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PARAONIDAE (ANNELIDA: POLYCHAETA) OF THE ANDAMAN SEA, THAILAND

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ABSTRACT

Polychaetes collected from 17–198 m depth off Phuket Island, Thailand in the Andaman Sea, yielded 95 specimens representing nineteen taxa of Paraonidae. Six species are previously described. Three species are newly described herein, *Aricidea* (*Aricidea*) *multiantennata* n. sp., *A*. (*A*.) *thailandica* n. sp., and *Levinsenia kirbyae* n. sp. Seven taxa are provisional and three taxa are indeterminate. *Aricidea elongata* Imajima, 1973 and *A. eximia* Imajima, 1973 are newly synonymized with *Aricidea* (*Acmira*) *catherinae* Laubier, 1967 and *A. neosuecica nipponica* Imajima, 1973 is newly synonymized with *A*. (*Acmira*) *simplex* Day, 1963. Range extensions are reported for *Aricidea* (*Aricidea*) *fragilis* Webster, 1879, *Aricidea* (*Acmira*) *assimilis* Tebble, 1959, *A*. (*A*.) *catherinae* Laubier, 1967, *A*. (*A*.) *simplex* Day, 1963, and *A*. (*Allia*) *hartleyi* Blake, 1995. Species accounts, new descriptions, illustrations, and a key to the species are presented.

INTRODUCTION

The paraonids are elongate, slender, many segmented worms. They are burrowing animals and are considered subsurface deposit feeders (Fauchald and Jumars 1979; Gaston *et al.* 1992; Strelzov 1973). Their bodies are often preserved in a corkscrew configuration. They occur in soft sediments from intertidal to abyssal depths. Paraonid species are benthic community dominants in many marine monitoring programs in southern California and elsewhere.

The body is composed of head (prostomium and peristomium), thoracic (prebranchial and branchial segments), and abdominal (postbranchial segments and pygidium) regions. The prostomium is triangular in shape with median antenna absent or present, single or branched, short to long, blunt or tapering, smooth or articulate. Palps are absent. Eyespots are absent or present in the posterior half of the prostomium as black or red distinct spots or a diffuse patch of pigment. Occasionally an additional pair of eyespots is located on the anterior half of the prostomium. A terminal pore is present or absent at the front of the prostomium. Paired nuchal slits occur on the posterior half of the prostomium. The proboscis is soft, sac-like and eversible from a ventrally located buccal area. The peristomium is reduced and difficult to see.

Parapodia are biramous. The notopodia and neuropodia both possess capillary setae. Prebranchial setigers will often have numerous well developed, curved limbate capillary setae, which become less numerous, regular capillaries in the branchial setigers. Notopodial capillary setae are typically longer than neuropodial capillary setae. Modified setae may be present in noto- or neuropodial lobes. Modified notosetae may be furcate (*Cirrophorus* and *Paradoneis*) or modified acicular setae, as in *Paradoneis spinifera* (Hobson, 1972) (see Blake 1996). Modified neurosetae are only present postbranchially and include simple,

curved, pseudocomposite, sheathed (hooded), or aristate spines. Strelzov (1973) presents an excellent discussion on the various modified setal types and their evolutionary development.

Parapodial lobes are well developed in the notopodia and usually poorly developed or absent in the neuropodia. Digitate notopodial postsetal lobes begin on setiger one. They become longer in branchial segments and thinner in postbranchial setigers. Notopodial postsetal lobes are bifurcate in *Aricidea* (*Allia*) *antennata* (Annenkova, 1934). If present, neuropodial lobes begin on setiger one; usually as poorly developed short, digitate postsetal lobes, which are reduced to low mounds in branchial segments. Sometimes they begin as longer, digitate postsetal lobes, which disappear near the end of the branchiae as in *Aricidea* (*Allia*) *antennata*; or as single or multiple presetal lobes as in *Aricidea* (*Allia*) *monicae* Laubier, 1967.

Branchiae are reported for all but a few of the described species of Paraonidae. They occur in pairs and are usually present beginning on setiger four (sometimes later). The branchiae are short to long, cylindrical to strap-like, held erect or overlapping the dorsum, and often have cilia along the outer and/or inner margins. There are few (3–4) to many pairs (50+) present or completely absent in a few species. Additional structures, termed papillary protuberances by Strelzov (1973), are sometimes present just posterior to several branchiae in a some species. They are difficult to observe and their presence may have been overlooked. Papillary protuberances were first reported and illustrated by Strelzov (1973) for *Aricidea* (*Acmira*) *rubra* (as *Aricidea* (*Acesta*) *finitima*) (see Blake 1996). A vascular loop has been observed within these structures which may indicate a respiratory function.

The pygidium has a terminal anus surrounded by 2–8 anal cirri. Usually there are three dorsal anal cirri arranged with a shorter median one and a longer lateral pair.

Important taxonomic characters are the presence, size, and shape of the median antennae; position, number, and shape of the branchiae; the shape and position of parapodial lobes; the presence of papillary protuberances; and presence, position, and structure of the modified setae.

Cerruti (1909) erected the family Paraonidae. Complete reviews of the family are presented in Hartman (1957) and Strelzov (1973). Other important works include Hartman (1959; 1965), Imajima (1973), Fauchald (1977), and Blake (1996). There are no previous published reports of paraonids from the Andaman Sea. A few records are reported for the Indo-Pacific region in Gallardo (1968), Rullier (1972), Strelzov (1973), and Hutchings and Murray (1984)

More extensive discussions of paraonid morphology, biology, and taxonomic history are presented in Strelzov (1973) and Blake (1996).

The taxonomic scheme used herein follows that of Strelzov with the modifications of Melville (1979) and Hartley (1981). The separation of *Paradoneis* (without median antenna) from *Cirrophorus* (with median antenna) follows Katzmann and Laubier (1975); and additionally, the modification concerning the position of the first pair of branchiae and type of modified notosetae as proposed by Blake (1996). At present seven genera are generally accepted by authors, they are *Aricidea* (with subgenera *Aricidea*, *Acmira*, *Aedicira*, and *Allia*), *Cirrophorus*, *Levinsenia*, *Paradoneis*, *Paraonella*, *Paraonis*, and *Sabidius*. The genera *Aricidea* (including all four subgenera), *Cirrophorus*, *Levinsenia*, and *Paradoneis* are newly reported from the Andaman Sea.

MATERIALS AND METHODS

Phuket Marine Biological Station (PMBC) personnel collected BIOSHELF Project samples in 1996 and 1997. A map and station locations are presented by Aungtonya and Eibye-Jacobsen in a separate paper in this volume. Primary identifications were performed in August 1997 at the research facilities of the PMBC on Phuket Island, Thailand.

Figures were produced it two ways. Good illustrations for previously described species were compiled from previous publications with the sources credited. New species were photographed using a Polaroid DMC 1E or a Leaf Lumina high-resolution digital camera through either a Wild Macro dissecting microscope with fiber optic lighting or a Nikon OptiPhot compound microscope. The

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figure plates were prepared using Adobe Photoshop 6.0 on a G4 MacIntosh computer.

Methyl green is a histological chemical that stains mucoid cells. The distribution of mucoid cells along the body can be used as a taxonomic tool in some polychaete families, especially those that build permanent or semi-permanent tubes (*i.e.*, Maldanidae, Sabellidae, Terebellidae, and Capitellidae). Arwidsson (1907) uses methyl green staining in the Maldanidae with the resulting staining patterns clearly shown in his figures. Banse (1970,1972) uses methyl green staining patterns to differentiate between species of *Chone* and *Euchone*. Blake (1996) presents methyl green staining patterns for species in the Cirratulidae, Magelonidae, Cossuridae, and Spionidae. Methyl green staining has not been previously considered a taxonomic tool for the Paraonidae. However, some members of the genus *Levinsenia* do exhibit staining differences.

The method used to stain specimens is rather basic and simple. Mix a solution of methyl green powder and ethanol. The solution should be light enough to see specimens in the solution for retrieval. Specimens are allowed to stain for 5–10 minutes or longer and then placed in clean ethanol and allowed to destain for 5–10 minutes. The resulting methyl green staining pattern will last for several hours to several days, but will eventually go back into solution with ethanol in most cases.

Unless otherwise stated, all material is deposited at the Phuket Marine Biological Station (PMBC). Other institutions receiving material are the Scripps Institution of Oceanography-Benthic Invertebrate Collection (SIO-BIC); Zoological Museum, University of Copenhagen (ZMUC) Los Angeles County Museum of Natural History (LACM-AHF), and the United States National Museum (USNM).

RESULTS

Paraonidae Cerruti, 1909

Levinseniens Mesnil and Caullery, 1898: 125.

Aricidea Webster, 1879

Aricidea Webster, 1879: 255.

Subgenus *Aricidea* sensu stricto *fide* Strelzov, 1973

Aricidea Strelzov, 1973: 62.

Aricidea* (*Aricidea*) *fragilis Webster, 1879
Fig. 1A–D

Aricidea fragilis Webster, 1879: 55–57, pl. IX, figs. 127–132. – Pettibone 1965: 129–131, figs. 1a–g, 2a–e, 3a–c.
Aricidea fragilis caeca Wu, 1962: 426, table 2, l–n.
Aricidea (*Aricidea*) *fragilis*. – Strelzov 1973: 63–65, figs. 16, 21.

Material examined: BIOSHELF st. C-1/BC, 20 Apr 1996, 40 m (1, ZMUC-POL-1155); st. K-20m/BC, 6 May 1996, 21 m (1, ZMUC-POL-1156); st. RY-3/BC, 8 May 1996, 49 m (2, PMBC 18504); st. PB-1/BC, 23 Apr 1997, 19 m (1, PMBC 18505); st. PB-3/BC 23 Apr 1997, 22 m (1, PMBC 18506); st. PB-5/BC, 22 Apr 1997, 21 m (1, SIO-BIC A788); st. PB-7/BC, 22 Apr 1997, 29 m (1, PMBC 18507); st. PB-8/BC, 22 Apr 1997, 19 m (1, SIO-BIC A789).

Description: Body pale, yellowish. Prostomium triangular with broadly rounded anterior; median antenna inserted on posterior third extends to middle of setiger 2 (see Fig. 1A). Nuchal slits present on latter half of prostomium. Eyes absent (faded) or two pairs, small black subdermal pair anterior to nuchal slits, larger pair of reddish eyespots (pigment) posterior to median antenna. Notopodial postsetal lobes begin on setiger 1 short, digitate, with inflated base in anterior setigers; longer in branchial region; thinner postbranchially (see Fig. 1C). Neuropodial postsetal lobes begin on setiger 1 as low, rounded mound; slightly longer in early branchial segments (see Fig. 1A); disappear mid-branchially. Branchiae begin on setiger 4, (21) 27–34 pairs, ciliated, strap-like tapering to tip; some specimens with lateral flange in mid-region, last few pairs shorter. Capillary setae present in anterior noto- and neuropodial setigers, neuropodial capillaries fringed in anterior setigers. Modified neurosetae present postbranchially, begin on setigers 43–44, pseudo-

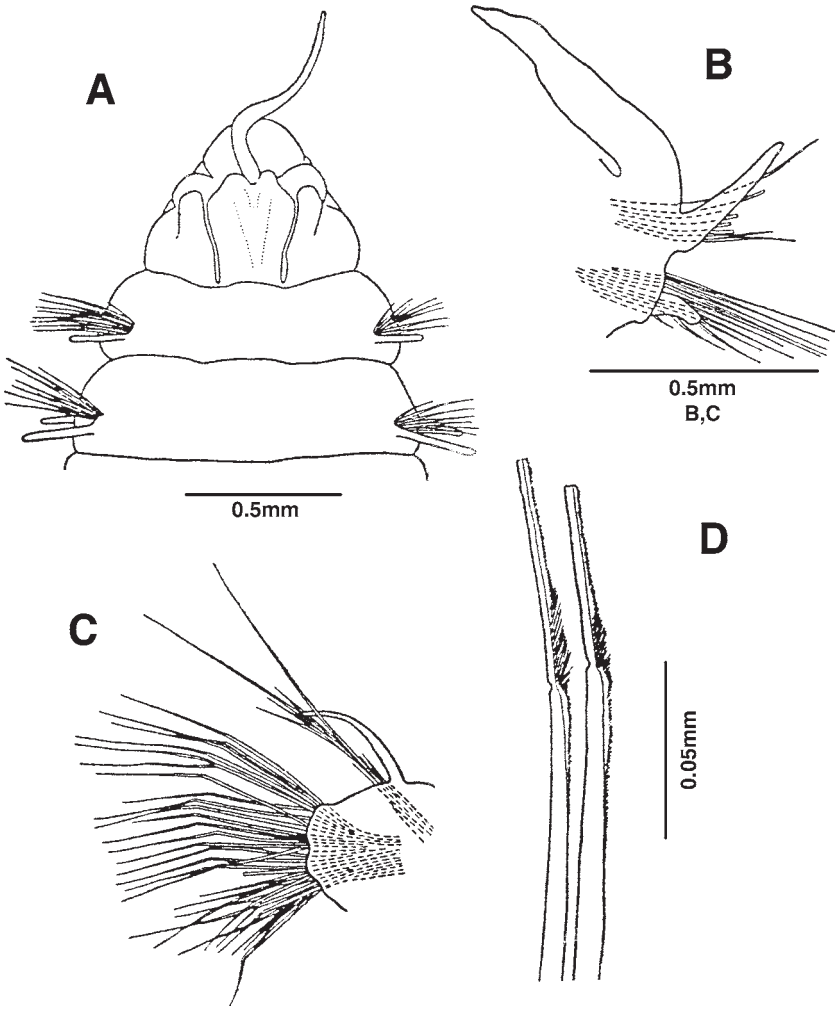

Figure 1 *Aricidea* (*Aricidea*) *fragilis* Webster, 1879: A. Anterior region, dorsal view. B. Parapodial lobe, branchial region. C. Parapodial lobe, abdominal region. D. Modified neurosetae. – All figures from Strelzov 1973.

compound with fringe on convex side (see Fig. 1D), accompanied by a few superior and inferior capillary setae. Pygidium unknown.

Remarks: The material examined matches well with previous literature reports. Eyespots have been reported as fading in alcohol by previous researchers. The presence of a second pair of anterior black eyespots may have been missed previously, since they are subdermal. The neuropodial postsetal lobes are not as broad as figured in Pettibone (1965, fig. 2a–b). This species is newly reported from the Indian Ocean. The nearest previous record comes from the Gulf of Tonkin, South China Sea (Strelzov 1973).

Distribution: Atlantic coast of North America, Gulf of Mexico, West Africa, Adriatic Sea, South China Sea, Andaman Sea. Littoral to 54 m.

Aricidea* (*Aricidea*) *multiantennata n. sp.
Fig. 2A–E

Material examined: BIOSHELF st. H-1/OS, 9 May 97, 31 m (1 paratype, ZMUC-POL-1157 [anterior

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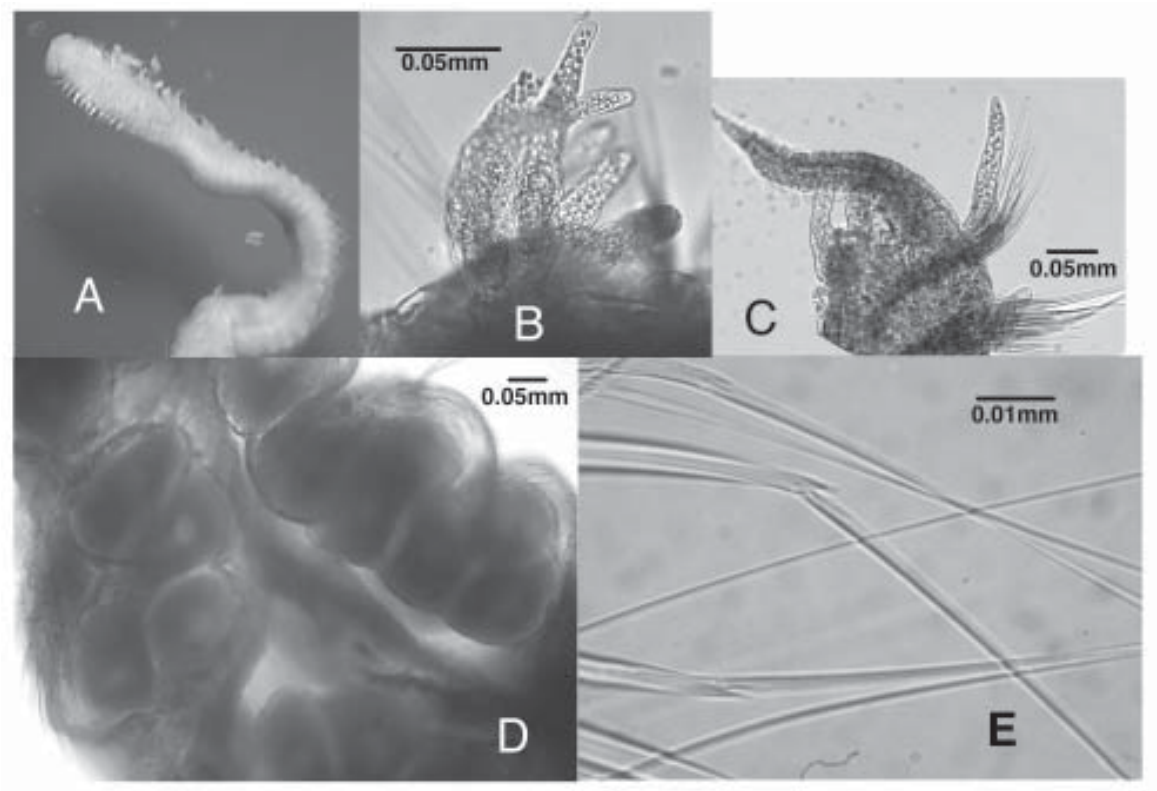

Figure 2 *Aricidea* (*Aricidea*) *multiantennata* n. sp., holotype: A. Anterior region, dorsal view. B. Median antenna. C. Parapodial lobe, setiger 6. D. Posterior region with eggs. E. Modified neurosetae. – All photographs original.

fragment, 98 setigers, length 27.0 mm, width at 10th setiger 0.88 mm, length to end of 10th setiger 1.2 mm]); st. I-3/BC, 2 May 1996, 79 m (holotype, PMBC 18508 [anterior fragment, 110 setigers, length 45.0 mm, width at 10th setiger 0.72 mm, length to end of 10th setiger 1.0 mm, gravid female, egg diameter 0.12–0.16 mm]); st. RY-3/BC, 8 May 1996, 49 m (1, PMBC 18509); st. PB-1/BC, 23 Apr 1997, 19 m (1 paratype, USNM 1001162 [anterior fragment, 67 setigers, length 19.67 mm, width at 10th setiger 0.54 mm, length to end of 10th setiger 1.2 mm]); st. PB-5/BC, 22 Apr 1997, 21 m (2 paratypes, SIO-BIC A790 [anterior fragment, 85 setigers, length 26.67 mm, width at 10th setiger 1.12 mm, length to end of 10th setiger 1.12 mm; anterior fragment, 51 setigers, length 113.67 mm, width at 10th setiger 0.52 mm, length to end of 10th setiger 0.88 mm]); st. PB-7/BC, 22 Apr 1997, 29 m (1 paratype, LACM-AHF 2090 [anterior fragment, 70 setigers, length 19.67 mm, width at 10th setiger 0.72 mm, length to end of 10th setiger 1.08 mm]).

Description: Prostomium triangular with bulbous end. Nuchal organs present on posterior half of prostomium. Faded eyespots present, lateral to nuchal organs. Median antenna present with five gradually tapering digitate branches; inserted mid-prostomium (see Fig. 2B). Proboscis sac-like ventrally positioned. Digitate notopodial postsetal lobes present from setiger 1, longer in branchial setigers; filiform postbranchially. Digitate neuropodial postsetal lobes present from setiger 1, shorter than notopodial postsetal lobes (see Fig. 2C), filiform in branchial and postbranchial setigers. Branchiae begin on setiger 4, 24–25 pairs, ciliated, long strap-like, tapering at the tip, longest pairs with an outer lateral flange, last few (1–3) pairs shorter. Capillary

setae present in anterior noto and neuropodial setigers, fringed in anterior setigers. Modified setae present postbranchially, pseudo-compound with a fringe on the convex side (see Fig. 2E), begin on setiger 37–39; up to 12 modified setae per fascicle, with 1–2 superior capillary setae. Eggs fill coelomic cavity in postbranchial region (see Fig. 2D). Pygidium unknown.

Remarks: The structure of the branched median antennae, presence of well developed noto- and neuropodial postsetal lobes, and modified setae are sufficient to separate this species from all others in the subgenus *Aricidea*. The egg size suggests demersal development. Large sand grains and forams were noted in the gut of one specimen.

Two other species have been previously described with branched median antennae. *Aricidea* (*Allia*) *ramosa* Annenkova, 1934 and *Aricidea* (*Aedicira*) *mediterranea* Laubier and Ramos, 1974. *A.* (*Allia*) *ramosa* has a similar median antenna, but is reported as having fewer branchial pairs (13–18 vs. 24–25). Unfortunately, Annenkova's types are reported as missing (Strelzov 1973) and additional comparative material has yet to be located. *A.* (*Aedicira*) *mediterranea* has a bilobed median antenna and 8–9 branchial pairs beginning on setiger 5. It should be noted that from the illustration in Laubier and Ramos (1974), the setae of *A.* (*Aedicira*) *mediterranea* appear to be modified, which would support placement in the genus *Allia*. Type material should be reviewed to confirm the original illustration of the posterior neurosetae. An additional species, *Aricidea* (*Aricidea*) *thailandica* n. sp., with a branched median antenna is also described in this paper. It has a median antenna with 2–3 pseudoarticulate branches, each with an inflated tip; 15–21 pairs of branchiae; and modified setae with a recurved tip and a terminal arista arising from the concave side.

There has been confusion regarding specimens of *Aricidea* that possess a branched median antenna since Strelzov (1973) noted in his remarks that "*A.* (*Allia*) *ramosa* is distinguished from all species of *Aricidea* by the branched unpaired prostomial antenna". Strelzov (1973) may have had two forms, with one different than that described by Annenkova (1934). The following sentence in Strelzov (1973, p. 83) provides a clue to support this conclusion, "Its structure in the studied specimens differs somewhat from the description and drawings by N. P. Annenkova (1934, p. 657, fig. 3a); *antenna has a broad and short base from which 4 to 6 offshoots issue, unequal in length*." Annenkova's and Strelzov's illustrations clearly show differently structured median antennae. A review of Strelzov's material reveals that it came from two locations. The first location (collection 8, st. 3579, 598 m, 2 specimens) is from the Sea of Japan and the second location (collection 8, st. 4179, 1155 m, 9 specimens) is from off central California. Strelzov does not note which location material for his illustrations came from. In other Californian material (see Blake 1996) the median antenna has secondary branches coming from a primary basal lobe which corresponds to figure 34, A in Strelzov (1973). Blake follows Strelzov in stating that "*Aricidea ramosa* is readily distinguished from all other paraonids by the branched median antenna". Tom Parker, County Sanitation Districts of Los Angeles County, concluded that the Californian material of Hartman (1969), Strelzov (1973), and Blake (1996) represents an undescribed species that he designated as provisional species *Aricidea* (*Allia*) sp. A SCAMIT 1996. His remarks and a voucher sheet are presented in SCAMIT Newsletter Vol. 15, No. 5. This information is available on the SCAMIT website at www.scamit.org.

Etymology: This species is named for the distinctive median antenna it possesses.

Distribution: Andaman Sea. 19–79 m.

Aricidea* (*Aricidea*) *thailandica n. sp.
Fig. 3A–E

Material examined: BIOSHELF st. C-2/BC, 20 Apr 1996, 65 m (1 paratype, SIO-BIC A791 [anterior fragment, 102 setigers, length 48.34 mm, width of 10th setiger 0.24 mm, length to end of 10th setiger 0.7 mm, gravid female, egg diameter 0.08–0.12 mm]; 1 paratype, ZMUC-POL-1158 [anterior fragment, 73 setigers, length 22.67 mm, width of 10th setiger 0.32 mm, length to end of 10th setiger 0.66 mm, gravid male, sperm diameter

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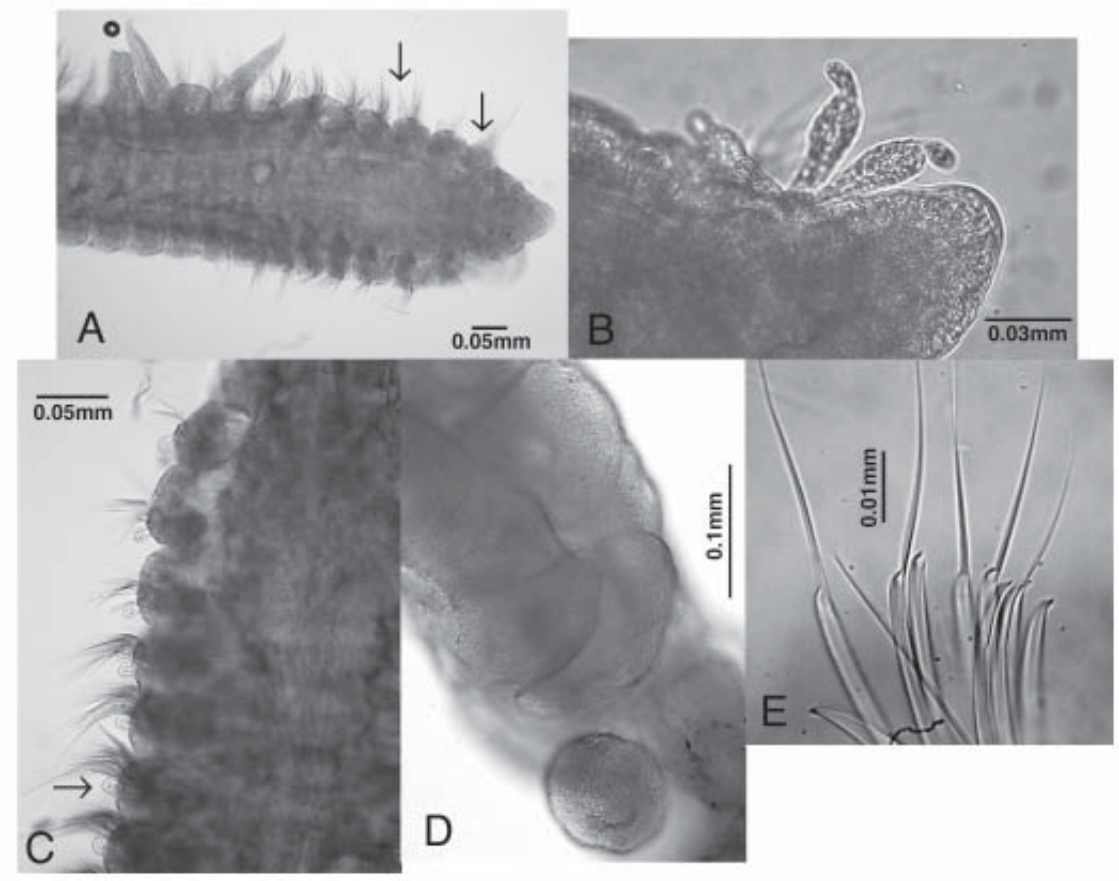

Figure 3 *Aricidea* (*Aricidea*) *thailandica* n. sp., holotype: A. Anterior region, dorsal view. B. Median antenna. C. Anterior region, ventral view. D. Posterior region with eggs. E. Modified neurosetae. – All photographs original.

0.004 mm]); st. PB-4/BC, 22 Apr 1997, 32 m (holotype, PMBC 18510 [anterior fragment, 41 setigers, length 16.34 mm, width of 10th setiger 0.3 mm, length to end of 10th setiger 0.72 mm, gravid female, egg diameter 0.08–0.12 mm]).

Description: Body long, thin, pale yellowish brown in color. Prostomium triangular. Pair of black eyespots present, anterior of median antennae. Median antenna with 2–3 pseudoarticulate branches arising from base, each branch with subdistal swelling tapering to filiform tip (see Fig. 3B). Paired nuchal organs present on posterior third of prostomium. Papillary postsetal notopodial lobes present from setiger 1, longer by setiger 3, digitate in branchial segments, filiform postbranchially. Papillary neuropodial postsetal lobes present from setiger 1, short rounded, slightly longer in anterior branchial setigers (see Fig. 3C), absent after setiger 16. Branchiae begin on setiger 4, 15–21 pairs, ciliated with broad base tapering to a tip, length to width ratio 3:1. Thickened bundles of capillary setae present in anterior noto- and neuropodial setigers; simple, fewer postbranchially. Modified neuropodial setae begin on setiger 34, acicular with recurved tip, terminal arista and hood emerge from concave side, frequently broken or worn in posterior setigers resembling acicular spine (see Fig. 3E). Eggs fill the coelomic cavity in postbranchial region (see Fig. 3D). Pygidium unknown.

Remarks: This species possesses a combination of branched median antenna with inflated subdistal ends, neuropodial postsetal lobes, are adequate to characterize this species. This antenna structure differs from all other known species with branched median antennae. Comments on related species are in the remarks section for the previous species. The eggs size suggests demersal development.

Etymology: This species is named for the country in which it was collected.

Distribution: Andaman Sea. 32–65 m.

Subgenus *Aedicira* Hartman, 1957

Aedicira Hartman, 1957: 325.

Aricidea (*Aedicira*) sp.

Material examined: BIOSHELF st. C-1/BC, 20 Apr 1996, 40 m (1, SIO-BIC A792); st. J-2/BC, 4 May 1996, 62 m (1, PMBC 18511); st. K-2/OS, 6 May 1996, 60 m (1, ZMUC-POL-1159).

Description: Body yellowish tan. Prostomium triangular, broadly rounded anteriorly. Proboscis sac-like. Median antenna inserted on posterior third of prostomium tapering to posterior margin of setigers 2–3. Nuchal organs present on posterior third of prostomium lateral to the median antenna, straight. Branchiae begin on setiger 4, 32–33 pairs, long, strap-like, tapering to a filiform tip, pairs on setigers 18–30 longest, the last 2–3 pairs shorter. Short, digitate postsetal notopodial lobe present on first setiger, longer by third setiger and through branchial setigers, filiform postbranchially. Neuropodial postsetal lobes papillary begin on setiger 1, gradually shorter then absent beginning in median branchial segments. Thickened, fringed capillary setae present in anterior noto- and neuropodial fascicles, simple in branchial and postbranchial setigers. Modified setae absent (55 postbranchial setigers present on 1 specimen). Pygidium unknown.

Remarks: Despite the fact that only three incomplete specimens were collected, the generic placement is warranted based on one specimen with 92 segments and no modified setae Three species of *Aricidea* (*Aedicira*) are reported from the northwest Pacific. Strelzov (1973) reported *Aricidea* (*Aedicira*) *pacifica* Hartman, 1944 and Imajima (1973) reported *A.* (*A.*) *pacifica* and two additional species, *A.* (*A.*) *foliata* n. sp. and *A.* (*A.*) *belgicae* (Fauvel, 1936). Day and Hutchings (1979) reported *Aedicira* sp. from Australia and New Zealand. The present material most resembles *A.* (*A.*) *pacifica* of Imajima, but additional specimens are necessary to fully determine the nature of this species. Imajima's report of *A.* (*A.*) *pacifica* is questioned due to the more conical prostomium illustrated in Imajima (1973) when compared with the truncate prostomium of *A.* (*A.*) *pacifica* as illustrated in Strelzov (1973)

It should be noted that Strelzov (1973) considers *A.* (*A.*) *belgicae* (Fauvel, 1936) to be of undetermined generic status due to the poor condition of the type material. Additionally, Hartley (1984) questions the validity of the subgenus *Aedicira*, since the complete absence of modified setae has never been confirmed by examination of complete specimens.

Distribution: Andaman Sea. 40–62 m.

Subgenus *Allia* Strelzov, 1973

Allia Strelzov, 1973: 76.

Aricidea (*Allia*) *hartleyi* Blake, 1996
Fig. 4A–D

Aricidea (*Allia*) *hartleyi* Blake, 1996: 51–52, fig. 2.11.
?*Aricidea jeffreysii*. – Imajima 1973: 262–263, fig. 4a–h. – [Not McIntosh, 1879 *fide* Blake 1996.]
Aricidea cf. *nolani*. – Lissner *et al*. 1986: appendix D, 13.

Material examined: BIOSHELF st. A-1/BC, 18 Apr 1996, 43 m (1, PMBC 18512); st. PB-8/BC, 22 Apr 1997, 19 m (1, ZMUC-POL-1160).

Description: Prostomium triangular rounded anteriorly, short median antenna present, extending

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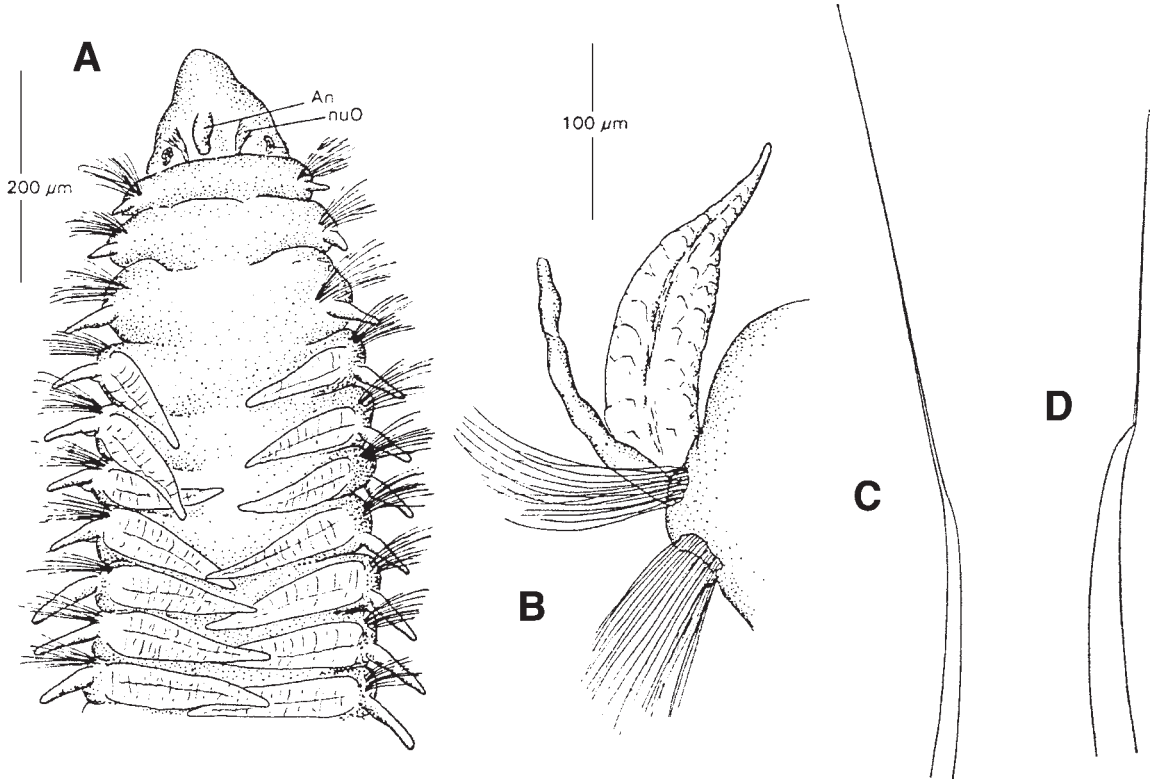

Figure 4 *Aricidea* (*Allia*) *hartleyi* Blake, 1996: A. Anterior region, dorsal view. B. Parapodial lobe, branchial region. C–D. Modified neurosetae. – A–B from Blake 1996, C–D from Imajima 1973.

to rear of prostomium, nuchal organs present on posterior half of prostomium, small red eyespots or absent (see Fig. 4A). Branchiae begin setiger 4, 21 pairs (see Fig. 4B) (some broken off?), last few pairs smaller with more separation. Postsetal notopodial lobes begin on setiger 1, short digitate, longer in branchial and postbranchial setigers. Neuropodial postbranchial lobes papillary begin on setiger 1, absent beginning in median branchial segments. Capillary setae present in anterior, branchial, and postbranchial noto and neuropodia. Neuropodial modified setae begin on setiger 50 as thickened capillary setae with simple arista (see Fig. 4C,D), or arista worn down and missing. Pygidium unknown.

Remarks: This species is unusual for the large number of post-branchial setigers prior to the start of neuropodial modified setae. The present material compares well with paratype material examined. This species is well known from southern California. The current records represent a considerable range extension.

Distribution: Type locality: California. ?Japan, Andaman Sea. 19–98 m, ?300 m.

Aricidea (*Allia*) sp. 1

Material examined: BIOSHELF st. I-1/OS, 3 May 1996, 38 m (1, PMBC 18513); st. J-2/OS, 4 May 1996, 61 m (1, SIO-BIC A793).

Description: Body yellowish tan, anterior inflated. Prostomium trilobed, median antenna inserted at midpoint of prostomium, short, blunt, not extending past prostomium. Nuchal organs present on posterior half of prostomium. Branchiae begin setiger 4, 21 pairs, conical, tapering, with cilia, posterior few pairs shorter. Postsetal notopodial lobes present from

setiger 1, short, longer in mid-branchial region, filiform thereafter. Postsetal neuropodial lobes absent. Thickened, fringed capillary setae present in anterior setigers, simple capillaries in branchial and postbranchial setigers. Modified neurosetae begin setiger 37 (approx.), thicker, with arista at tip (arista sometimes worn). Pygidium unknown.

Remarks: These specimens are distinct and separable from the other species presented (see Key to the Species). However, the presented limited material does not allow for a proper comparison with the described species of *Aricidea* (*Allia*).

Distribution: Andaman Sea. 38–61 m.

***Aricidea* (*Allia*) sp. 2**

Material examined: BIOSHELF st. E-20m/BC, 22 Apr 1996, 21 m (1, SIO-BIC A794); st. I-20m/BC, 3 May 1996, 21 m (1, ZMUC-POL-1161); st. PB-5/BC, 22 Apr 1997, 21 m (1, PMBC 18514).

Description: Prostomium triangular, short, digitate median antenna present extends to anterior margin of setiger 1, nuchal organs present on posterior half of the prostomium. Branchiae begin setiger 4, 32–35 pairs, tapering, ciliated, with a filiform tip, overlap the dorsum. Postsetal notopodial lobe present from setiger 1, well developed, no basal swelling. Postsetal neuropodial postsetal lobes absent. Thickened, fringed, capillary setae present in anterior and branchial setigers in noto- and neuropodia, simple capillaries in notopodia thereafter. Modified neuropodial setae thickened with terminal arista, begin approximately setiger 59, single in inferior part of fascicle, adding more modified setae over the following setigers. Pygidium unknown.

Remarks: The modified neurosetae begin in much later setigers than is normal for paraonids (see *Aricidea* (*Allia*) *hartleyi* above). These specimens are distinct and separable from the other species presented (see Key to the Species). However, the presented limited material does not allow for a proper comparison with the described species of *Aricidea* (*Allia*).

Distribution: Andaman Sea. 21 m.

Subgenus *Acmira* Hartley, 1981

Acmira Hartley, 1981: 135.
Acesta Strelzov, 1973: 105.

Aricidea* (*Acmira*) *catherinae Laubier, 1967
Fig. 5A–C

Aricidea catherinae Laubier, 1967: 112–118, figs. 4a–e, 5a–d. – Laubier and Ramos 1974: 1112.
Aricidea jeffreysii. – Pettibone 1963: 305–307, fig. 80a–e; 1965: 134–135, figs. 6a–b, 7a–c, 8a–d. – [Not McIntosh, 1879 *fide* Strelzov 1973.]
Aricidea lopezi. – Hartman 1963: 38. – [Not Berkeley and Berkeley, 1956 *fide* Strelzov 1973.]
Aricidea zelenzovi Strelzov, 1968: 86–87, fig. 6a–g. [*Fide* Strelzov 1973.]
Aricidea elongata Imajima, 1973: 271–272, fig. 9. **New synonymy.**
Aricidea eximia Imajima, 1973: 269–270, fig. 8. **New synonymy.**
Aricidea (*Acesta*) *catherinae*. – Strelzov 1973: 91–93, figs. 15, 38a–f. – Katzman and Laubier 1975: 575.
Aricidea (*Acmira*) *catherinae*. – Gaston 1984: 43–45, figs. 44a–c. – Blake 1996: 56–57, fig. 2.14.

Material examined: BIOSHELF st. A-1/BC, 18 Apr 1996, 43 m (1, PMBC 18515); st. A-3/BC, 19 Apr 1996, 82 m (1, SIO-BIC A795); st. PB-1/BC, 23 Apr 1997, 19 m (1, ZMUC-POL-1162); st. PB-5/BC, 22 Apr 1997, 21 m (1, PMBC 18516).

Comparative material studied: *Aricidea catherinae* (3 paratypes, USNM 35914); *Aricidea eximia* (holotype, NSMT-Pol. H 92); *Aricidea elongata* (holotype, NSMT-Pol. H 93).

Description: Prostomium triangular, median antenna extends to setiger 1–3, eyespots present, nuchal organs present. Notopodial postsetal lobes present from setiger one, papillary, changing to digitate in branchial region, filiform in postbranchial setigers (see Fig 5A). Neuropodial postsetal lobes low, mounds on anterior setigers, absent thereafter. Branchiae begin on setiger 4, 9 (juv.)–20 pairs (up

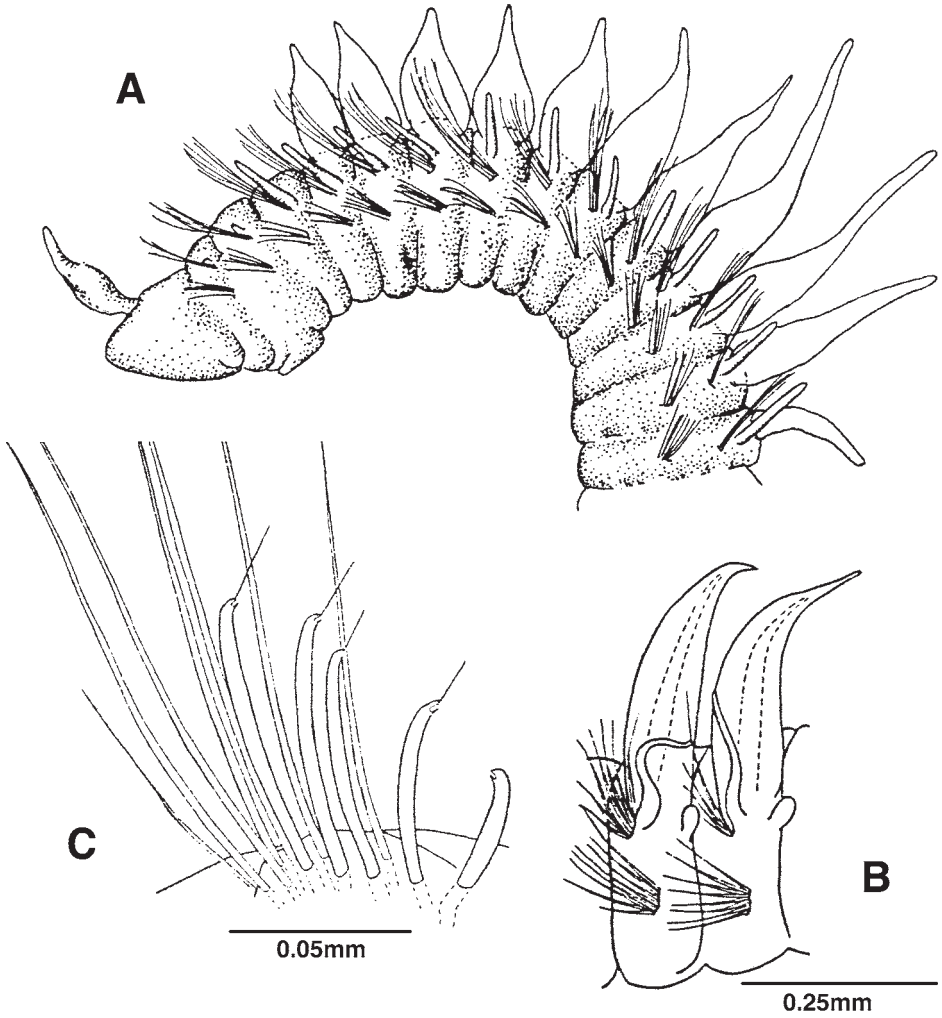

Figure 5 *Aricidea* (*Acmira*) *catherinae* Laubier, 1967: A. Anterior region, lateral view. B. Papillary protuberances, branchial region. C. Modified neurosetae. – A from Blake 1996, after Laubier 1967; B and C from Strelzov 1973.

to 25 depending on size), posterior pairs longer, thinner, last few pairs shorter. Papillary protuberances present on setigers 11–17, occur just posterior to branchia (see Fig. 5B). Bundles of thickened, fringed capillary noto- and neurosetae present in anterior setigers, postbranchial capillaries simple, fewer. Modified neuropodial setae present postbranchially, 5–7 acicular spines or hooks with recurved tip, distal hood with terminal arista accompanied by a few capillaries (see Fig. 5C). Pygidium with 3 anal cirri, 2 lateral, 1 short mid-ventral.

Remarks: This is the first report of papillary protuberances for this species. These structures are difficult to see and their function is unknown. An internal vascular loop has occasionally been observed which has led to speculation that these protuberances may be accessory respiratory structures. Strelzov (1973) first reported these structures for *Aricidea* (*Acmira*) *finitima* Strelzov, 1973; which Blake (1996) synonymized with *A.* (*A.*) *rubra* Hartman, 1963. *Aricidea* (*Acmira*) *rubra* is a more robust species than *A.* (*A.*) *catherinae* with a shorter median antenna and greater number

of branchial pairs (up to 32). The author has examined holotype and paratype material of *Aricidea* (*Acmira*) *philbinae* Brown, 1976 (USNM 53172, 53173, 53174) and noted papillary protuberances present in approximately segments 5–15.

A. (*A.*) *catherinae* has a widespread distribution and is an abundant species in shallow water monitoring programs in southern California and Massachusetts Bay, Massachusetts. This report from the Andaman Sea is the first of this species for the Indian Ocean.

Distribution: Type locality: Mediterranean Sea. Western North Atlantic, Gulf of Mexico, California, Japan, Andaman Sea. 2–1929 m.

Aricidea* (*Acmira*) *assimilis Tebble, 1959
Fig. 6A–D

Aricidea assimilis Tebble, 1959: 25–26, fig. 4. – Rullier 1963: 243. – [Not Day, 1961: 482.]
Aricidea (*Acesta*) *assimilis*. – Strelzov 1973: 93–95, figs. 16, 39 (?in part).

Material examined: BIOSHELF st. PB-8/BC, 22 Apr 1997, 19 m (1, PMBC 18517).

Comparative material studied: *Aricidea assimilis* (holotype, BMHN 1955.10.12.229).

Description: Body small, thin, pale yellowish tan. Prostomium triangular, with reddish pigment spots

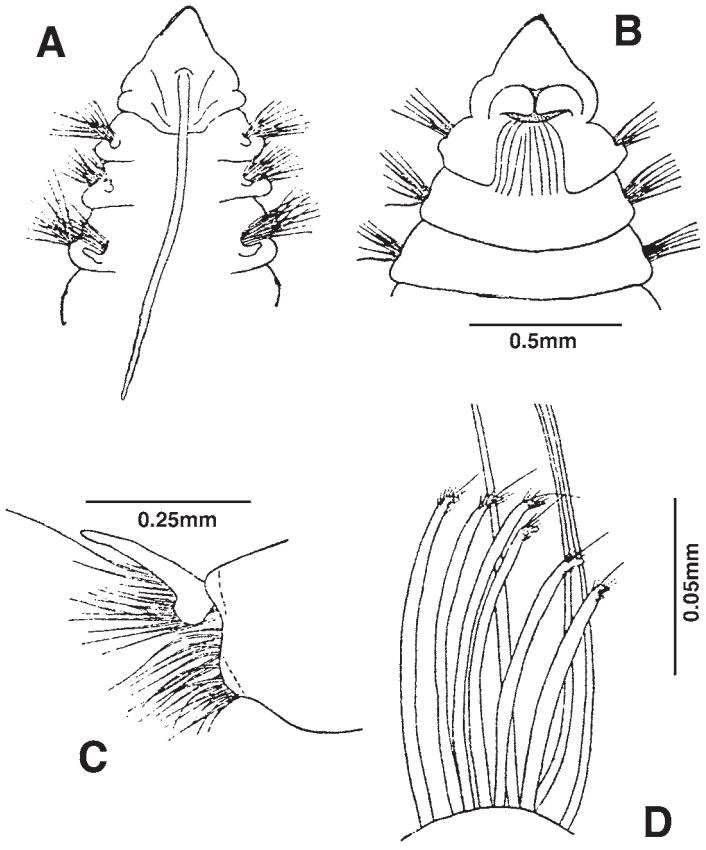

Figure 6 *Aricidea* (*Acmira*) *assimilis* Tebble, 1959: A. Anterior region, dorsal view. B. Anterior region, ventral view. C. Parapodial lobe, branchial region. D. Modified neurosetae. – A after Strelzov 1973; B–D from Strelzov 1973.

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(eyespots) present along the anterior and lateral prostomial margins. Oral opening ventral, well developed with posterior striations (see Fig. 6B). Median antenna long, thin, with attachment resembling a basal ceratophore, reaching to setiger six (see Fig. 6A). Papillary notopodial postsetal lobes present on setigers 1 and 2, filiform from setiger 3, longer in branchial region with inflated base (see Fig. 6C), filiform postbranchially. Neuropodial postsetal lobe papillary in setigers 1–3, absent thereafter. Branchiae begin on setiger 4, 18–22 pairs, ciliated, last 3–4 pairs longer, thinner. Internal structures of branchiae stain with methyl green. Papillary protuberances present on setigers 12–23. Thickened, fringed bundles of capillary setae present in anterior setigers, simple capillaries post branchially. Modified neuropodial setae begin about setiger 29, acicular with recurved tip and multiple arista (see Fig. 6D). Dorsum with segmental bands of fimbriae. Pygidium unknown.

Remarks: The presence of a ceratophore-like structure with the median antenna, prostomial pigment spots, and papillary protuberances are newly reported for this species. The papillary protuberances are similar to those found on *Aricidea* (*Acmira*) *catherinae* and *A.* (*A.*) *rubra*. Strelzov (1973) erroneously includes Day 1961 in his list of synonyms. Day (1961) does not report *Aricidea* (*Acmira*) *assimilis*, he only comments that he considers it identical to *Aricidea fauveli* Hartman, 1957. Strelzov did not examine Day's material.

Distribution: Type locality: Mediterranean Sea. Andaman Sea. 19–1155 m.

Aricidea* (*Acmira*) *simplex Day, 1963
Fig. 7A–C

Aricidea suecica simplex Day, 1963: 364–365, fig. 3a–b; 1967: 558, fig. 24.1.f–i.
Aricidea uschakovi. – Levenstein 1966: 39–40. – [Not Zachs, 1925 *fide* Strelzov 1973.]
Aricidea (*Acesta*) *simplex*. – Strelzov 1973: 99–101, figs. 12, 43a–c.
Aricidea neosuecica Hartman, 1965: 137; 1969: 63–64, fig. 1. – Hartman and Fauchald 1971: 96–97, pl. 13, fig. d–f.
Aricidea neosuecica nipponica Imajima, 1973: 263–265, fig. 5a–f. **New synonymy**.
Aricidea (*Acmira*) *simplex*. – Blake 1996: 63–64, fig. 2.18.

Material examined: BIOSHELF st. A-2/BC, 18 Apr 1996, 61 m (1, PMBC 18518); st. A-2/OS, 18 Apr 1996, 66 m (12, SIO-BIC A796); st. C-2/OS, 20 Apr 1996, 64 m (1, PMBC 18519); st. C-3/BC, 20 Apr 1996, 79 m (1, PMBC 18520); st. E-2/BC, 22 Apr 1996, 63 m (1, PMBC 18521); st. RN-3/BC, 8 May 1996, 72 m (3, ZMUC-POL-1163).

Comparative material studied: *Aricidea neosuecica nipponica* (holotype, NSMT-Pol. H 89).

Description: Body pale, robust, yellowish tan in color. Prostomium triangular, tri-lobed, broad distally; median antenna short, blunt, distally swollen, inserted on posterior third and extending to rear of prostomium; nuchal organs well developed, present on posterior half of the prostomium (see Fig. 7A). Notopodial postsetal lobes present; begin on setiger 1, short, blunt; digitate in branchial segments (see Fig. 7B); longer, filiform postbranchially. Neuropodial postsetal lobes absent. Branchiae begin on setiger 4, 15 pairs (up to 30 depending on size), short, blunt tipped, extending half way to midline of dorsum, last pairs shorter. Capillary setae present in anterior noto and neuropodial lobes. Modified neuropodial setae begin postbranchially on setiger 23–29, 2 in inferior position, thick, acicular with recurved tip, no arista or hood present, up to 8 per fascicle alternating with capillaries (see Fig. 7C). Pygidium. Papillary protuberances absent.

Remarks: This species is easily recognized by the robust body, short median antenna, number and shape of the branchiae, and hook-shaped modified neurosetae. It has a widespread distribution. See Blake (1996) for further discussion on the history on this species. It should be noted that Blake (1996) incorrectly lists the Imajima (1973) species *Aricidea neosuecica nipponica* as *A. neosuecica japonica* in his synonymies for *A.* (*A.*) *simplex*. This is the first report of this species for the Indian Ocean.

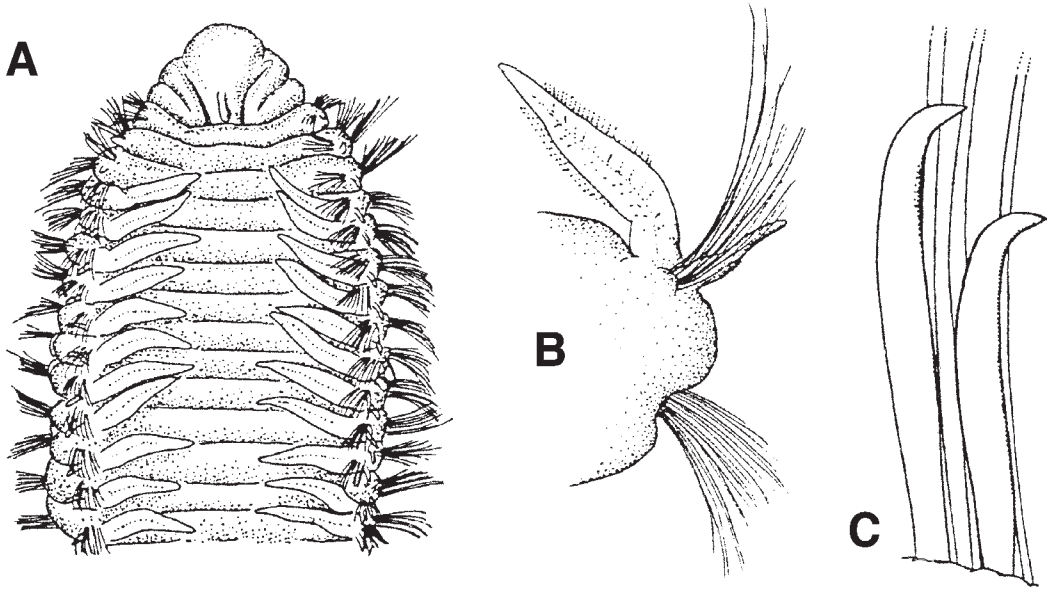

Figure 7 *Aricidea* (*Acmira*) *simplex* Day, 1963: A. Anterior region, dorsal view. B. Parapodial lobe, branchial region. C. Modified neurosetae. – All figures from Blake 1996, after Imajima 1973.

Distribution: Type locality: South Africa. Uruguay, Patagonia, Scotia Sea; Antarctic Ocean, New Zealand, Bering Sea, Japan, Caroline Islands, California, Andaman Sea. 61–5540 m.

***Aricidea* (*Acmira*) sp. 1**

Material examined: BIOSHELF st. A-1/BC, 18 Apr 1996, 43 m (1, SIO-BIC A798); st. C-3/BC, 20 Apr 1996, 79 m (1, PMBC 18522); st. G-2/OS, 23 Apr 1996, 63 m (1, PMBC 18523); st. H-2/BC, 9 May 1996, 59 m (1, PMBC 18524); st. I-2/BC, 3 May 1996, 59 m (1, ZMUC-POL-1164); st. J-3/BC, 4 May 1996, 79 m (1, SIO-BIC A797); st. RN-1/BC, 8 Apr 1996, 63 m (1, ZMUC-POL-1165); st. PB-7/BC, 22 Apr 1997, 29 m (1, PMBC 18525).

Description: Body yellowish tan. Head and branchial region with small pigment spots on dorsum, venter, and branchiae. Prostomium triangular, eyes absent, median antenna smooth emerges from center of prostomium, tapering to setiger 2; nuchal organs in posterior third of prostomium. Branchiae strap-like, begin on setiger 4, 26 pairs, overlying the dorsum; with long cilia (>1/2 width) on inner and outer margins, tapering to a fine tip without cilia; last 2–3 branchial pairs with cilia. Papillary protuberances present on setigers 12–22. Notopodial postsetal digitate lobes begin on setiger 1, short, longer by the third setiger with basal inflation in branchial region, thinner in posterior branchial region and postbranchial segments. Neuropodial postsetal papillar lobes begin on setiger 1, absent in posterior branchial segments and postbranchial region. Thicken fringed capillary setae present in anterior noto- and neuropodial lobes. Simple capillary setae present in branchial setigers and thereafter. Modified neuropodial setae begin postbranchially on setiger 43, acicular, recurved tip with multiple aristae on the convex side, central arista longest; up to 11 per fascicles, alternating with capillaries. Pygidium unknown

Remarks: While distinct from the other species, the current material is not adequate for specific determination. The modified setae are similar to *Aricidea* (*Acmira*) *lopezi* Berkeley and Berkeley, 1956; however, the median antenna is shorter and the number of branchial pairs fewer. The shape of the modified setae are of the subgenus *Acmira.*

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The presence of papillary protuberances on these specimens is a further indication that these structures have been overlooked and are present in several species of *Aricidea* (*Acmira*) (see *Aricidea* (*Acmira*) *catherinae* above). Better-preserved material will be necessary before the specific status of this material can be determined.

Distribution: Andaman Sea. 29–79 m.

Aricidea (*Acmira*) sp. 2

Material examined: BIOSHELF st. E-2/BC, 22 Apr 1996, 63 m (1, PMBC 18526).

Description: Body pale, orange-yellow. Dorsum broad in anterior and branchial regions. Prostomium triangular with short, blunt median antenna, extending to rear to prostomium. Eyes absent. Branchiae begin on setiger 4, 20 pairs, conical, erect over dorsum, last pair short. Inner and outer margins ciliated. Postsetal notopodial lobes well developed on setiger 1, slightly longer in branchial region, becoming thin and long post-branchially. Postsetal neuropodial lobes present on setiger 1, low mound, develops to short papillae in branchial segments, absent in posterior branchial segments and thereafter. Anterior noto and neuropodial setigers with thickened, fringed capillary setae. Simple capillaries in branchial and postbranchial setigers. Modified neuropodial acicular setae begin approximately setiger 30, recurved tip, fringing on convex side, subdistal arista, up to 7 per fascicle. Pygidium unknown.

Remarks: With only one specimen collected, the current material is not adequate to allow for specific identification. The combination of characters present, especially the modified setae, allows placement in the subgenus *Acmira* and separation from other species present.

Distribution: Andaman Sea. 63 m.

Aricidea Webster, 1879

Aricidea Webster, 1879: 255.

Aricidea sp. *sensu lato*

Material examined: BIOSHELF st. A-1/BC, 18 Apr 1996, 43 m (1, PMBC 18527); st. H-1/OS, 9 May 1996, 31 m (1, PMBC 18528); st. J-1/BC, 4 May 1996, 43 m (1, PMBC 18529).

Description: Triangular prostomium with short median antennae, not extending past prostomium. Branchiae begin on setiger four, strap-like with tapering tip, ciliated, up to 21 pairs. Notopodial postsetal lobes filiform from setiger 1, continue through branchial region. Neuropodial postsetal lobes absent. Anterior setigers with thickened, fringed capillaries, branchial region with simple capillaries. No modified setae present in notopodial or neuropodial fascicles present.

Remarks: These specimens were anterior fragments broken just posterior to the branchial region and prior to the development of any modified neuropodial setae. Notopodial modified setae are also absent. The placement in the genus *Aricidea sensu lato* is justified. No subgeneric placement is possible; however, these specimens did resemble specimens of *Aricidea* (*Allia*) sp. 1.

Cirrophorus Ehlers, 1908

Cirrophorus Ehlers, 1908: 124.

Cirrophorus sp.

Material examined: BIOSHELF st. C-3/BC, 20 Apr 1996, 79 m (1, SIO-BIC A799); st. E-1/BC, 22 Apr 1996, 42 m (1, PMBC 18530); st. L-3/BC, 5 May 1996, 83 m (1, PMBC 18531); st. PB-6/BC, 22 Apr 1997, 30 m (1, ZMUC-POL-1166).

Description: Body reddish brown. Prostomium triangular, longer than wide, rounded at the tip. Median antenna inserted in middle of prostomium, extends to anterior margin of setiger 1. Eyespots present (st. C-3/BC, PB-6/BC) or absent. Nuchal organs present lateral to eyespots. Branchiae begin setiger 4, 21 pairs, conical tapering, last few pairs shorter. Notopodial postsetal lobes are present from setiger 1, papillary, gradually longer; digitate

in branchial region; shorter, thinner in postbranchial segments. Simple capillary setae present in notopodial setigers throughout. Thickened, fringed capillary setae present anterior neuropodial lobes beginning on setiger 1, simple capillaries in branchial segments and thereafter. Modified notosetae furcate, begin on setiger 4 (st. C-3/BC), 9 (ST. E-1/BC), 13? (st. PB-6/BC); up to 3 per fascicle; both tines of nearly equal length; not asymmetrical; continue to end of segments present (32). Pygidium unknown.

Results: The examined material may represent more than one species. The setiger where the furcate setae begin is often difficult to observe because they are hidden by the capillary setae in the fascicle and can have a transition zone where the modified setae change shape. The variability in this starting position is not well known for many species in the genus. This material is left at the generic level until additional material is available.

Paradoneis Hartman, 1965

Paradoneis Hartman, 1965: 139.

Remarks: Hartman (1965) defined the genus as 1) without prostomial antenna, 2) with capillary and furcate notosetae and 3) with capillary neurosetae only. The inclusion of *Paradoneis drachi* Laubier and Ramos, 1974, *P. spinifera* (Hobson, 1972) and *P. eliasoni* Mackie, 1991 (see Blake 1996) modifies the generic definition to 1) without prostomial antenna, 2) with capillary and furcate or acicular notosetae and 3) with capillary neurosetae only or with capillary and acicular neurosetae. The starting position of furcate notosetae is in the branchial or prebranchial region, whereas the starting position of the acicular notosetae is postbranchial (*P. drachi*, setiger 30; *P. spinifera*, setiger 33–34). This difference from the other members of the genus may warrant separation.

Blake (1996) expands the definition of the genus to include *Paradoneis spinifera* (Hobson, 1972). Two changes were proposed; the beginning position of the branchiae was expanded from setiger 4 only to setigers 4–6 and the type of modified notosetae was expanded from lyrate setae only to lyrate setae or acicular spines.

Paradoneis ? armata Glémarec, 1966
Fig. 8A–C

Paradoneis armata Glémarec, 1966: 1046–1049, figs. 1b–c, 2a–c. – López-Jamar *et al.* 1987: 130.
Cirrophorus armatus. – Strelzov 1973: 112–113, figs. 18, 47a–e.
Cirrophorus harpagoneus. – Strelzov 1973: 113–114, figs. 18, 47f–o.
Paraonis (*Paraonides*) *harpagonea* Storch, 1967: 108, fig. 6. [*Fide* López-Jamar *et al.* 1987: 127–136.]

Material examined: BIOSHELF st. A-2/BC, 18 Apr 1996, 61 m (1, SIO-BIC A800); st. PB-7/BC, 22 Apr 1997, 29 m (1, PMBC 18532).

Description: Body thin, pale yellow orange. Prostomium triangular, median antennae absent, nuchal organs present on posterior of prostomium, small black eyes present (see Fig. 8A). Branchiae begin setiger 4, 11 pairs (15–19 pairs described); thin, conical with blunt tip (see Fig. 8B). Notopodial postsetal lobes present from setiger 1, papillar, slightly longer in branchial setigers, papillar postbranchially. Simple capillary setae present in both rami from setiger one, continue throughout body. Symmetrical (equally tined) furcate setae begin setigers 3–7, 1–2 per fascicle; transition to large, asymmetrical furcate setae (harpoon setae) by setiger 12, 1–2 per segment (see Fig. 8C). Pygidium with 2 lateral cirri, 1 ventral cirrus, all equal in length.

Results: The examined material varies from the description by possessing only 11 pairs of branchiae. Complete specimens were unavailable and confirmation of elongate setal lobes in the preanal segments was not possible. Generic placement follows Katzmann and Laubier (1975).

Distribution: Type locality: Red Sea. Brittany, Black Sea, Mediterranean Sea, Andaman Sea. 5–61 m.

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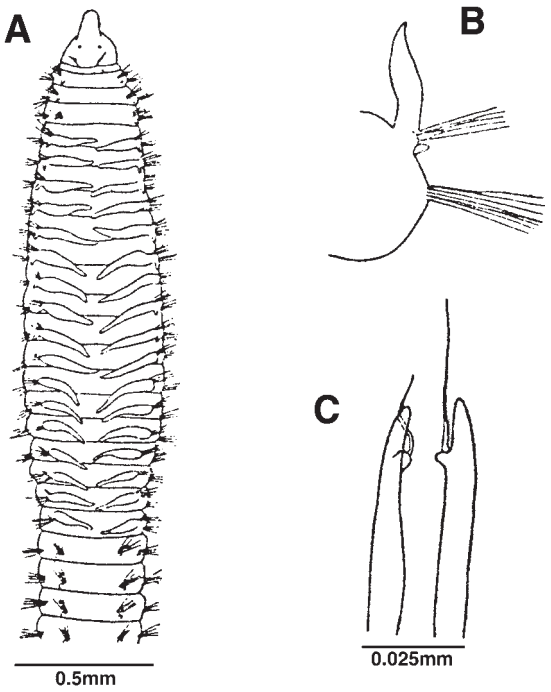

Figure 8 *Paradoneis* ? *armata* Glémarec, 1966: A. Anterior region, dorsal view. B. Parapodial lobe, branchial region. C. Modified notosetae. – A–B from Strelzov 1973, after Glémarec 1966; C from Strelzov 1973.

Paradoneis sp. 1

Material examined: BIOSHELF st. A-2/OS, 18 Apr 1996, 66 m (1, PMBC 18533).

Description: Prostomium triangular, lateral indentations produce trilobed look, terminal sensory organ present, median antennae absent, nuchal organs present. Small red eyespots present anterior and lateral to nuchal organs, larger reddish granular pigmented area posterior and medial to nuchal organs. Branchiae begin setiger 4, 8 pairs, ciliated. Notopodial postsetal lobes present from setiger 1 as a low mound, becoming digitate in branchial setigers, short again postbranchially. Capillary setae present in both rami throughout body. Modified notopodial furcate setae with equal tines begin in setiger 8 (?), transition to asymmetrically tined by setiger 12, 1–3 per fascicle. Pygidium unknown.

Results: Only one incomplete specimen was available for examination. It could not be properly compared with those described in the literature. It is different from the other species reported and is thus designated as a provisional taxa.

Distribution: Andaman Sea. 66 m.

Levinsenia Mesnil, 1897

Levinsenia Mesnil, 1897: 93.
Tauberia Strelzov, 1973: 150.

Levinsenia kirbyae n. sp.
Fig. 9A–D

Material examined: BIOSHELF st. E-1/BC, 22 Apr 1996, 42 m (1 paratype, LACM-AHF 2091 [anterior fragment, 74 setigers, length 22.67 mm, width of 10th setiger 0.2 mm, length to end of 10th setiger 1.2 mm]); st. G-2/OS, 23 Apr 1996, 63 m (1 paratype, USNM 1001164 [anterior fragment, 67 setigers, length 25.33 mm, width of 10th setiger

0.24 mm, length to end of 10th setiger 1.36 mm]); st. H-2/BC, 9 May 1996, 59 m (1 paratype, SIO-BIC A801 [anterior fragment, 93 setigers, length 30.67 mm, width of 10th setiger 0.2 mm, length to end of 10th setiger 1.32 mm]); st. I-2/BC, 3 May 1996, 59 m (holotype, PMBC 18534 [anterior fragment, 102 setigers, length 34.0 mm, width of 10th setiger 0.24 mm, length to end of 10th setiger 1.2 mm]); st. RY-3/BC, 8 May 1996, 49 m (1 paratype, ZMUC-POL-1167 [anterior fragment, 87 setigers, length 29.67 mm, width of 10th setiger 0.16 mm, length to end of 10th setiger 1.28 mm]).

Description: Prostomium triangular longer than wide, terminal pore present, median antenna absent, nuchal organs present on posterior of prostomium (see Figs. 9B). Branchiae begin on setiger 8, 13–14 pairs, conical, tapering (see Fig. 9A), cilia present on lateral edges (see Fig. 9C). Notopodial postsetal lobes present, papillar on setiger 1, digitate in branchial region, becoming shorter in post-branchial region. Neuropodial postsetal lobes reduced to low mound anteriorly, absent from branchial and postbranchial regions. Capillary setae present in noto and neuropodial lobes from setiger one. Modified acicular neuropodial setae alternate with capillary setae begin postbranchial on setiger 23, slender and nearly straight in superior part of fascicle, thicker and more recurved in inferior part of fascicle (see Fig. 9D), double rowed in far posterior setigers. Intersegmental area of posterior setigers deeply furrowed dorsally. Pygidium unknown.

Methyl green stain: Methyl green staining areas laterally and ventrally on latter half of segments in branchial area, as ventral longitudinal dashes for about 15 postbranchial segments, and as notopodial postsetal spots in postbranchial region.

Etymology: Kirby is my wife's family name. This species is named in honor of my wife and children, Jacqueline Kirby Lovell, Andrew Kirby Lovell, and Robyn Kirby Lovell.

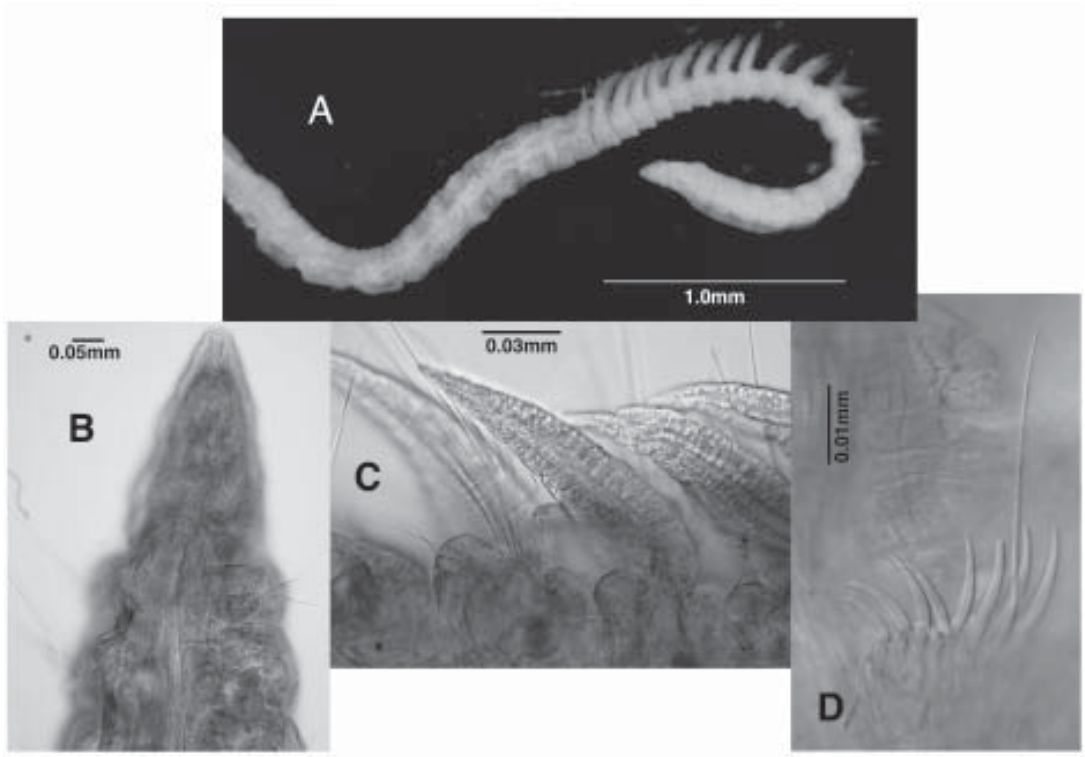

Figure 9 *Levinsenia kirbyae* n. sp., holotype: A. Anterior region, lateral view. B. Prostomium, dorsal view. C. Branchiae, lateral view. D. Modified neurosetae. – All photographs original.

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Remarks: The shape and arrangement of the modified setae are unique within the genus. The methyl green staining pattern is different than the other species presented, but unknown for most of the members of the genus. This species is similar to specimens of *Levinsenia* found off California, USA. The genus is best known for the cosmopolitan species *L. gracilis* (Tauber, 1879), which has been reported worldwide in shallow to deep water.

Distribution: Type locality: Andaman Sea. 42–63 m.

Levinsenia sp. 1

Material examined: BIOSHELF st. A-2/BC, 18 Apr 1996, 61 m (3 (1 lost), SIO-BIC A803); st. C-2/BC, 20 Apr 1996, 65 m (1 juv., PMBC 18535); st. E-3/BC, 22 Apr 1996, 81 m (1, PMBC 18536); st. G-2/BC, 23 Apr 1996, 63 m (1, PMBC 18537); st. G-2/OS, 23 Apr 1996, 63 m (1, ZMUC-POL-1168); st. J-2/OS, 4 May 1996, 61 m (1, ZMUC-POL-1169); st. K-1/BC, 6 May 1996, 43 m (1, PMBC 18538); st. RN-1/BC, 8 May 1996, 63 m (1, SIO-BIC A803); st. PB-5/BC, 22 Apr 1997, 21 m, 6 ind. (SIO-BIC A804).

Description: Body pale anteriorly, orange colored postbranchially on larger specimens; inflated prebranchially. Prostomium triangular, with a terminal pore; median antennae absent; nuchal organs present (prominent), on posterior half of the prostomium curving posteriorly to connect at rear of prostomium (largest specimen). Branchiae begin on setigers 6 (largest specimen)-8, 8–19 (largest specimen) pairs, cili-ated, conical tapering with a rounded tip, the last two pairs shorter. Notopodial postsetal lobes present from setiger 1, short prebranchially, longer in branchial segments, short again postbranchially. Neuropodial postsetal lobes absent. Capillary setae present from setiger 1 in both parapodial lobes, present throughout body. Modified acicular setae present in neuropodia beginning in setiger 21–29, emerge from separate row anterior to capillary bundle, up to 5–7 per bundle, fringe present to near tip on convex side, begin as thinner *Allia*-like modified setae and transition to thicker *Levinseni*a modified setae during 4–5 following setigers. Pygidium unknown.

Methyl green stain: Methyl green staining areas on lateral postsetal beginning on setiger 3, ventral band in branchial and postbranchial setigers, leading edge of branchiae, dorsal intersegmental band postbranchially. One specimen (reproductive male) from PB5, BC with staining lateral line.

Results: The inflated body, distribution of modified setae, and methyl green staining pattern distinguish these specimens from the other *Levinsenia* material presented. These specimens have modified setae similar to *L. gracilis*, however *L. gracilis* lacks the dorsally inflated prebranchial area. The stained reproductive male contained sperm pockets associated with the lateral methyl green staining line. This same specimen had silt around parts of the body, which resembled a tube.

Distribution: Andaman Sea. 21–81 m.

Levinsenia sp. 2

?*Paraonis gracilis minuta*. — Imajima 1973: 284–285, fig. 16 (in part). [Not Hartmann-Schröder, 1965.]

Material examined: BIOSHELF st. J-2/OS, 4 May 1996, 61 m (1, PMBC 18539); st. K-20m/OS, 6 May 1996, 22 m (1, ZMUC-POL-1170); st. PB-5/BC, 22 Apr 1997, 21 m (1, SIO-BIC A805).

Description: Prostomium triangular with terminal sensory organ, median antenna absent, nuchal organs present on later half of prostomium, eyespots absent. Branchiae begin setiger 6, 4–6 pairs, short with blunt tip, cilia present on basal half. Notopodial postsetal lobes begin papillary, digitiform in branchial region, gradually longer postbranchially, longest in pre-pygidial segments. Neuropodial postsetal lobes absent. Capillary setae present in both rami throughout body. Modified neuropodial setae begin setigers 14–17 in inferior part of fascicle; 1–6 per fascicle; short, thick, strongly recurved (almost avicular); shaft constricted at insertion point to body-wall; fringe

present on convex side. Pygidium with 2 lateral cirri and median triangular lobe.

Methyl green stain: The body does not stain, but the gut contents of several postbranchial setigers did stain.

Results: Imajima (1973) reported and illustrated *L. gracilis minuta* Hartman-Schroder, 1965 from Japanese waters. In his paper he presents a table of characters relating to number and starting position of branchial pairs. In the table there are 10 specimens that have 3–5 branchial pairs with 5–6 prebranchial setigers and 5 specimens with 10–15 branchial pairs with 5–9 prebranchial setigers. These two groups seem to represent two distinct species, with the Andaman Sea material matching the former group. In addition, the Andaman Sea material matches Imajima's illustrations (fig. 16a–f). The low number of branchial pairs and short, recurved neuropodial modified setae distinguish this species from other reported *Levinsenia*, but the current material is inadequate to fully determine this species.

Distribution: Andaman Sea. 21–61 m.

KEY TO THE SPECIES

1. Median antenna absent 2
– Median antenna present 5

2. Modified setae (furcate) present in notopodium only ..... (*Paradoneis*) 3
– Modified setae (acicular) present in neuropodium only ..... (*Levinsenia*) 4

3. Furcate setae undergo drastic transition to harpoon setae in branchial segments .... *Paradoneis harpagoneus*
– Furcate setae undergo mild transition to slightly unequal tines ..... *Paradoneis* sp.1

4. Each abdominal setal fascicle with straight superior acicular setae transitioning to curved, thicker inferior acicular setae (double rowed in far posterior segments); branchiae begin on setiger 8, 13–14 pairs ..... *Levinsenia kirbyae* n. sp.
– Abdominal setae similar shape within each fascicle along the body 5

5. Modified setae long, nearly straight; branchiae begin on setiger 6–8, 8–19 pairs .... *Levinsenia* sp. 1
– Modified setae short, strongly recurved; branchiae begin on setiger 6, 4–6 pairs .... *Levinsenia* sp. 2

6. Furcate modified notosetae present ..... *Cirrophorus* sp.
– Modified notosetae absent, modified neurosetae present or absent ..... (*Aricidea* sensu lato) 7

7. Modified neurosetae absent ..... *Aricidea* (*Aedicira*) sp.
– Modified neurosetae present 8

8. Modified setae acicular with tapering distal arista (frequently worn) ..... *Aricidea* (*Allia*) 9
– Modified setae pseudocompound or acicular with recurved tip, with or without arista 11

9. Modified setae begin on setiger 59 with many transitional segments, 32 pairs of branchiae, notopodial postsetal lobes well developed on setiger 1 ..... *Aricidea* (*Allia*) sp. 2
– Modified setae begin by setiger 40 or before, 21 pairs of branchiae, notopodial postsetal lobes short on setiger 1 10

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10. Modified setae begin on setiger 25, latter branchial pairs shorter and spaced further apart .... *Aricidea* (*Allia*) *hartleyi*
– Modified setae begin on about setiger 37, latter pairs shorter with spacing uniform .... *Aricidea* (*Allia*) sp. 1

11. Modified setae pseudocompound or acicular with recurved tip and subdistal arista originating from the concave side ..... *Aricidea* (*Aricidea*) 12
– Modified setae acicular with recurved tip, with or without hood, with or without single or multiple distal or subdistal aristae, with or without fringe originating from convex side ..... *Aricidea* (*Acmira*) 14

12. Medial antenna simple, 27–34 pairs of branchiae, body robust ..... *Aricidea* (*A.*) *fragilis*
– Median antenna branched, 15–25 pairs of branchiae, body thin 13

13. Median antenna with 5 digitiform branches, gradually tapering; 24–25 pairs of branchiae; postsetal lobes digitate on setiger 1 ..... *Aricidea* (*A.*) *multiantennata* n. sp.
– Median antenna with 2–3 branches with subdistal swelling tapering to filiform tips, 15–21 pairs of branchiae, postsetal lobes papillary on setiger 1 ..... *Aricidea* (*A.*) *thailandica* n. sp.

14. Median antenna short, blunt, not extending past prostomium 15
– Median antenna long, tapering, extending to setigers 2–6 16

15. Modified neuropodial setae without any aristae or hood, alternating with capillary setae .... *Aricidea* (*Acmira*) *simplex*
– Modified neuropodial setae with convex fringe and subterminal arista .... *Aricidea* (*Acmira*) sp. 2

16. Postbranchial papillary protuberances absent ..... *Aricidea* (*Acmira*) sp. 1
– Postbranchial papillary protuberances present (look in setigers 11–23) 17

17. Median antenna extending to setigers 2–3, modified setae with single terminal arista and subdistal hood ..... *Aricidea* (*Acmira*) *catherinae*
– Median antennae extending to setiger 6, modified setae with multiple aristae .... *Aricidea* (*Acmira*) *assimilis*

DISCUSSION

The Paraonidae is a difficult family for several reasons. They are generally small in size, fragment easily, and the modified setae can look extremely different depending on the angle of view. Early polychaete workers did not effectively sample or report paraonids. Some authors simply ignored or left them out when publishing their results. As a result, there are probably many species to be discovered and described worldwide.

Running counter to the prevalent attitudes against cosmopolitan species, several species in the family Paraonidae are reported from widely separated areas of the world (*i.e.*, *Aricidea* (*Acmira*) *catherinae, A.* (*A.*) *simplex*). If these reports are true, what are the mechanisms for such a broad dis-tribution? The family is considered very old, possibly dating back to the Cretaceous (Rouse and Pleijel 2001). Simple reproductive dispersal could, over time, produce such dis-tributions for a group that old. Perhaps other dispersal mechanisms assisted by human intervention (shipping, mariculture) are involved. Regardless of how, testing several populations of such broadly distributed species with genetic or molecular

methods would be of great interest to all that work with the group.

There are no previous reports of Paraonidae from the Andaman Sea and reports from the Indo-Pacific region are few. This paper should provide other polychaete workers with information that will help with future identifications from this area. It is unfortunate that the BIOSHELF material was not more adequate to determine specific status and/or to fully describe several taxa. New samples from coastal shallow waters around Phuket Island are available and the author is hopeful that their examination will yield additional specimens that provide more information regarding those taxa.

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