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Two new species of *Sigambra* (Annelida, Pilargidae) from the Andaman coast and the Gulf of Thailand

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Abstract

Two species of Pilargidae, *Sigambra pakbaraensis* **sp. nov.** and *S. sirilukae* **sp. nov.** are described from different coasts of Southern Thailand (Andaman Sea and the Gulf of Thailand). Both species belong to the subgroup of *Sigambra* which lack ventral cirri at chaetiger 2 and have capillary notochaetae. *Sigambra pakbaraensis* **sp. nov.** is described from the Andaman coast and can be distinguished from other species in the genus by the occurrence of the first dorsal hook at chaetiger 8, the presence of capillaries in notopodia, and 14 pharyngeal papillae. *Sigambra sirilukae* **sp. nov.** is described from the Gulf of Thailand and it is clearly distinguished from all other species in the genus by having 12 pharynx papillae, an elongate median antenna with a large ceratophore, dorsal hooks from middle chaetigers, and up to five capillary notochaetae from anterior most chaetigers (4–5). Molecular phylogenetic analyses, based on cytochrome oxidase subunit I (COI) and mitochondrial genes 16S, indicate *S. pakbaraensis* **sp. nov.** clusters within *Sigambra* Müller, 1858. Pores on the dorsal and ventral cirri of both species are herein described for the first time for the genus. An updated key to species of *Sigambra* from the Indo-Pacific region is also provided.

Key words: COI, Pilargids, Polychaeta, Songkhla Sea, taxonomy

Introduction

Eight species of Pilargidae from four genera have been described from Thailand along the coasts of both the Andaman Sea and the Gulf of Thailand (Plathong *et al.* 2021). The eight described species include four *Ancistrosyllis*, two *Cabira* (Plathong *et al.* 2021; Plathong *et al.* 2022), one *Hermundura* and one *Sigambra*. The species of *Ancistrosyllis* are *A. eidimtaiteae* (Plathong, Plathong & Dean, 2022), *A. kornkanokae* (Plathong, Dean & Plathong, 2021), *A. nakkaritae* (Plathong, Dean & Plathong, 2021), and *A. suksani* (Plathong, Plathong & Dean, 2022). The species of *Cabira* are *C. saithipae* (Plathong, Dean & Plathong, 2021) and *C. thailandica* (Plathong, Dean & Plathong, 2021). The one known species of *Hermundura*, *H. annandelei* (Fauvel, 1932) was collected from Songkhla Lake (Fauvel 1932; Salazar-Vallejo *et al.* 2001), and the species of *Sigambra*, *S. phuketensis* Licher & Westheide, 1997, was collected from Phuket Island in the Andaman Sea (Licher & Westheide 1997). Despite the presence of Pilargids on both coasts of Thailand, genetic analyses of the known species have not been carried out. Their taxonomy and phylogeny are therefore still poorly known. This study includes the first reported molecular phylogenetic analysis of *Sigambra* in Thailand.

The group of *Sigambra* species that lack ventral cirri on chaetiger 2 includes 22 known species as well as the herein described two new species. This group can be separated into three smaller groups based on the number of

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pharyngeal papillae present. Species in Group I bear eight pharyngeal papillae; species in Group II bear 12–16 pharyngeal papillae; and the number of pharyngeal papillae in Group III is unclear (Table 1).

This is the 4th paper in a series of taxonomic studies of Pilargidae from Thailand. We describe here two new species of *Sigambra*, one from the intertidal zone on the Andaman Coast of Thailand and one from the Gulf of Thailand. Genetic analyses of the cytochrome oxidase subunit I (COI) and 16S mitochondrial genes of *S. pakbaraensis* **sp. nov.** are included with a molecular phylogenetic analysis. A key to the species of *Sigambra* from the Indo-Pacific is also provided. Further papers will deal with other species of *Sigambra* and other genera belonging to the family Pilargidae.

Materials and methods

Samples were collected from two sites on the Andaman Coast and Gulf of Thailand. On the Andaman coast samples were collected from two areas. The first area was the intertidal zone in Pak Bara, Mu Ko Phetra National Park (6°51'07"–6°51'14"N, 99°43'23"–99°43'38"E), Satun Province was sampled from 2018 to 2020 by the Marine National Park Operation Center. The second area was the seagrass beds at Libong Island (7°13'08"N–7°17'49"N, 99°23'49"E–99°27'39"E), Trang Province sampled in 2022 by the Marine Ecosearch Management Company. Samples collected from the Gulf of Thailand were collected in the Songkhla Sea (7°14'21"–7°49'22"N, 100°24'42"–100°49'01"E) from 2010 to 2019 by the Marine Ecosearch Management Company and Tetra Tech Inc. In the intertidal zone of the Andaman coast quadrat sampling occurred at low tide and in the Songkhla Sea, the southern Gulf of Thailand, a Van Veen grab (0.1 m^2) was used at depths ranging from 9 to 27 m (Fig. 1).

Samples were sieved in the field with 2.0 mm, 1.0 mm and 0.5 mm mesh stacked screens. In addition, water and sediment were passed through a 300 μm filter bag. Retained material from both sampling methods was fixed with 10% formalin in seawater. In the laboratory, samples were washed with fresh water and transferred to 70% ethanol. Polychaetes were sorted into taxonomic groups using a stereo microscope, and specimens of the proposed new species were dissected and examined under the compound light microscope. Photographs and measurements of specimens were taken using a stereomicroscope (Olympus SZX16) and a compound microscope (Leica DM1000) with a digital camera (DP74). Stacks of multifocal shots were merged into a single photograph using Helicon Focus (https://www.heliconsoft.com).

Specimens of the proposed new species were examined by Scanning Electron Microscopy (SEM). They were first dehydrated in 100% ethanol, critical-point dried, mounted on SEM stubs and coated with gold. SEM photographs were taken with a Field Emission Scanning Electron Microscope (Apreo, FEI).

The taxonomic descriptions of the new species were based on morphology and measurements of the holotype, and variability found in the paratypes. Confirmation of the taxonomic status of the new species was based on the revision and compilation of the diagnostic characteristics from all recognized species of *Sigambra*, as reported by Bhowmik *et al.* (2021); Dean (1998); Gagaev (2008); Glasby & Salazar-Vallejo (2022); Licher & Westheide (1997); Moreira and Parapar (2002); Muir & Bamber (2008); Nishi *et al.* (2007); Pettibone (1966); Salazar-Vallejo (1990); Salazar-Vallejo *et al.* (2019). For comparative purposes, the main diagnostic characters of the new species and closely similar species were tabulated (Table 1).

Type specimens were deposited in the Princess Maha Chakri Sirindhorn Natural History Museum, Prince of Songkla University (PSUZC), Thailand and the Australian Museum (AM), Sydney, Australia. Additional non-type specimens are maintained in the personal collections of JP & SP at Marine Ecosearch Management Co., Ltd. (MEM).

Molecular taxonomy and analysis

*S*amples identified as *Sigambra pakbaraensis* **sp. nov.** were collected separately in Pak Bara mudflat, Mu Ko Phetra National Park, Satun Province during 1–2 December 2020 and fixed in 96% ethanol for molecular analysis of COI and 16S rDNA sequences. Nineteen specimens were collected (one specimen dried out), all 18 specimens used for paratypes. Seven complete specimens were randomly selected from the same morphological group. Whole samples were fixed in 70% ethanol and whole bodies were used for DNA extraction.

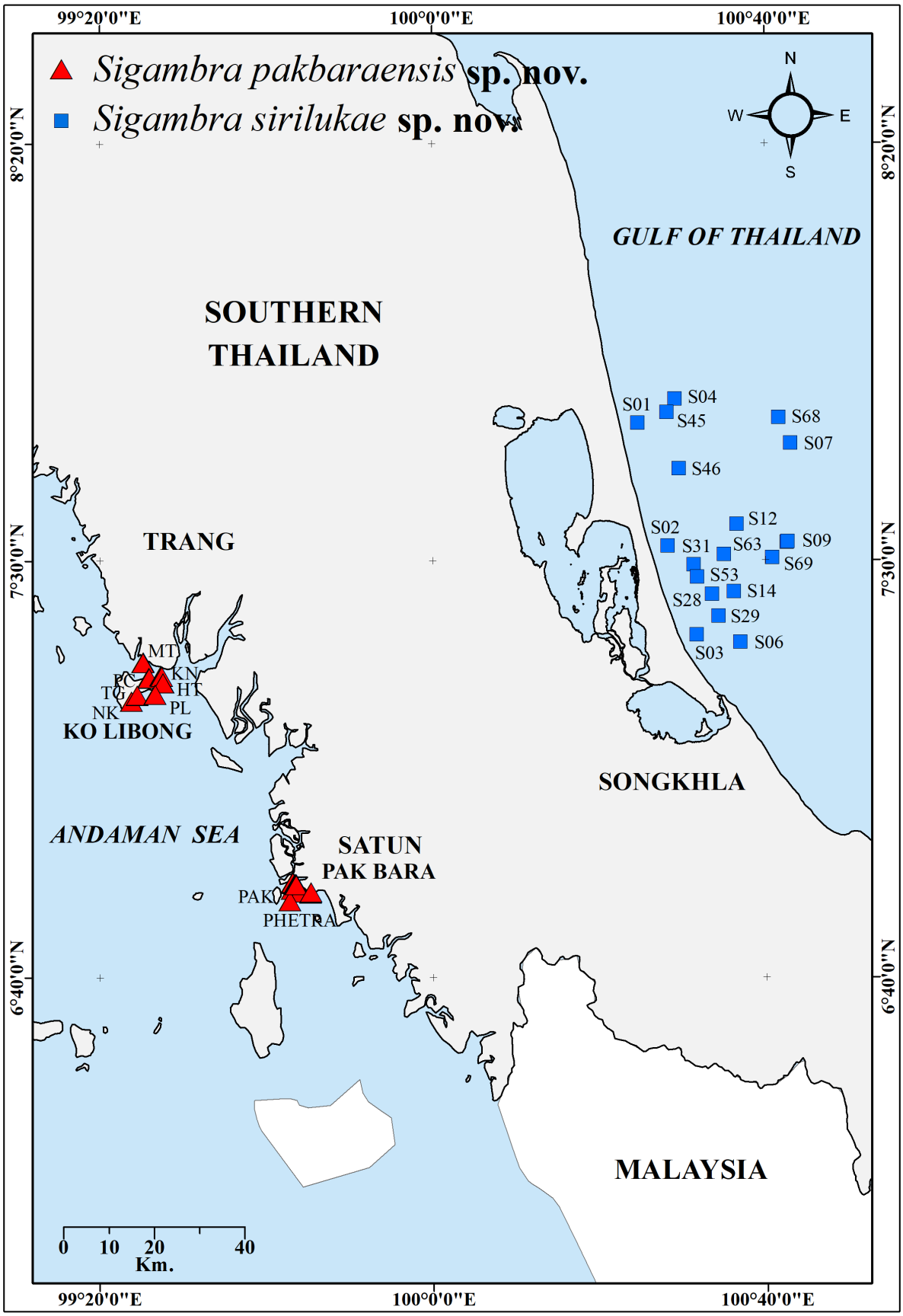

FIGURE 1. Stations in the Andaman Coast of Thailand and Gulf of Thailand, where specimens of *Sigambra pakbaraensis* **sp. nov.** (triangles) and *S. sirilukae* **sp. nov.** (squares) were collected.

TABLE 1. *Sigambra* species group not having ventral cirri on chaetiger 2 arranged according to the number of pharyngeal papillae on the prostomium (modified from Bhowmik *et al.* 2021). (* species were described from Indo-Pacific region)

Species	Distribution	Number of papillae on prostomium	First noto-hook from chaetiger	Length of median antenna compared to lateral antennae	Notopodial capillaries	Source
I. Eight pharyngeal papillae						
S. bidentata Britaev & Saphronova, 1981*	Pacific Ocean, Sea of Japan	8	3–8	Barely longer	Present	Licher and Westheide 1997
S. magnuncus Paterson & Glover, 2000	Northeast Atlantic Ocean	8	3	Barely longer	Present	Paterson & Glover 2000
S. ocellata Hartmann-Schröder, 1959	El Salvador	8	6–7	2 times longer	–	Licher & Westheide 1997; Nishi *et al.* 2007
S. papagayu Bamber in Muir & Bamber, 2008*	Hong Kong	8	3–5	1.75 times longer	Absent	Muir & Bamber 2008
S. qingdaoensis Licher & Westheide, 1997*	Pacific Ocean, China	8	3–7	2 times longer	Present	Licher & Westheide 1997
S. vargasi Dean, 1998	Costa Rica	8	15–17	3 times longer	Present	Dean 1998
II. 12–16 pharyngeal papillae						
S. elegans Britaev & Saphronova, 1981*	Pacific Ocean, Sea of Japan	13	12–18	2 times longer	–	Nishi *et al.* 2007; Salazar-Vallejo *et al.* 2019
S. pettiboneae Hartmann-Schröder, 1979*	Western Australia	13	7–10	Slightly longer	–	Licher & Westheide 1997
A. Present notopodial capillaries						
S. bassi Hartman, 1945	Western Atlantic, Gulf of Mexico	14	14–15	2 times longer	Present	Licher & Westheide 1997
S. constricta Southern, 1921*	Chilka Lake, India	14	30–40	Nearly 2 times longer	Present	Southern 1921
S. diazi Salazar-Vallejo, Rizzo, León-González & Brauko, 2019	Gulf of México	13–16	4–5	Twice	Present	Salazar-Vallejo *et al.* 2019
S. hanaokai Kitamori, 1960*	Japan	14	4	2 times longer	Present	Kitamori 1960; Nishi *et al.* 2007
S. parva Day, 1963	South Africa	14	4–5	1.5 times longer	Present	Moreira & Parapar 2002
S. phuketensis Licher & Wesheide, 1997*	Andaman Sea, Thailand	14	3	2 times longer	Present	Licher & Westheide 1997
S. tentaculata Treadwell, 1941	Western Atlantic	14	4	1.5–2 times longer	Present, posterior only	Moreira & Parapar 2002
S. pakbaraensis **sp. nov.***	Andaman coast, Thailand	14	8	Longer	Present	This study

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TABLE 1. (Continued)

Species	Distribution	Number of papillae on prostomium	First noto-hook from chaetiger	Length of median antenna compared to lateral antennae	Notopodial capillaries	Source
S. sirilukae **sp. nov.***	Gulf of Thailand	12	50–61	2.8–5 times longer	Present	This study
B. Absent notopodial capillaries						
S. grubii Müller, 1858	SW Atlantic Ocean, Brazil	14	16–20	Longer	Absent	Salazar-Vallejo 1990
S. hernandezi Salazar-Vallejo, Rizzo, León-González & Brauko, 2019	Caribbean	14	11–18	Twice	Absent	Salazar-Vallejo *et al.* 2019
S. nkossa Martin, Gil, Chaineau, Thorin, Le Gall & Dutrieux, 2022	Gulf of Guinea, Republic of Congo, western Africa	14	5–6	1.5–2 times longer	Absent	Martin *et al.* 2022
S. sundarbanensis Bhowmik, Ghoshal, Salazar-Vallejo & Mandal, 2021*	E India, River Thakuran, Sundarbans	14	8	2.3 times longer	Absent	Bhowmik *et al.* 2021
S. olivai Salazar-Vallejo, Rizzo, León-González & Brauko, 2019	Caribbean	13–16	30–39	Twice	Absent	Salazar-Vallejo *et al.* 2019
III. Pharyngeal papillae unknown						
S. rugosa Fauchald, 1972	Pacific Ocean, Gulf of California	–	43–46	Subequal	Absent	Fauchald 1972
S. setosa Fauchald, 1972	Pacific Ocean, western Mexico	–	3–4	Similar length	Present	Fauchald 1972

Extraction, gene amplification, and sequencing

Whole-body samples were extracted to get adequate quantities of DNA from the small specimens. Genomic DNA was extracted using the DNeasy Blood & Tissue kit (Qiagen; Germantown, USA), following the manufacturer's protocol. A 655 bp amplicon was amplified using the universal primers HCO2198 and LCO1490 (Folmer *et al.* 1994) and 520 bp 16S rDNA fragments were amplified by primers 16S arL and 16S brH (Palumbi *et al.* 1991) (Table 2). The 20 µl PCR reaction mixture included 10 µl of 2X MyTaq HS Mix (Bioline, USA), 2 µl of 10 pmol/µl forward and reverse primers and 1-2 µl of genomic DNA template. The PCR cycling profile for COI amplicons was 94 °C for 5 min, followed by 35 cycles at 94 °C for 45 s, 40 °C for 60 s, 72 °C for 90 s, and a final extension of 72 °C for 5 min. The amplification profile for 16S rDNA amplicon started with 94 °C for 5 min, followed by 35 cycles of 95 °C for 30 s, 50°C for 30 s, and 72 °C for 90 s, with a single final extension at 72 °C for 8 min. The quality and quantity of PCR products were checked by electrophoresis in 1.5% gel. PCR products were cleaned up and sequenced by Gibthai Co., Ltd. (Thailand). Nucleotide sequences were checked and trimmed using the CodonCode Aligner software v. 6.0.2 (CodonCode Corp., Dedham, Massachusetts). COI and 16S rDNA sequences from the assembled transcriptomes were deposited in the NCBI.

TABLE 2. Primers used for PCR and sequencing of COI and 16S.

COI primers	Primer sequence	Reference
LCO1490-F2	5'-GGTCAACAAATCATAAAGATATTGG-3'	Folmer *et al.* 1994
HCO2198-F2	5'-TAAACTTCAGGGTGACCAAAAAATCA-3'	Folmer *et al.* 1994
16S rDNA Primers		
16S arL	5'-CGCCTGTTTATCAAAAACAT-3'	Palumbi *et al.* 1991
16S brH	5'-CCGGTCTGAACTCAGATCACGT-3'	Palumbi *et al.* 1991

Molecular analyses

Phylogenetic analysis was used to assess the relationship between *S. pakbaraensis* **sp. nov.** and other species in the family Pilargidae. COI sequences of *S. magnuncus* Paterson & Glover, 2000; *S. parva* Day, 1963; *Sigambra* cf. *tentaculata* and *Pilargis verrucosa* Saint-Joseph, 1899 are deposited in NCBI, but only *S. magnuncus* 16S rDNA sequences are available. Species from the same suborder as *Sigambra*, Nereidiformia, and from a different suborder, Aphroditiformia, were added to understand the relationship between *S. pakbaraensis* **sp. nov.** and other members of the order Phyllodocida. A species in the order Eunicida was used as an outgroup (Table 3). Multiple sequence alignment was carried out with the ClustalW model (Thompson *et al.* 1994), using MEGAX (Kumar *et al.* 2018). A concatenated dataset was not created since the successfully amplified and sequenced samples of COI and 16S rDNA were mostly different. Substitution models were selected by jModelTest (Posada 2008), using the Akaike Information Criterion corrected for small sample sizes (AICc). For all genes, HKY+G+I was selected as the best model. The evolutionary relationship was inferred by using the maximum likelihood method performed by MEGAX (Kumar *et al.* 2018). The tree with the highest log likelihood was shown. The tree was drawn to scale with branch lengths that represented the number of substitutions per site. The percentage of trees in which the associated taxa clustered together is shown next to branches. Sequence divergences were calculated by DNAsp (Rozas & Rozas 1997) (Table 2), using the interspecific and intraspecific genetic distances of available *Sigambra* spp. sequences in the NCBI database (Table 3).

Results

Systematics

Order Phyllodocida Dales, 1962

Suborder Nereidiformia Glasby, 1993

Family Pilargidae de Saint-Joseph, 1899

Subfamily Pilarginae de Saint-Joseph, 1899

Genus *Sigambra* Müller, 1858

Diagnosis (after Glasby & Salazar-Vallejo 2022)**.** Pilargids with body depressed, integument smooth to papillated, papillae restricted to anterior segments, arranged in a single transverse row per segment. Lateral and median cirriform antennae present. Palps unfused, biarticulate, palpostyles directed ventrally. Paired ventrolateral palpal papillae present. Pharynx with distal terminal papillae as well as proximal papillae. Two pairs of tentacular cirri. Dorsal and ventral cirri present, ventral cirri may be absent on chaetiger 2. Notochaetae include hooks and sometimes shorter spines or capillaries; dorsal hooks present along the body, beginning in anterior or median regions. Neurochaetae limbate capillaries of varying size.

TABLE 3. Taxa and their NCBI accession numbers for the COI and 16S rDNA sequences used to construct phylogenetic trees and calculate sequence divergences.

Polychaeta	Suborder	Family	Species	GenBank accession no.	Reference
COI					
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra magnuncus*	GQ426640- GQ426643	Böggemann 2009
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra parva*	KY775644	Vijapure *et al.* 2019
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra cf. tentaculata*	AF221574	Dahlgren *et al.* 2000
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra pakbaraensis* **sp. nov.**	OP437496	This study
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra pakbaraensis* **sp. nov.**	OP437497	This study
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra pakbaraensis* **sp. nov.**	OP437498	This study
Phyllodocida	Nereidiformia	Pilargidae	*Pilargis verrucosa*	KT307679	Aylagas *et al.* 2016
Phyllodocida	Nereidiformia	Microphthalmidae	*Hesionides arenaria*	AF221569	Dahlgren *et al.* 2000
Phyllodocida	Aphroditiformia	Polynoidae	*Harmothoe imbricata*	KM612232	Hebert *et al.* 2014
Eunicida		Lumbrineridae	*Lumbrineris erecta*	HM473450	Carr *et al.* 2011
16S rDNA					
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra magnuncus*	GQ426621- GQ426624	Böggemann 2009
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra pakbaraensis* **sp. nov.**	OP445024	This study
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra pakbaraensis* **sp. nov.**	OP445021	This study
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra pakbaraensis* **sp. nov.**	OP445022	This study
Phyllodocida	Nereidiformia	Pilargidae	*Sigambra pakbaraensis* **sp. nov.**	OP445023	This study
Phyllodocida	Nereidiformia	Hesionidae	*Hesiospina aurantiaca*	AY340464	Rousset *et al.* 2007
Phyllodocida	Nereidiformia	Polynoidae	*Harmothoe imbricata*	AY340463	Rousset *et al.* 2007
Eunicida		Lumbrineridae	*Scoletoma tetraura*	GU362682	Zhou *et al.* 2010

Sigambra pakbaraensis sp. nov.

Figs 2–5

Material examined. Andaman Coast, southern Thailand. Intertidal zone at Pak Bara, Mu Ko Phetra National Park; muddy sediments mixed with sand; coll. Marine National Park Operation Center; Libong Island, seagrass beds, coll. Marine Ecosearch Management Company. 58 specimens. Holotype: PSUZC-POL-0423, Sta. PAK-C2 (B2) (6°51'8"N, 99°43'38"E), 16 Nov. 2019. 57 paratypes: Pak Bara, mudflat; PSUZC-POL-0424 (3), Sta. PAK-1B (B3) (6°51'25", 99°43'11"), 20 Jan. 2018; PSUZC-POL-0425 (7, 4 on SEM stubs), Sta. PAK-2A (B1) (6°51'22.19"N, 99°43'14"E); PSUZC-POL-0426 (3), Sta. PAK-2B (B2) (6°51'20"N, 99°43'12"E); Sta. PAK-2C (6°51'18"N, 99°43'10"E): PSUZC-POL-0427 (4, 1 on SEM stub), Sta. PAK-2C (B1); PSUZC-POL-0428 (3); Sta. PAK-2C (B2); PSUZC-POL-0429 (3), Sta. PAK-3C (B3); Sta. PAK-C2 (6°51'08"N, 99°43'38"E), 16 Nov. 2019: PSUZC-POL-0430 (3), Sta. PAK-C2 (B1); PSUZC-POL-0431 (5), Sta. PAK-C2 (B3); Libong Island, 19 Jan. 2022: PSUZC-POL-0432 (2), Sta. PC2 (7°15'55"N, 99°25'54"E); PSUZC-POL-0433 (3), Sta. PC3 (7°15'52"N, 99°25'53"E); 20 Jan. 2022; PSUZC-POL-0434 (1), Sta. PC4 (7°15'54"N, 99°25'58"E); PSUZC-POL-0435 (1), Sta. HT2 (7°15'19", 99°27'37"); 18 specimens fixed for DNA analyses, Pak Bara, mudflat, 1–2 Dec. 2020: PSUZC-POL-0700 (5 fixed for DNA analyses, 2 used), Sta. PAK-C2 (6°51'08"N, 99°43'38"E); PSUZC-POL-0701 (2 fixed

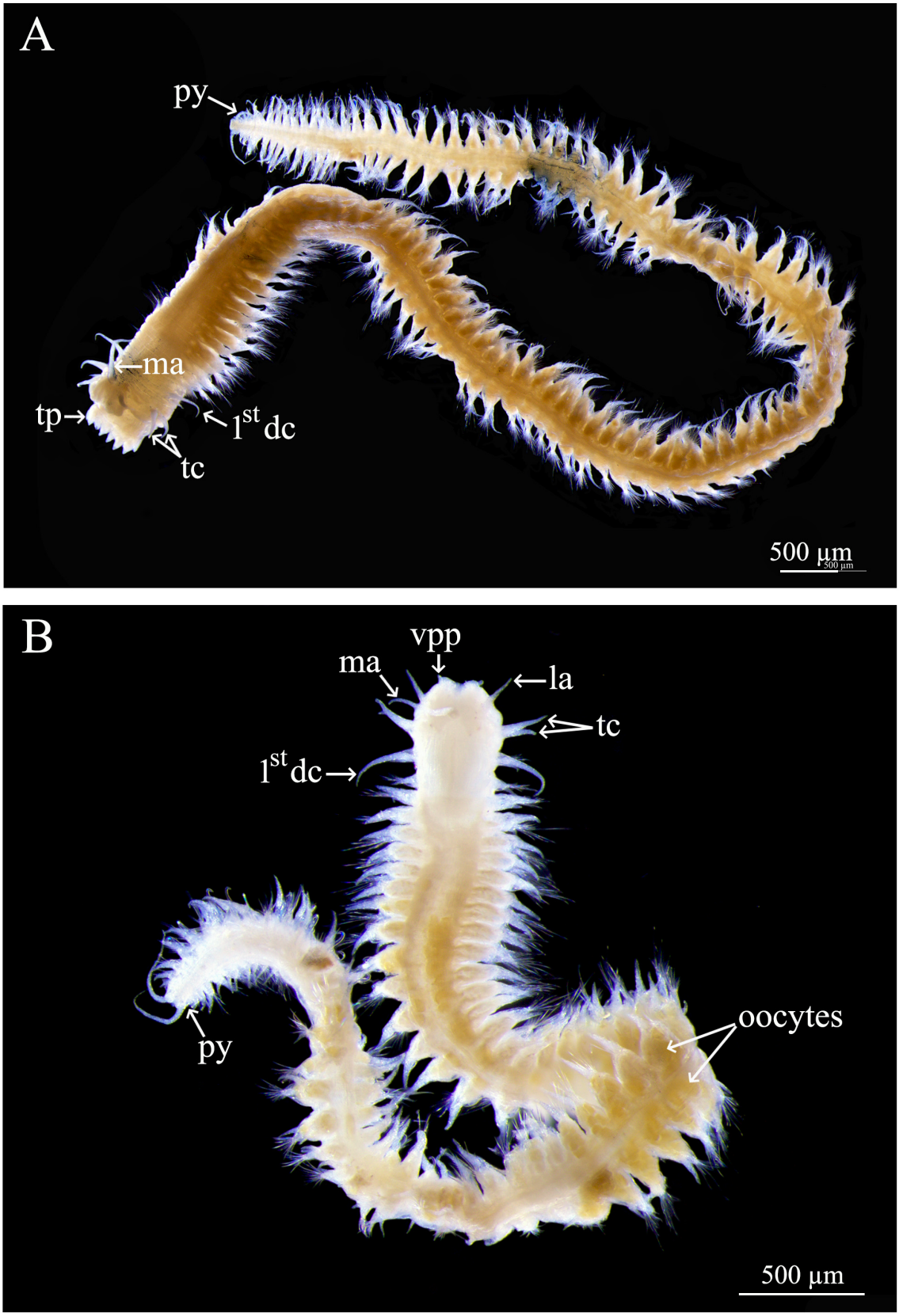

FIGURE 2. *Sigambra pakbaraensis* **sp. nov.** light photographs (A, holotype: PSUZC-POL-0423; B, PSUZC-POL-0433). A. Whole specimen, anterior lateral view, posterior flips; B. Same, anterior dorsal view, posterior flips. Abbreviations: 1st dc, first dorsal cirrus; la, lateral antenna; ma, median antenna; py, pygidium; tc, tentacular cirri; tp, terminal papilla; vpp, ventrolateral palpal papilla.

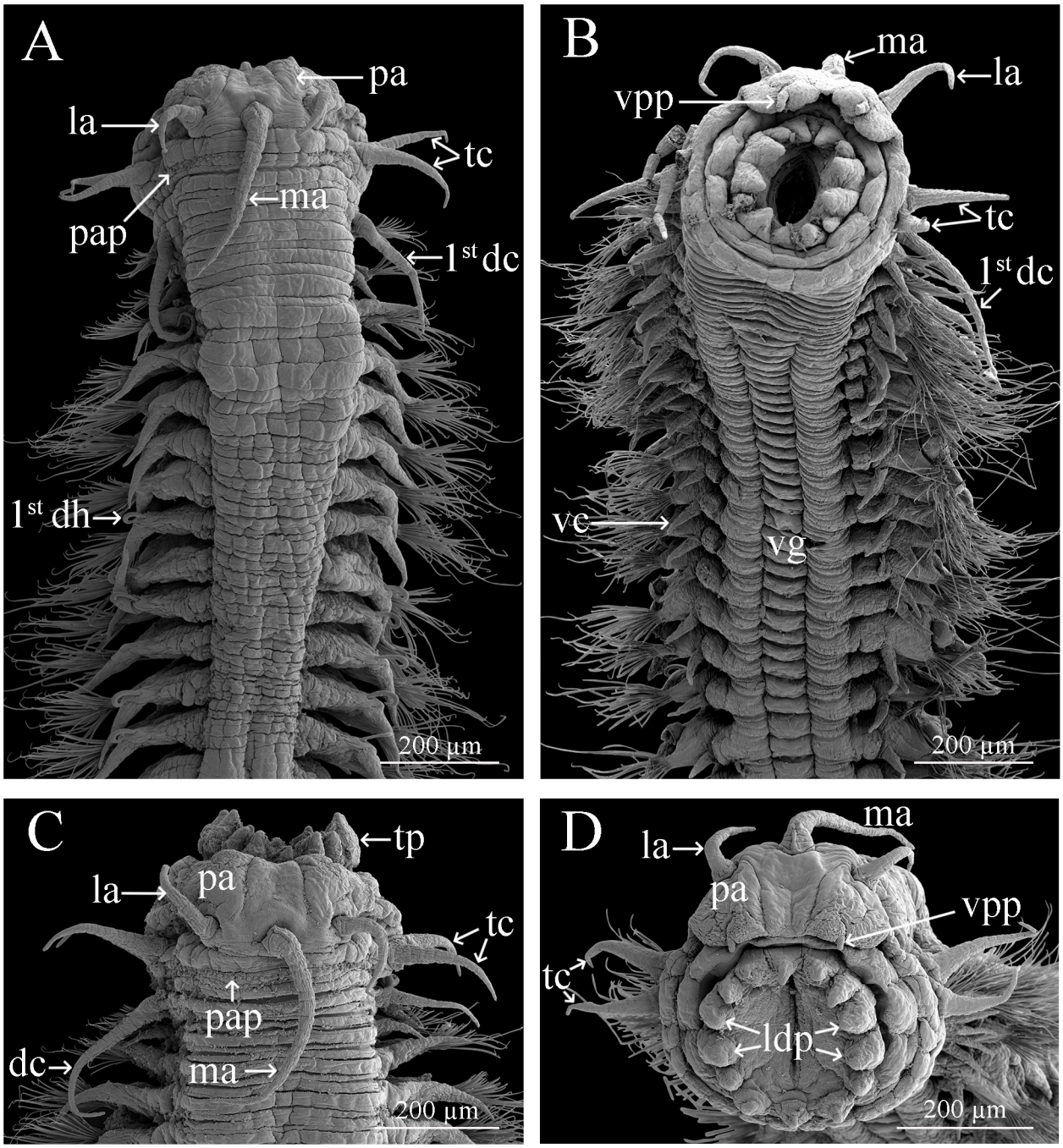

FIGURE 3. *Sigambra pakbaraensis* **sp. nov.** (A–D, PSUZC-POL-0425). A. Anterior region, dorsal view; B. Same, ventral view; C. Prostomium, dorsal view; D. Same, frontal view. Abbreviations: 1st dc, first dorsal cirrus; 1st dh, first dorsal hook; dc, dorsal cirrus; la, lateral antenna; ldp, lateral distal papilla; ma, median antenna; pa, palp; pap, papilla; tc, tentacular cirri; tp, terminal papilla; vc, ventral cirrus; vg, ventral groove; vpp, ventrolateral palpal papilla.

for DNA analyses, used), Sta. PAK-B2 (6°51’08”N, 99°43’38”E), 2 Dec. 2020; PSUZC-POL-0702 (3 fixed for DNA analyses, 1 used), Sta. PAK-A2 (6°51’09”N, 99°43’33”E); PSUZC-POL-0703 (2 fixed for DNA analyses used), Sta. PAK-L2S3 (6°51’14”N, 99°43’17”E); PSUZC-POL-0704 (6 fixed for DNA analyses), Sta. PAK-L3S2 (6°51’16”N, 99°43’12”E); AM W.52916 (2), Sta. PAK-S2 (6°51’09”N, 99°43’34”E), 4 Jul. 2019, mudflat.

Additional material. 596 specimens. Pak Bara intertidal zone (412 specs.): 21 Oct. 2017, 323 specs.: 4 specs., Sta. PAK-1A (6°51’25”N, 99°43’11”E); 10 specs., Sta. PAK-2C (6°51’18”N, 99°43’10”E); 6 specs., Sta. PAK-3B (6°51’16”N, 99°43’16”E); 20 Jan. 2018, 5 specs., Sta. PAK-1A (6°51’25”N, 99°43’11”E); 13 specs., Sta. PAK-1B

(6°51’23”N, 99°43’09”E); 2 specs., Sta. PAK-1C (6°51’20”N, 99°43’08”E); 2 specs., Sta. PAK-2A (6°51’22”N, 99°43’14”E), 81 specs., Sta. PAK-2B (6°51’20”N, 99°43’12”E); 64 specs., Sta. PAK-2C (6°51’18”N, 99°43’10”E); 19 specs., Sta. PAK-3A (6°51’18”N, 99°43’18”E); 73 specs., Sta. PAK-3B (6°51’16”N, 99°43’16”E); 44 specs., Sta. PAK-3C (6°51’14”N, 99°43’14”E); 2 Feb. 2024: 16 specs., Sta. PAK-A (6°51’13”N, 99°43’24”E), 2 specs., Sta. PAK-B (6°51’13”N, 99°43’27”E), 9 specs., Sta. PAK-C (6°51’12”N, 99°43’28”E); 3 Feb. 2024: 27 specs. Sta. PAK-D1 (6°51’11”N, 99°43’29”E), 15 specs., Sta. PAK-D2 (6°51’10”N, 99°43’28”E), 1 spec. Sta. PAK-D3 (6°51’08”N, 99°43’28”E); 4 Feb. 2024: 10 specs, Sta. PAK-E1 (6°51’10”N, 99°43’34”E), 8 specs., Sta. PAK-E2 (6°51’08”N, 99°43’35”E), 1 spec. Sta. PAK-E3 (6°51’07”N, 99°43’34”E). Ao Nun, intertidal zone (33 specs.): 3 Feb. 2024, 20 specs., Sta. Phetra1 (6°50’06”N, 99°45’20”E); 7 Feb. 2024, 9 specs., Sta. Phetra2 (6°50’08”N, 99°45’20”E); 4 specs., Sta. Phetra3 (6°50’13”N, 99°45’22”E). Pak Bara Bay (6 specs.): 17 Feb. 2018, 1 spec., Sta. PAK05 (6°50’33”N, 99°43’07”E), 2.7 m; 4 specs., Sta. PAK06 (6°50’14”N, 99°43’59”E), 6.4 m; 1 spec., Sta. PAK07 (6°49’12”N, 99°42’50”E), 3 m. Libong Island, seagrass bed (intertidal zone) (145 specs.): 17 specs., Sta. HT (7°15’20”N, 99°27’36”E); 6 specs., Sta. KN (7°16’09”N, 99°27’20”E); 51 specs., Sta. MT (7°17’46”N, 99°25’13”E); 5 specs., Sta. NK (7°13’08”N, 99°23’50”E); 56 specs., Sta. PC1 (7°15’57”N, 99°25’56”E); 7 specs., Sta. PL1 (7°13’58”N, 99°26’38”E); 3 specs., Sta. TG1 (7°13’49”N, 99°24’31”E).

Diagnosis. *Sigambra* with median antenna reaching to chaetiger 4, 1.9–2.7 times as long as lateral antennae; dorsal cirri larger than ventral cirri; chaetiger 2 lacking ventral cirri; notopodia with dorsal hook from chaetiger 8; capillary chaetae in middle–posterior chaetigers; pharynx with 14 marginal papillae.

Description. Holotype complete, largest specimen 14.2 mm long and 1 mm wide, 102 chaetigers (Fig. 2A). Paratypes, complete specimens 5.3–8.2 mm long, 0.5–0.8 mm wide, 45–84 chaetigers; incomplete specimens, 3.2–5.5 mm long, 0.5–0.7 mm wide, 31–56 chaetigers.

Eighteen paratypes were fixed for DNA analyses, seven complete specimens used for whole body extraction. All specimens with pharynx everted possessing 14 terminal papillae, first dorsal hooks from chaetiger 8 and notopodial capillary chaetae present. Others characters not observed.

Body elongate, annulated, tapering posteriorly; anterior region with deep transverse grooves, integument with small papillae on dorsal parapodia surface. Ventral groove present from chaetiger 4 (Fig. 3B). Noto-capillaries start from chaetiger 83 (19–67 in paratypes). Specimens white, or light tan–light brown in alcohol (Fig. 2A–B).

Prostomium short, wider than long, trilobed, median lobe blunt and lateral lobes with curved tips (Fig. 3A, C–D). Three long cirriform antennae with basal ceratophore located on posterior of prostomium. Median antenna located on median lobe at posterior edge of prostomium, extending to chaetiger 3 (chaetigers 2–5 in paratypes), twice longer than lateral antennae (499 μm: 245 μm) (2–2.7 times in paratypes) (Figs 2A–B, 3A, C–D, 4A). Eyespots absent. Prostomium separated from peristomium by shallow transverse groove (Fig. 3A, C).

Palps biarticulate, palpophores large, palpostyles small, terminating in small digitate ventrolateral papillae, palpophores with oblique ciliated band (Figs 2B, 3B, D).

Pharynx with 14 heteromorphic terminal papillae, five smaller along mid-dorsal area, four larger lateral, two per side, and 5 ventral alternating in size, two smaller, three larger (Fig. 3B; other specimens with less heteromorphic papillae, Fig. 3D).

Peristomium annulated, 5–6.2 times wider than long, slightly longer than following segment; anterior peristomium with two pairs of tentacular cirri, dorsal tentacular cirri slightly longer than ventral tentacular cirri. Transverse band of uniseriate papillae on mid-peristomium (Figs 3A, C, 4A), posterior margin of peristomium separated from anterior part and first chaetiger by a deep transverse groove.

Parapodial cirri triangular, longer than wide. Dorsal cirri long, cylindrical, longer than ventral cirri throughout. First dorsal cirrus reaching chaetiger 5 (chaetigers 3–6 in paratypes). Chaetiger 2 with tiny dorsal cirri, without ventral cirri. Dorsal and ventral cirri with rows of pores along dorsal and ventral sides (Fig. 4A, C).

Parapodia sub-biramous, notopodia reduced, neuropodia well-developed. First dorsal hooks from chaetiger 8 in all specimens (Figs 3A, 4A) continuing along body to last two pre-pygidial chaetigers; dorsal hooks longer in posterior chaetigers. Chaetigers 1–7 without hooks, notopodia with acicular and dorsal cirri; dorsal hooks accompanied by acicula from chaetiger 8 onwards to middle chaetigers; notopodia with single dorsal hook and one capillary chaeta from chaetiger 86 to posterior chaetigers, dorsal hooks longer in posterior chaetigers (Figs 3A, C, 4A, D–E). Parapodial glands present.

Neurochaetae present from chaetiger 1, neurochaetae with numerous limbate capillaries, up to 40 per fascicle, of various types and sizes, especially in middle chaetigers (Fig. 5A–D).

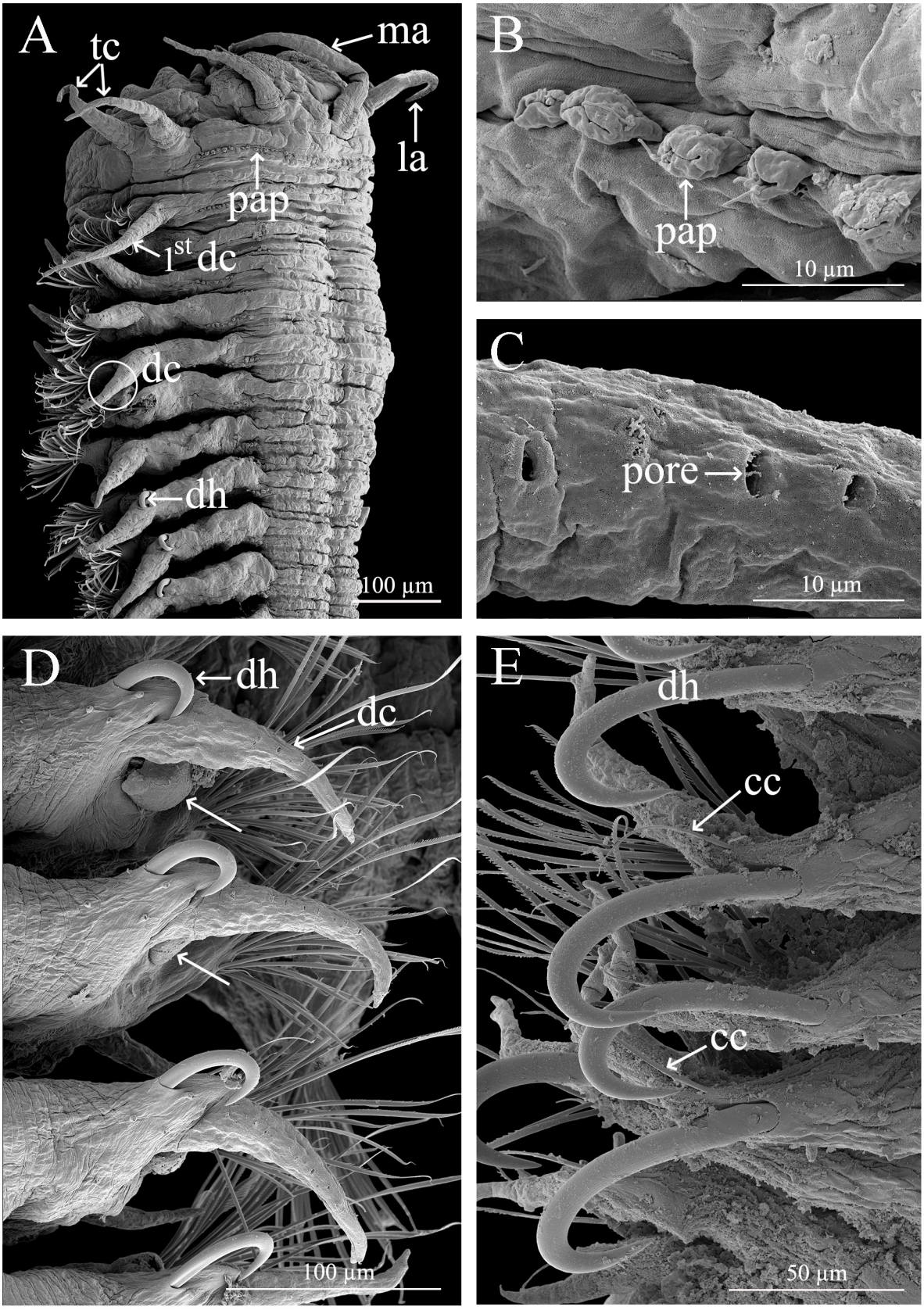

FIGURE 4. *Sigambra pakbaraensis* **sp. nov.** (PSUZC-POL-0425) A. Anterior region, lateral view; B. Close up of body papillae, lateral view; C. Close up of pores on dorsal cirrus, dorsal view; D. Midbody notopodia, arrows point to gonopores, lateral view; E. Far posterior notopodium, dorsal view. Abbreviations: 1st dc, first dorsal cirrus; cc, capillary notochaeta; dc, dorsal cirrus; dh, dorsal hook; la, lateral antenna; ma, median antenna; pap, papilla; tc, tentacular cirri.

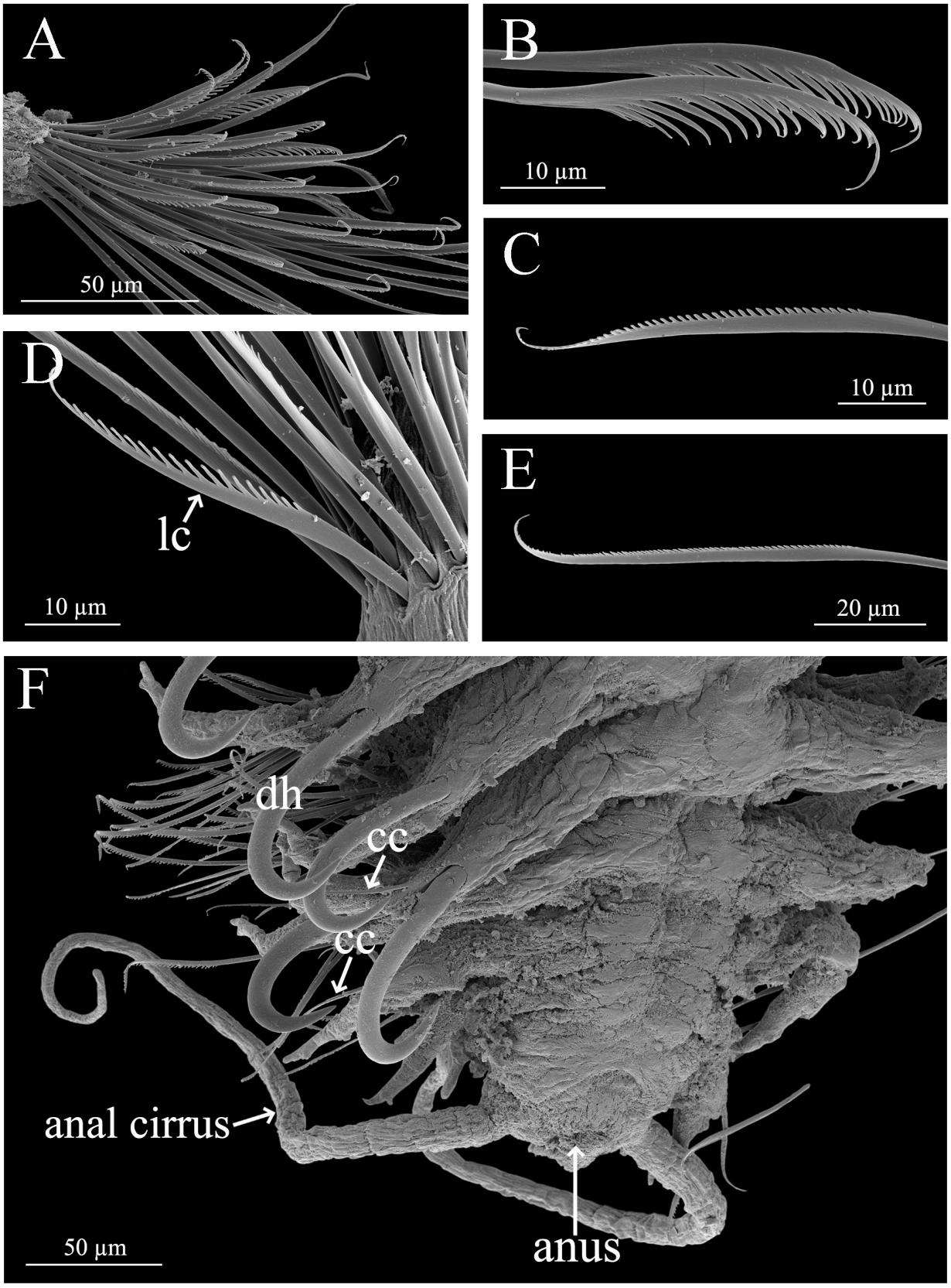

FIGURE 5. *Sigambra pakbaraensis* **sp. nov.** A. Anterior neurochaetae, ventral view; B. Close-up of pectinate chaetae, lateral view; C–E. Close up of various types of limbate capillary chaetae, lateral view; C. Short teeth chaeta; D. Inferior limbate chaeta with thin and long teeth, lateral view; E. Long limbate chaeta; F. Posterior end, dorsal view. Abbreviations: cc, capillary notochaeta; dh, dorsal hook; lc, limbate chaeta.

Holotype and paratypes mature females, with oocytes (Fig. 2A, B), hypertrophied gonopores occur ventral of parapodia located between dorsal cirrus and neuropodia in paratypes (Fig. 4D).

Pygidium with two slender, elongate lateral anal cirri (579 μm in length, left side), reaches to chaetiger 10 from posterior end (chaetigers 6 to 10 in paratypes) (Figs 2A–B, 5F).

Variations. Additional materials included large specimens and juveniles. All show first dorsal hooks fixed at chaetiger 8 and 14 pharynx marginal papillae. Notopodial capillary present. Other characters not observed.

Etymology. This species was named after Pak Bara, the locality where the specimens were collected for the first time.

Habitat. The intertidal zone at Pak Bara, Mu Ko Phetra National Park; seagrass bed in Andaman coast of Southern Thailand (fine muddy and fine sand sediments).

Distribution. Only known from the Andaman Coast, Southern Thailand (Fig. 1).

Genetic data. GenBank OP437496-OP437498 for COI and OP445021-OP445024 for 16S—no identical matches on GenBank for COI or 16S.

Remarks. *Sigambra pakbaraensis* **sp. nov.** belongs to the group of *Sigambra* which lack ventral cirri at chaetiger 2, have 14 pharyngeal papillae, and notopodial capillary chaetae (Table 1). It resembles the species in subgroup A (Day 1963; Hartman 1945; Kitamori 1960; Licher & Westheide 1997; Salazar-Vallejo *et al.* 2019; Southern 1921; Treadwell 1941) by the presence of 14 pharyngeal papillae and notopodial capillary: *S. bassi* Hartman, 1945*, S. constricta* Southern, 1921, *S. diazi* Salazar-Vallejo, Rizzo, León-González & Brauko, 2019, *S. hanaokai* Kitamori, 1960, *S. parva* Day, 1963, *S. phuketensis* Licher & Westheide, 1997, and *S. tentaculata* Treadwell, 1941 (Table 1). However, it differs from all those species in the subgroup by having its first dorsal hook at chaetiger 8. Whereas other species have first dorsal hooks at chaetigers 3–5 and chaetigers 15–40 (Hartman 1945; Licher & Westheide 1997; Moreira & Parapar 2002; Nishi *et al.* 2007; Salazar-Vallejo *et al.* 2019; Southern 1921) (Table 1).

Pores on the dorsal and ventral cirri are herein described for the first time, these pores may or may not open and close.

Phylogenetic analysis. A phylogenetic tree was generated from each of 3 COI and 4 16S rDNA sequences of *S. pakbaraensis* **sp. nov.** and other related taxa (Figs 6–7). DNA barcoding assessments in both COI and 16s rDNA clearly classified all *S. pakbaraensis* **sp. nov.** samples to the *Sigambra* clade. All *S. pakbaraensis* **sp. nov.** samples were designated to a monophyletic clade. The *S. magnuncus* clade was the sister group. The COI data revealed that the clade of Pilargidae does not cluster with the Microphthalmidae. *S. pakbaraensis* **sp. nov.** forms the sister clade with other *Sigambra* species, but with low bootstrap support. In contrast, the 16S rDNA phylogenetic tree shows that *S. pakbaraensis* **sp. nov.** is distinctly clustered from other *Sigambra* species, supported by high bootstrap values, with the *Sigambra* clade clearly separated from other families. These findings, based on both COI and 16S rDNA gene analyses, provide strong molecular evidence that *S. pakbaraensis* **sp. nov.** represents a genetically distinct species within the genus *Sigambra*. The genetic divergence observed across both markers highlights the evolutionary separation of *S. pakbaraensis* **sp. nov.** from other *Sigambra* in the available sequence databases, supporting its designation as a new species.

Inter- and intraspecific genetic distances of *Sigambra* spp. were investigated from both COI and 16S rDNA sequences. For the COI gene, nucleotide substitutions occurred at eight positions within the 429-bp fragment, and all positions were singleton variables leading to 1.86% intraspecific genetic distances for *S. pakbaraensis* **sp. nov.** Intraspecific variation from the closest related species, *S. magnuncus*, was 4.2%. The average interspecific distance between the *S. pakbaraensis* **sp. nov.** clade and the *S. magnuncus* clade was 22.29%, while differences between the proposed new species and *S. parva* and *S.* cf. *tentaculata* were 20.59% and 17.87%, respectively.

For the 16S rDNA gene, nucleotide substitutions occurred at five positions within the 444-bp fragment, and all positions were singleton variables, leading to 1.13% intraspecific genetic distances for *S. pakbaraensis* **sp. nov.**, whereas the distance for *S. magnuncus* was 1.78%. The average interspecific distance between the *S. pakbaraensis* **sp. nov.** clade and the *S. magnuncus* clade was 22.7%.

Since there is no recorded genetic data for *S. sundarbanensis*, a comparison with the new species cannot be made based on DNA analysis. We were able to separate *S. pakbaraensis* **sp. nov.** from *S. sundarbanensis* by the presence of notopodial capillary chaetae in the new species. This is a major morphological character that is absent in *S. sundarbanensis* (Bhowmik *et al.,* 2021).

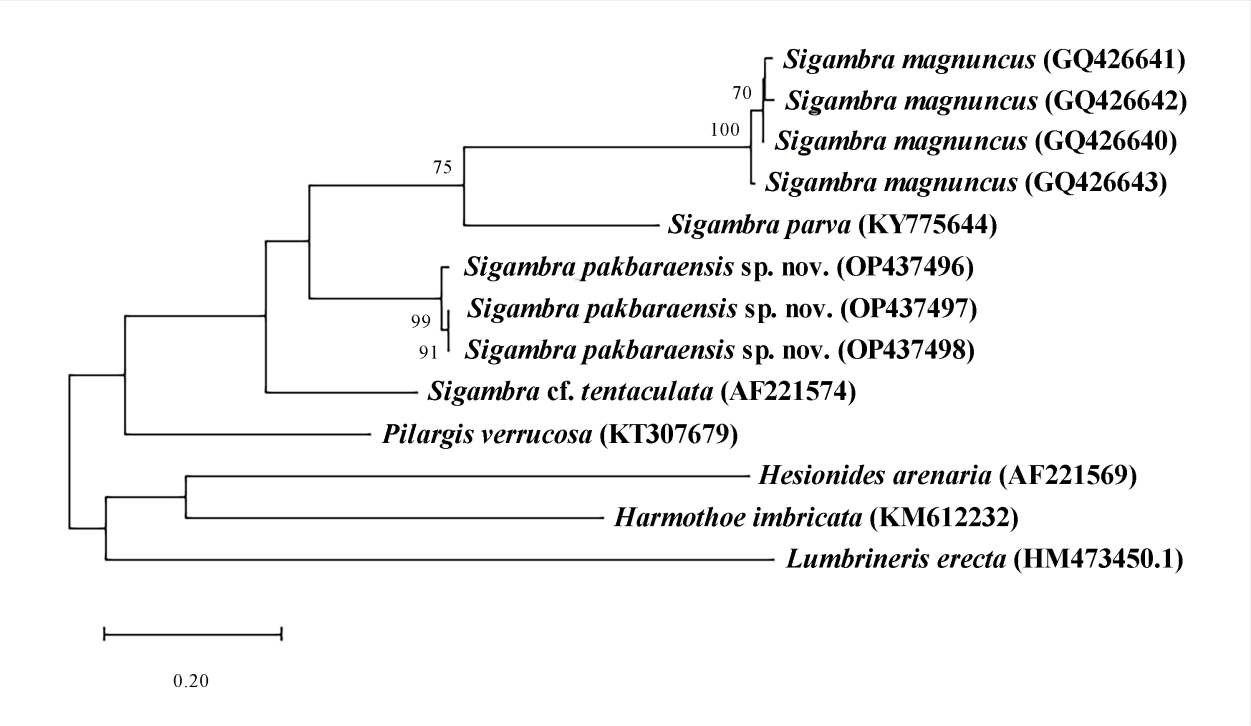

FIGURE 6. Phylogenetic tree from COI sequences was derived from maximum likelihood analyses. Bootstrap values show above branches and scale represents evolutionary distance in substitutions per position.

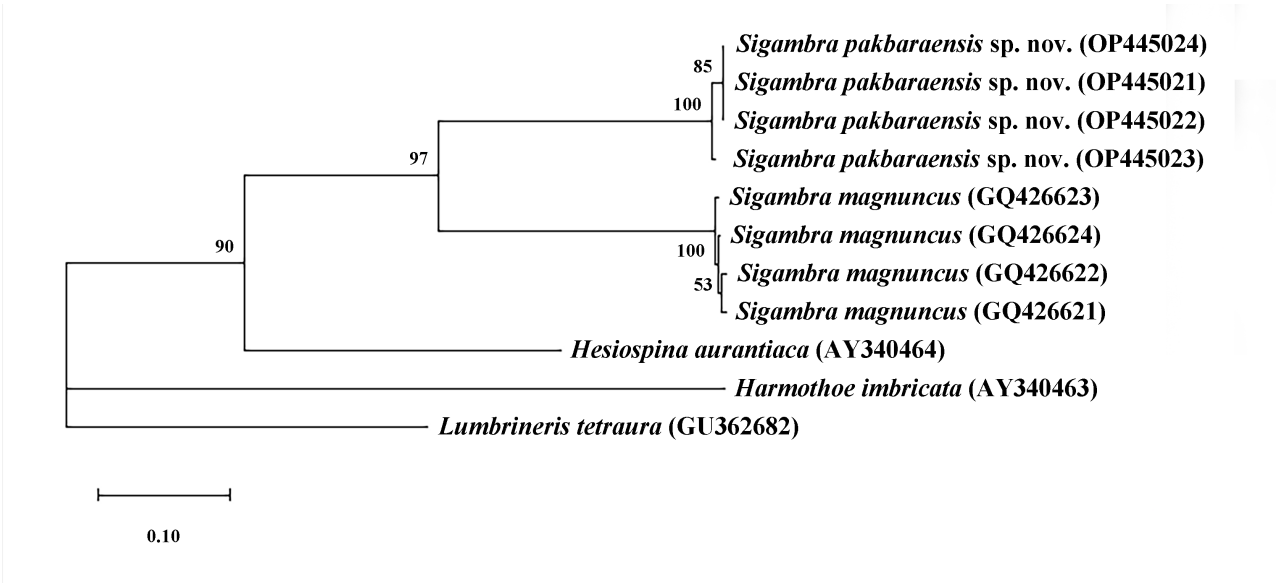

FIGURE 7. Phylogenetic tree from 16S rDNA sequences was derived from maximum likelihood analyses. Bootstrap values shown above branches and scale represents evolutionary distance in substitutions per position.

Sigambra sirilukae sp. nov.

Figs 8–11

Material examined. Thailand, Gulf of Thailand, Songkhla Sea. Fifty-three specimens, coll. Marine Ecosearch Management Company and Tetra Tech Inc., mud mixed with sand and shell fragments. Holotype: PSUZC-POL-0236, Sta. S10–3 (7°28'32"N, 100°36'22"E), 5 Jun. 2010, 18.5 m. 52 paratypes: PSUZC-POL-0237–0239 (5), Sta. S01 (7°46'29"N, 100°24'42"E), 9.5 m: 16 Oct. 2013(1 on SEM stub), 8 Oct. 2014 (3, 1 on SEM stub), 16 Mar. 2016 (1); PSUZC-POL-0240 (1), Sta. S02 (7°31'44"N, 100°28'15"E), 12 Sep. 2016, 10 m; PSUZC-POL-

0241–0243 (3), Sta. S03 (7°21’02”N, 100°31’45”E), 9 m: 30 Jan. 2012 (1), 11 Oct. 2012 (1), 2 Jun. 2013 (1); PSUZC-POL-0244–0248 (5, 4 on SEM stubs), Sta. S04 (7°49’22”N, 100°29’11”E), 17.5 m: 11 Oct. 2012 (1 on SEM stub), 12 Mar. 2013 (1 on SEM stub), 1 Jun. 2013 (1 on SEM stub), 3 Mar. 2015 (1), 14 Oct. 2015 (1 on SEM stub); PSUZC-POL-0249–0252 (7, 2 on SEM stubs), Sta. S06 (7°20’10”N, 100°36’59”E), 15.5 m: 3 Mar. 2011 (1 on SEM stub), 10 Oct 2012 (3, 1 on SEM stub), 2 Jun. 2013 (2), 6 Feb. 2014 (1); PSUZC-POL-0253 (1), Sta. S31 (7°29’27”N, 100°31’22”E), 11 Sep. 2011, 13 m; PSUZC-POL-0254 (1), Sta. S69 (7°30’17”N, 100°40’50”E), 16 Sep. 2014, 21.6 m; PSUZC-POL-0255 (1), Sta. S46 (7°40’58”N, 100°29’39”E), 22 Feb. 2015, 14.5; PSUZC-POL-0256 (1), Sta. S53 (7°27’59”N, 100°31’47”E), 23 Feb. 2015, 14.3 m; PSUZC-POL-0257 (1), Sta. S28 (7°25’55”N, 100°33’35”E), 23 Feb. 2015, 14.2 m; PSUZC-POL-0258 (2), Sta. S29 (7°23’18”N, 100°34’20”E), 24 Feb 2015, 13.4 m; PSUZC-POL-0259 (1), Sta. S63 (7°30’40”N, 100°35’01”E), 8 Oct. 2015, 16.5 m; PSUZC-POL-0260 (1), Sta. S45 (7°47’46”N, 100°28’10”E), 23 Feb 2015, 14.3 m; AM W.52917 (1), Sta. S29 (7°23’18”N, 100°34’20”E), 27 Jan. 2015, 13.4 m; AM W.52918 (1), Sta. S09-1 (7°32’13”N, 100°42’42”E), 8 Mar. 2014, 24 m.

Additional materials. Gulf of Thailand, Songkhla Sea. 64 specimens: 8 specs., Sta. S01 (same locality as paratypes): 21 Feb. 2013 (1), 1 Jun. 2013 (3), 8 Oct. 2014 (2), 26 Feb. 2015 (1), 14 Oct. 2015 (1); 15 specs., Sta. S02 (same locality as paratypes): 29 Jan. 2012 (1), 11 Oct. 2012 (1), 21 Feb. 2013 (3), 2 Jun. 2013 (4), 17 Oct. 2013 (2), 6 Feb. 2014 (2), 5 Jun. 2014 (2); 15 specs., Sta. S03 (same locality as paratypes): 30 Jan. 2012 (3), 24 May 2012 (1), 20 Feb. 2013 (2); 6 Feb. 2014 (3), 21 May 2015 (1), 17 May 2016 (4), 18 Oct. 2016 (1); 10 specs., Sta. S04 (same locality as paratypes): 11 Oct. 2012 (1), 21 Feb. 2013 (2), 1 Jun. 2013 (1), 16 Oct. 2013 (2); 5 Feb. 2014 (3), 4 Jun. 2014 (1); 9 specs., Sta. S06 (same locality as paratypes): 30 Jan. 2012 (1), 6 Feb. 2014 (3), 12 Feb. 2015 (3), 19 May 2015 (2); 1 spec., Sta. S07 (same locality as paratypes), 16 Oct. 2013; 3 specs., Sta. S09 (same locality as paratypes): 17 Mar. 2013 (1), 18 Mar. 2013 (2); 1 spec., Sta. S12 (7°34’19”N, 100°36’34”E), 4 Mar. 2014, 20 m; 1 spec., Sta. S14 (7°26’14”N, 100°36’13”E), 4 Mar. 2014, 15.5 m; 1 spec., Sta. S68 (7°47’06”N, 100°41’37”E), 29 Feb. 2016, 22 m.

Diagnosis. *Sigambra* without ventral cirri at chaetiger 2, with an elongate median antenna with ceratophore as long as 2.8–5x of lateral antennae, dorsal hooks present from middle chaetigers, notopodial capillary chaetae present from chaetiger 4–5, up to five chaetae per parapodium, and pharynx with 12 marginal papillae. Body lacking pigmentation.

Description. All specimens incomplete. Holotype the longest specimen with coiled median and posterior regions; total length of the specimen 19.3 mm long and 0.6 mm wide, about 180 chaetigers (Fig. 8A). Paratypes, 14–85 chaetigers, 2.0–15.4 mm long and 0.6–1.3 mm wide. Body long, annulated, with a wide ventral groove posteriorly (Figs 8A, 9A–B). Color in alcohol white to light tan (Fig. 8A–B).

Prostomium bilobed, wider than long, separated from peristomium by a deep transverse groove. Three tapering antennae, median antenna with large annulated, long ceratophore about 99 µm in length (Fig. 9A, D), 5 times longer than lateral antennae (1.84: 0.37 mm) (2.8–4.7 times as long in paratypes) extending to chaetiger 11 (10–12 in paratypes) (Figs 8A–B, 9A). Lateral antennae longer than palps (Figs 8B, 9A, D). Palpostyles long, ventrolateral palpal papillae thin, digitate (Figs 8A–B, 9A–D). Nuchal organs deep ciliated grooves, along lateral side of the posterior end of prostomium and above anterior end of peristomium (Fig. 9A, D). Paratype with pharynx everted; with 12 ciliated papillae, the four lateral papillae are slightly larger than dorsal and ventral papillae and bear subdistal papillae on the first ring of proboscis (Fig. 9B–C). Eyespot absent.

Peristomium with two pairs of slender tentacular cirri, shorter than lateral antennae; dorsal tentacular cirri longer than ventrals. A transverse row of small ciliated papillae (about 4–7 µm in diameter) located dorsally near the posterior margin of peristomium (Figs 8A–B, 9A–D).

Parapodia biramous, strongly annulated with dorsal and ventral cirri slender, tapered distally (Figs 8A–C, 9A–B, 10A–B, D); notopodia with strong curved acicular tips and dorsal cirrus; dorsal hooks from chaetiger 61 (50–62 in paratypes) continued to posterior chaetigers. Dorsal hooks small, transparent, first dorsal hooks small, subdermal (Fig. 8C).

Dorsal cirrus bearing dorsal pores (seen only in SEM images), with 2–5 capillary chaetae from chaetiger 4 (chaetigers 4–5 in paratypes) (Fig. 10A, C–E). Dorsal cirrus of chaetiger 1 longer than lateral antennae and tentacular cirri, about twice longer than dorsal tentacular cirri and up to 6 times as long as dorsal cirrus of chaetiger 2; longer than all dorsal cirri. Chaetiger 2 with short dorsal cirrus, shorter than those of following segments (Figs 8A–B, 9A, D, 10A, C, 11A, C).

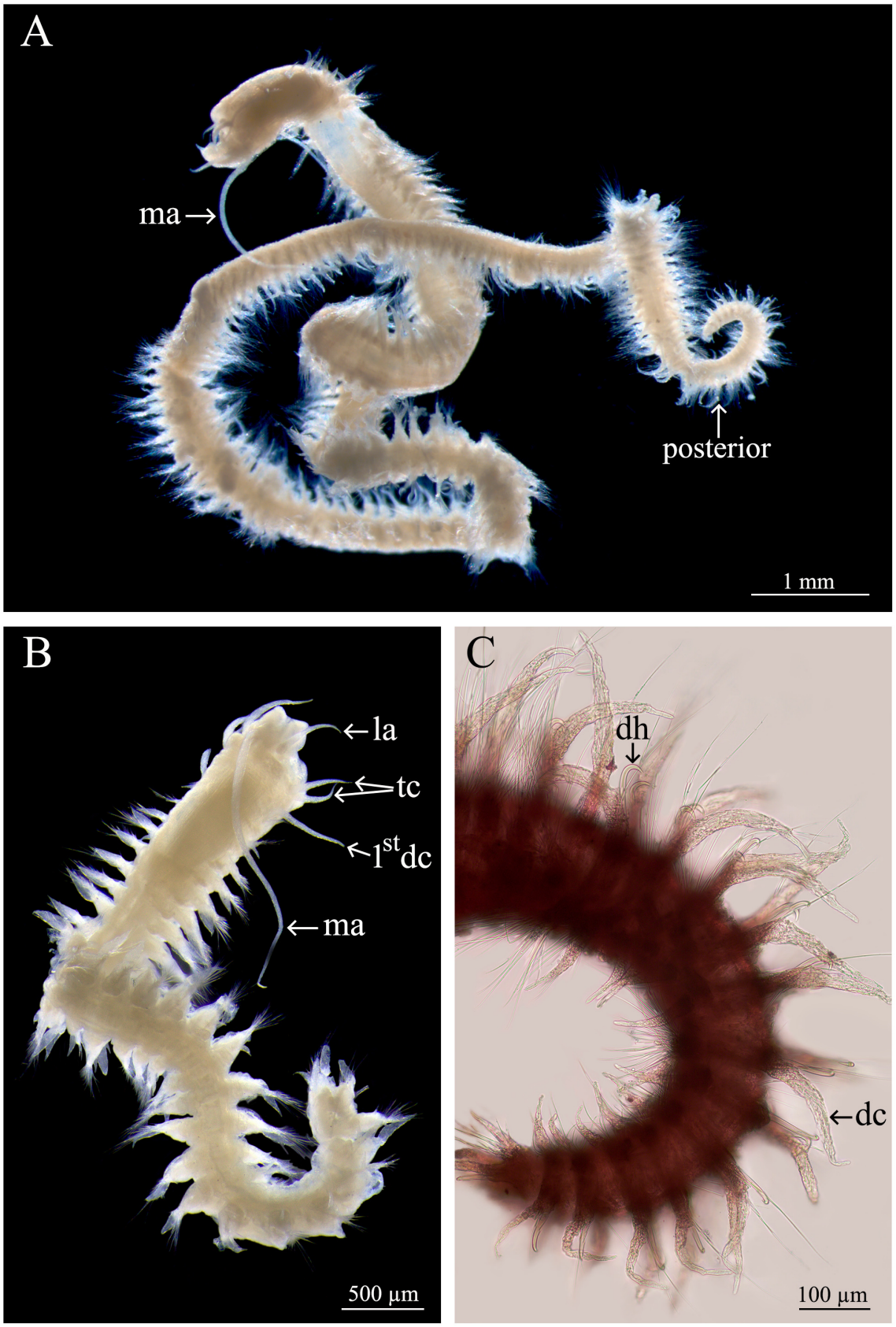

FIGURE 8. *Sigambra sirilukae* **sp. nov.** light photographs (A, C, holotype: PSUZC-POL-0236; B, PSUZC-POL-0252). A. Whole specimen, lateral view; B. Anterior region, dorsal view; C. Posterior region, lateral view. Abbreviations: 1st dc, first dorsal cirrus; dc, dorsal cirrus; dh, dorsal hook; la, lateral antenna; ma, median antenna; tc, tentacular cirri.

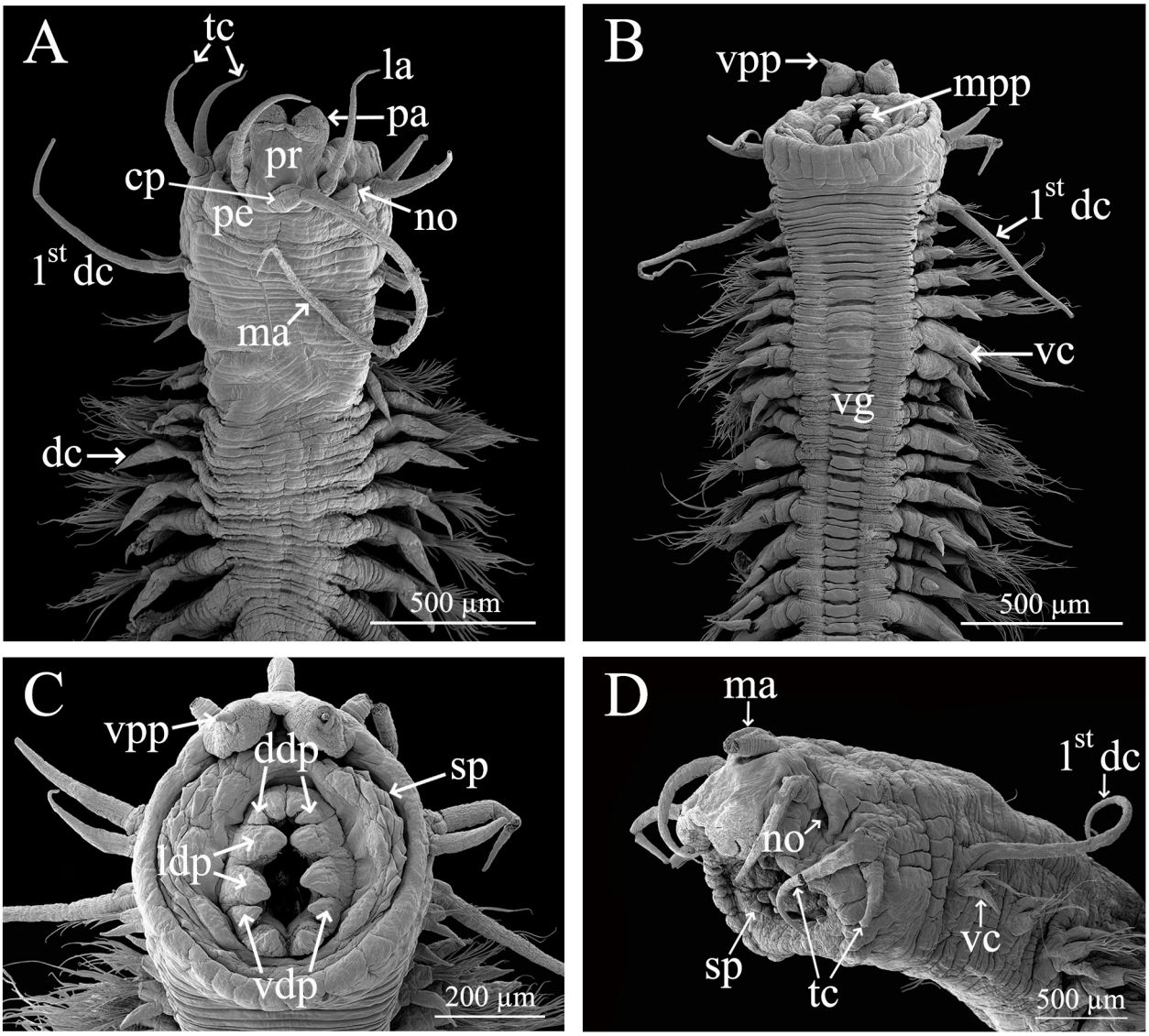

FIGURE 9. *Sigambra sirilukae* **sp. nov.** (A, PSUZC-POL-0238; B–C, PSUZC-POL-0244; D, PSUZC-POL-0245). A. Anterior region, dorsal view; B. Same, ventral view; C. Pharynx papillae, top view; D. Anterior end, lateral view. Abbreviations: 1st dc, first dorsal cirrus; cp, ceratophore; dc, dorsal cirri; ddp, dorsal distal papillae; la, lateral antenna; ldp, lateral distal papillae; ma, median antenna; mpp, mount papillae; no, nuchal organ; pe, peristomium; pr, prostomium; sp, subdistal papilla; tc, tentacular cirri; vc, ventral cirrus; vdp, ventral distal papillae; vg, ventral groov; vpp, ventrolateral palpal papilla.

Each chaetiger with rows of small epidermal papillae along posterior dorsolateral margin of parapodia, at the base of parapodium, larger than papillae over prostomium (Figs 8A, 10B, D, 11A).

Neuropodia well developed with ventral cirrus smaller than dorsal cirrus, lacking at chaetiger 2. Each ventral cirrus bears pores similar in shape to those on dorsal cirrus. Ventral cirri slender, longer than neurochaetal lobes in posterior chaetigers. Neuropodia with straight acicula in a conical parapodial lobe and numerous simple neurochaetae in a bundle, variable in length and up to 60 chaetae per bundle (Figs 9B, 10A, E).

Neuropodia with four types of capillary chaetae, pectinate with long spinous chaeta, limbate chaetae with short, deep, upwardly oriented serrated teeth, limbate chaeta with 1–2 minute teeth between the main teeth, and long capillary chaeta. Supra-acicular chaetae pectinate, up to 9 chaetae per parapodium (Fig. 11A), limbate, and long limbate chaetae. Inferior subacicular chaetae shorter than superiors, with 1–2 minute teeth between main teeth (Fig. 11B–C). Superior subacicular chaetae long, limbate, lacking minute teeth between main teeth, limbate chaetae ventrally (Fig. 11A–C).

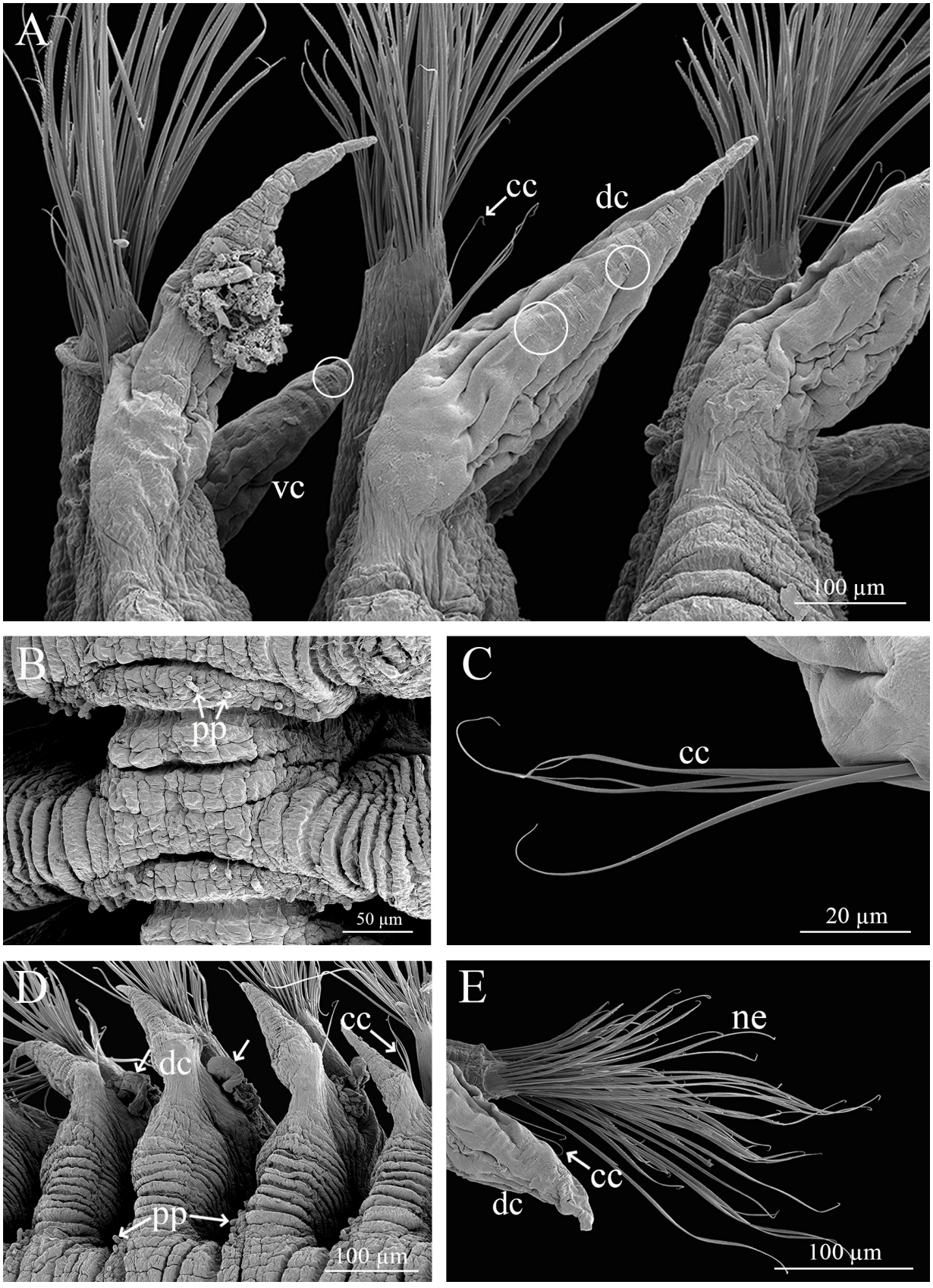

FIGURE 10. *Sigambra sirilukae* **sp. nov.** (PSUZC-POL-0328).A. Anterior parapodia, chaetigers 7–9 (from left to right), in circles are pores, dorsal view; B. Close up papillae on cheatiger, dorsal; C. Close up notopodial capilary chaeta, lateral view; D. Close up parapodia, arrows point to gonopores, dorsal view; E. Neurochaetae, dorsal view. Abbreviations: cc, capillary notochaeta; dc, dorsal cirrus; ne, neurochaetae; pp, papillae; vc, ventral cirrus.

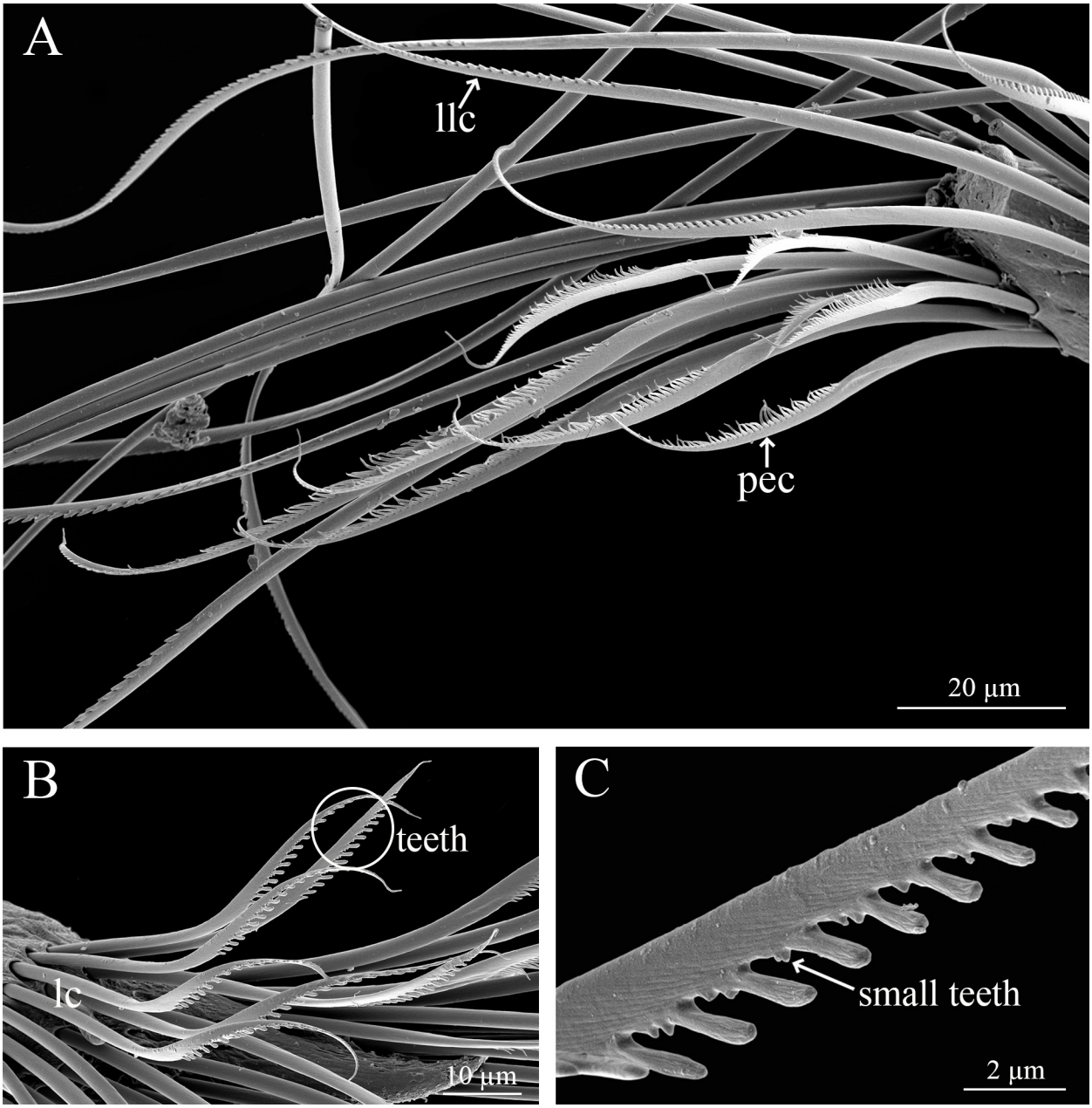

FIGURE 11. *Sigambra sirilukae* **sp. nov.** A. Long limbate and pectinated neurochaetae, lateral view; B. Inferior limbate neurochaetae, ventral-lateral view; C. Close up teeth of inferior limbate chaeta, lateral view. Abbreviations: llc, long limbate chaeta; pec, pectinated neurochaeta.

Pygidium unknown.

Reproduction. Oocytes were found in parapodial spaces in holotype and paratypes.

Variations. In additional materials, all specimens are anterior regions; median antenna very long and lateral antennae longer than palps. When median antenna broken, the ceratophore remains. Dorsal hooks absent and capillary chaeta also present from chaetiger 4–5 as holotype and paratypes. Pharynx with 12 marginal papillae.

Etymology. This species was named after Miss Siriluk Sutthinun, senior staff person at the Marine Ecosearch Management Company, for her initiation of taxonomy and establishment of database of benthic fauna from the Gulf Thailand.

Habitat. Found in 10–26.5 m depth, in muddy substrates mixed with sand and shell fragments.

Distribution. Gulf of Thailand, Western Pacific.

Remarks. *Sigambra sirilukae* **sp. nov.** belongs to the *Sigambra* group lacking ventral cirri on chaetiger 2 and with more than eight pharyngeal papillae (Table 1). It is a very distinctive species having 12 pharynx papillae, a median antenna 2.8–5x longer than lateral antennae, and with a large ceratophore extending to chaetiger 11–12. It also has up to 5 notopodial capillary chaetae present per parapodia from anterior to posterior chaetigers, and dorsal hooks from mid chaetigers (chaetiger 50 or greater). *Sigambra sirilukae* **sp. nov.** differs from all *Sigambra* species by possessing 12 marginal papillae on the pharynx. Other species have marginal papillae either lower (8) or higher (13–16) than the new species. Moreover, the number of notopodial capillary chaetae in *S. sirilukae* **sp. nov.** is greater than other species (2–5: 1–2 chaetae per parapodium, respectively) (Table 1).

There are three previously described species: *S. constricta* Southern, 1921*, S. olivai* Salazar-Vallejo, Rizzo, León-González & Brauko, 2019, and *S. rugosa* Fauchald, 1972 that have the dorsal hooks in middle chaetigers (starting from chaetiger 30–40, 30–39 and 43–46 respectively). In *S. sirilukae* **sp. nov.** the first dorsal hooks begin more posteriorly, up to chaetiger 60. Moreover both *S. constricta* and *S. olivai* having greater than 12 marginal papillae (14 and 13–16, respectively) (Fauchald 1972; Salazar-Vallejo *et al.* 2019; Southern 1921). Additionally, *S. constricta* has capillary chaetae only in posterior chaetigers, while they are absent in both *S. olivai* and *S. rugosa* (Bhowmik *et al.,* 2021; Fauchald 1972; Salazar-Vallejo *et al.* 2019; Southern 1921). *Sigambra sirilukae* **sp. nov.** also differs from those three species in median antenna length being 3–5x longer than lateral antennae. In *S. constricta* and *S. olivai* the median antenna is about 2x longer than the lateral antennae and in *S. rugosa* the median antenna is subequal in length to the lateral antennae (Bhowmik *et al.* 2021; Fauchald 1972; Salazar-Vallejo *et al.* 2019). Additionally, there are up to 60 chaetae per neuropodium in the new species with up to 9 chaetae per bundle in the other species. There are up to 5 notochaetae per parapodium which is greater than the other species.

Of the 26 known *Sigambra* species and the proposed two new species, the number described from the Indo-Pacific region is quite high, totalling 11 species including the proposed new species. All these species are from the larger group that lack ventral cirri on chaetiger 2. Three of the ten species bear eight pharyngeal papillae: *S. bidentata* Britaev & Saphronova, 1981 from Japan, *S. papagayu* Bamber in Muir & Bamber, 2008 from Hong Kong, and *S. qingdaoensis* Licher & Westheide, 1997from China. One species, *S. sirilukae* **sp. nov.** from the Gulf of Thailand bears 12 pharyngeal papillae. The other seven species bear 14 pharyngeal papillae. They include *S. elegans* Britaev & Saphronova, 1981 and *S. hanaokai* Kitamori, 1960, both from Japan; *S. constricta* Southern, 1921 and *S. sundarbanensis* Bhowmik, Ghoshal, Salazar-Vallejo & Mandal, 2021, both from India; *S. pettiboneae* Hartmann-Schröder, 1979 from Western Australia; and *S. phuketensis* Licher & Westheide, 1997 and *S. pakbaraensis* **sp. nov**. both from the Andaman Sea, Thailand (Table 1).

Key to *Sigambra* Müller, 1858 from the Indo-Pacific region

(modified after Bhowmik *et al.* 2021)

1. Chaetiger 2 lacking ventral cirri; pharynx with 8 marginal papillae. 2
– Chaetiger 2 lacking ventral cirri; pharynx with 12–14 marginal papillae 4
2. Some neurochaetae with bifid tips; dorsal hooks from chaetigers 3–5; median and posterior notopodia with 2 capillaries per parapodia . . . . . ***S. bidentata*** Britaev & Saphronova, 1981 (Sea of Japan, Pacific Ocean)
– Neurochaetae lacking bifid tips; dorsal hooks from chaetigers 3–7. 3
3. Median antenna reaching to chaetiger 5; notopodia without capillaries, dorsal hooks from chaetigers 3–5. . . . . ***S. papagayu*** Bamber in Muir & Bamber, 2008 (Hong Kong)
– Median antenna 2 times longer than lateral antennae; notopodia with capillaries; dorsal hooks from chaetigers 3–8 . . . . . ***S. qingdaoensis*** Licher & Westheide, 1997 (China, Pacific Ocean)
4. First dorsal hooks from anterior chaetigers 5
– First dorsal hooks from median chaetigers 10
5. First dorsal hooks from chaetigers 3–10 6
– First dorsal hooks from chaetigers 12–18; pharynx with 13 marginal papillae . . . . . ***S. elegans*** Britaev & Saphronova, 1981 (Sea of Japan, Pacific Ocean)
6. Median antenna longer than lateral antennae; pharynx with 14 marginal papillae 7
– Median antenna slightly longer than lateral antennae, pharynx with 13 marginal papillae; first dorsal hooks from chaetigers 7–10 . . . . . ***S. pettiboneae*** Hartmann-Schröder, 1979 (Western Australia)
7. First dorsal hooks from chaetiger 3–4; notopodia with capillaries 8
– First dorsal hooks from chaetiger 8 9
8. First dorsal hooks from chaetiger 3 . . . . . ***S. phuketensis*** Licher & Westheide, 1997 (Andaman Sea, Thailand)
– First dorsal hooks at chaetiger 4. . . . . ***S. hanaokai*** Kitamori, 1960 (Japan, Pacific Ocean)

9. Notopodia with capillaries . . . . . ***S. pakbaraensis* sp. nov.** (Andaman coast, Thailand)
– Notopodia without capillaries. . . . . .
. . . . . ***S. sundarbanensis*** Bhowmik, Ghoshal, Salazar-Vallejo & Mandal, 2021 (River Thakuran, Sundarbans, E India)
10. Median antenna long as 3–5 times of lateral antennae, notopodial capillaries present from anterior chaetigers; pharynx with 12 marginal papillae . . . . . ***S. sirilukae* sp. nov.** (Gulf of Thailand)
– Median antenna nearly 2 times longer than lateral antennae; notopodial capillaries present from posterior chaetigers; pharynx with 14 marginal papillae . . . . . ***S. constricta*** Southern, 1921 (Chilka Lake, India)

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