateral flange and lateral notch absent. Neurosetae include about 3 short anterior and 3 longer, posterior capillaries. Neuropodia with one thin, distally slightly curved aciculum, clearly emergent from about abdominal setiger 7. Posterior end unknown.

Remarks: The specimens reported here agree well with the original description. *Scoloplos* (*Leodamas*) *rubra orientalis* has previously been reported from a large number of localities in the BIOSHELF study area (Phasuk 1992: 83). These specimens have not been studied.

S. (*L.*) *rubra* (Webster, 1879) was originally described from Northeastern U.S.A. According to Gallardo (1968), the differences between the stem form and his subspecies are very small. However, based on information provided by Hartman (1957: 291, pl. 32, figs. 1–6) the outer lobe of abdominal neuropodia is much larger in Webster's form than in Asian animals and the number of thoracic setigers is also considerably higher (24–25 as opposed to 18–21). I consider it doubtful that Gallardo's form actually is a subspecies of *S.* (*L.*) *rubra*. On the other hand, the specimens described from Vietnam and here actually agree quite well with the original description of *S.* (*L.*) *chevalieri* (Fauvel, 1902: 83–86, figs. 23–28), from Senegal. Fauvel's description lacks a number of details that could confirm this and it would be necessary to study his type material to settle the issue.

Distribution: Vietnam, Andaman Sea. Among BIOSHELF stations found at depths of 21–79 m in sandy and muddy substrates, with or without shell fragments.

Subgenus *Scoloplos* de Blainville, 1828

Scoloplos* (*Scoloplos*) *pseudosimplex n. sp.
Figs. 11A–B, 12A–D

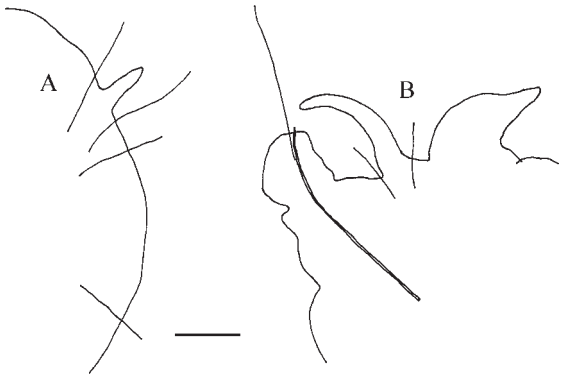

Figure 11 *Scoloplos* (*Scoloplos*) *pseudosimplex* n. sp.: A–B. Parapodia of setigers 11 and 18 (abdominal setiger 3). Setae omitted for clarity; extent of noto- and neuropodial fascicles indicated. – PMBC 18825. Scale = 0.1 mm.

Material examined: BIOSHELF st. H-1/BC, 7°45′ N, 98°16′ E, 32 m, sandy mud, 9 May 1996 (1 paratype, ZMUC-POL-1245; 1 paratype on SEM stub, ZMUC-POL-1246; 1 paratype on SEM stub, ZMUC-POL-1247); st. H-1/OS, 7°45′ N, 98°16′ E, 31 m, mud, 9 May 1996 (holotype, PMBC 18824; 2 paratypes, PMBC 18825); st. H-2/BC, 7°45′ N, 98°15′ E, 59 m, soft mud, 9 May 1996 (2 paratypes, PMBC 18826); st. PB-2/BC, 8°00′ N, 98°39′ E, 17 m, sand with shell fragments, 22 Apr 1997 (1 paratype, ZMUC-POL-1248); st. PB-4/BC, 7°52′ N, 98°41′ E, 32 m, sand with shell fragments, 22 Apr 1997 (1, PMBC 18827); st. PB-5/BC, 7°52′ N, 98°48′ E, 21 m, sand with shell fragments, 22 Apr 1997 (1, PMBC 18828); st. PB-8/BC, 7°45′ N, 98°52′ E, 19 m, sand with shell fragments, 22 Apr 1997 (1, PMBC 18829).

Description: Up to at least 14.5 mm long and 1.0 mm wide, with at least 46 setigers; holotype 7.3 mm long and 1.0 mm wide, with 32 setigers; all specimens posteriorly incomplete. Prostomium conical, not acute, about 1½ times as long as broad (Fig. 12A), with a dorsal pair of diffuse light brown spots (not eyes) near posterior border. Peristomium uniannular, longer than prostomium and twice as long as first setiger (Fig. 12A).

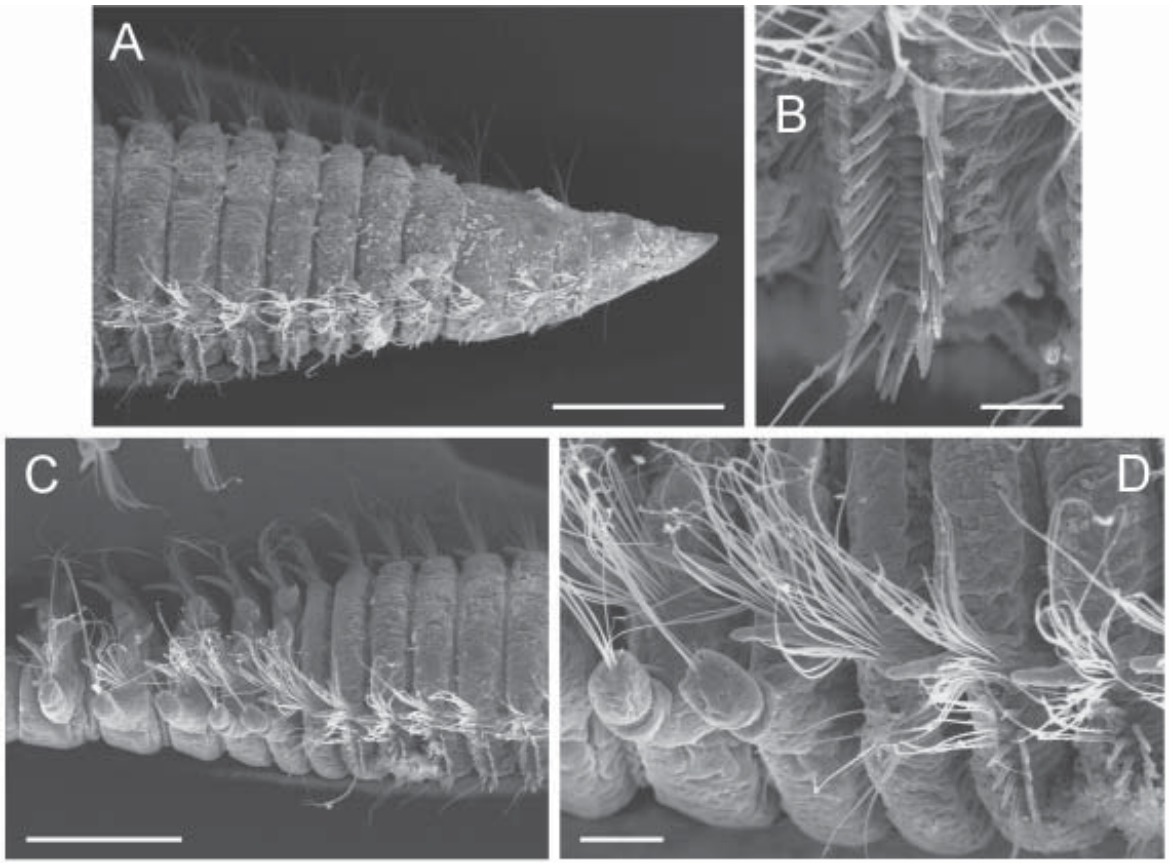

Figure 12 *Scoloplos* (*Scoloplos*) *pseudosimplex* n. sp.: A. Anterior end, dorsolateral view. B. Neuropodium of setiger 10, lateral and slightly dorsal view, anterior at right. C. Transition from thorax (right) to abdomen. D. Setigers 13–17, lateral view, showing closer view of transition from thorax (right) to abdomen. Note absence of lobes on abdominal neuropodia. – SEM micrographs. ZMUC-POL-1247. Scales = 0.5 mm (A, C), 50 µm (B) and 0.1 mm (D).

Thorax with 15 setigers (juveniles with as few as 11). Branchiae from setiger 16, absent on thorax. Notopodial postsetal lamellae miniscule on setiger 3 (Fig. 11A), very small on setiger 4, gradually growing to end of thorax, where they are cirriform and about 5 times as long as broad (Fig. 12D). All notosetae crenulate capillaries. Interramal cirri absent. Neuropodial postsetal lamellae weakly developed, as low fold on 2–3 last thoracic setigers. Podal and subpodal papillae absent. Neuropodia with two rows of up to 15 hooks and dorsal and ventral groups of 2–5 capillaries (Fig. 12B); hooks weakly curved, almost smooth, with a few weak transverse ridges.

Branchiae from first or rarely second abdominal setiger, growing gradually to setiger 20, rather short and broad, with blunt tips, distal half strongly curved towards branchia of opposite side. Notopodial postsetal lamellae similar to those on posterior thoracic setigers but considerably larger (Fig. 12C). Notosetae crenulate capillaries; furcate setae not observed. Interramal cirri absent. Ab-

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dominal neuropodia without any lobes, with prominent lateral notch, the distal portion of each neuropodium appearing oval (Figs. 11B, 12C, D). "Ventral cirri", subpodal papillae and lateral flange absent. Neurosetae capillaries. Neuropodial acicula not or only slightly emergent. Posterior end unknown.

Two specimens (PMBC 18826 and ZMUC-POL-1248) appear to be males with sperm in parapodial lobes of mid-abdominal setigers.

Remarks: *Scoloplos* (*Scoloplos*) *pseudosimplex* is easily recognizable by the characteristic shape of the abdominal neuropodia and the branchiae. The relatively short prostomium and long peristomium also give the anterior end a distinctive appearance.

S. (*S.*) *pseudosimplex* resembles *S.* (*S.*) *difficilis* Day, 1977 (pp. 229–230, fig. 2a–e) in the number of thoracic setigers and the distribution of branchiae. However, Day's species differs from the one described here in having one papilla on each thoracic neuropodial postsetal lamella, thoracic neuropodia with one row of hooks and 3–4 rows of crenulate capillaries, a prominent inner lobe on abdominal neuropodia, and branchiae that are only weakly curved.

The new species also resembles *S.* (*S.*) *spiniferus* Gallardo, 1968 (95–96, pl. 42, figs. 4–6) in the same characters (16 thoracic setigers, branchiae beginning on first abdominal setiger). However, in Gallardo's species the abdominal neuropodia have well developed inner and outer lobes and the branchiae are symmetrical.

Distribution: Known only from the Thai sector of the Andaman Sea. Found at depths of 17–59 m in sandy and muddy substrates, with or without shell fragments.

Etymology: This species is named after its superficial resemblance to *Scoloplos* (*Scoloplos*) *simplex* (Hutchings, 1974: 183–184, fig. 2a–d), specifically the number of thoracic setigers and the presence of what Hutchings termed "faded eye spots" on the prostomium.

Scoloplos (*Scoloplos*) sp. A

Material examined: BIOSHELF st. PB-4/BC, 7°52′ N, 98°41′ E, 32 m, sand with shell fragments, 22 Apr 1997 (1, PMBC 18830).

Remarks: This specimen is 11.1 mm long and 0.6 mm wide, with 30 setigers, posteriorly complete. There are 14 thoracic setigers and branchiae begin on setiger 13. Most thoracic neurosetae are capillaries, but a few hooks are also present. The last two thoracic neuropodia have one elongate papilla on the postsetal lobe. Subpodal papillae, interramal cirri, and "ventral cirri" are absent. Abdominal neuropodia are bilobed, with the inner lobe longer and broader than the outer lobe.

This animal could not be referred to any known species of *Scoloplos*, but more material is necessary before any definitive conclusions can be drawn.

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NOTES: