



Two new species of Traviisiidae (Annelida, Sedentaria) from Thailand

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Abstract

Two new species of Traviisiidae, *Travisia satunensis* **sp. nov.** and *T. thailandensis* **sp. nov.**, were collected from different locations in Thailand waters. *Travisia satunensis* **sp. nov.** was collected in the Andaman Sea, at 2–14 m water depths. *Travisia thailandensis* **sp. nov.** was collected from offshore petroleum concession areas in the Gulf of Thailand, at 50–80 m water depths. *Travisia satunensis* **sp. nov.** differs from all other species by having branched annulated branchiae on chaetigers 2–35, each annulated with a single filament, chaetae throughout the body and pygidium with 10 anal cirri, six digitiform and four short cirri, alternately arranged. *Travisia thailandensis* **sp. nov.** differs from all other species by having 21 pairs of cirriform, annulated branchiae from chaetiger 2, a mid-ventral groove along body, two last segments achaetous, and nephridiopores on chaetigers 7–14. A key for *Travisia* species from the Indo-Pacific region is also provided.

Key words: Andaman Sea, Gulf of Thailand, Pak Bara Bay, taxonomy, *Travisia*

Introduction

Members of Traviisiidae Hartmann-Schröder, 1971 are rarely abundant (de León-González 1998; Maciolek & Blake 2006). The family has only one valid genus, *Travisia* Johnston, 1840 (Blake & Maciolek 2019). Currently, there are 38 valid species of *Travisia* (Read & Fauchald 2023). According to Rizzo & Salazar-Vallejo (2020), *Travisia* can be divided into two groups, based on the absence or presence of branchiae. One group (Group I) includes four species that do not have branchiae: *T. glandulosa* McIntosh, 1879; *T. gravieri* McIntosh, 1908; *T. nigrocincta* Ehlers, 1913 and *T. fusus* Chamberlin, 1919. The other group (Group II) consists of 35 species, including the two new species with branchiae. Group II can be separated into two subgroups based on the type of branchiae: (A) branched branchiae, or (B) cirriform branchiae subgroups.

In Thailand, Eibye-Jacobsen (2002) recorded one species from an incomplete specimen from Phuket in the Andaman Sea. He reported it as *Travisia* cf. *horsti*, which belongs to the group of *Travisia* with cirriform branchiae and without mid-ventral groove.

The new species from the Andaman Sea described herein, *T. satunensis* **sp. nov.**, differs from *Travisia* cf. *horsti* by having branched rather than cirriform branchiae; *T. satunensis* **sp. nov.** belongs in the subgroup having branched branchiae; it comprises only three species: *T. arborifera* Fauvel, 1932 from the Indian Ocean; *T. filamentosa* de León-González, 1998 from Lower California; and *T. satunensis* **sp. nov.** from the Andaman coast of Thailand.

The other newly described species, *T. thailandensis* **sp. nov.**, was collected from the Gulf of Thailand; *T. thailandensis* **sp. nov.** belongs in the subgroup having cirriform branchiae comprising 33 species. Only three out of these 33, including the new species from the Gulf of Thailand, have a mid-ventral groove along the body. These three species are *T. hobsonae* Santos, 1977 from Florida, USA; *T. fusiformis* Kudenov, 1975 from the Gulf of California, Mexico; and *T. thailandensis* **sp. nov.** from an offshore area of the Gulf of Thailand (Table 1).

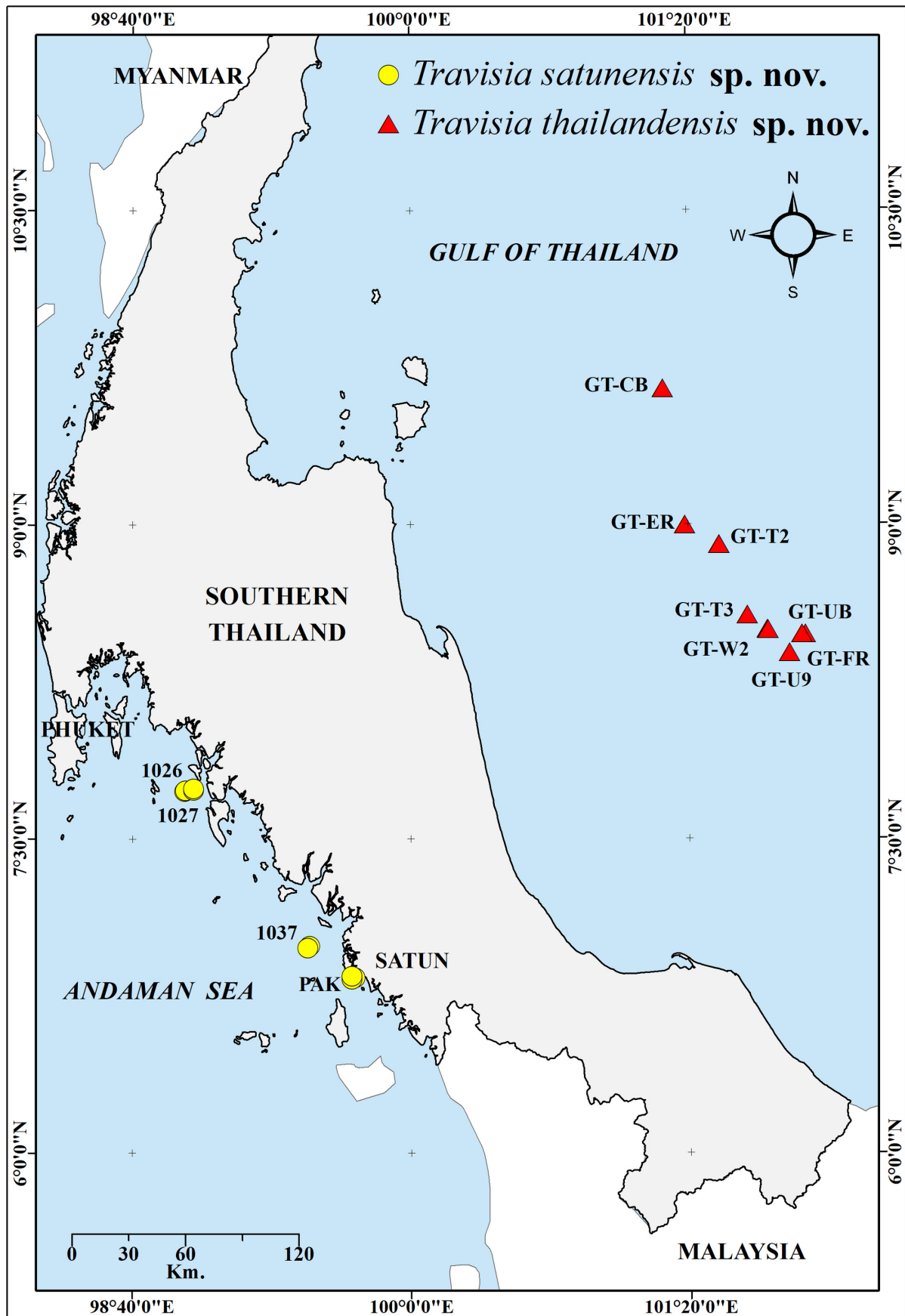


FIGURE 1. Sites in the Andaman Sea and Gulf of Thailand where specimens of *Trivisia satunensis* sp. nov. (circles) and *T. thailandensis* sp. nov. (triangles) were collected.

TABLE 1. List of valid *Travisia* species arranged by groups and subgroups.

Species	Distribution
I. Without branchiae	
<i>T. fusus</i> Chamberlin, 1919	Pacific Ocean, off Marquesas Islands
<i>T. glandulosa</i> McIntosh, 1879	Northeast Atlantic Ocean
<i>T. gravieri</i> McIntosh, 1908	Atlantic Ocean, northern sector
<i>T. nigrocincta</i> Ehlers, 1913	Antarctic Ocean, Wilhelm II Coast
II. With branchiae	
A. Branchiae branched	
<i>T. arborifera</i> Fauvel, 1932	Indian Ocean
<i>T. filamentosa</i> de León-González, 1998	Lower California, eastern Pacific
<i>T. satunensis</i> sp. nov.	Andaman coast, Thailand
B. Branchiae cirriform	
B1. With ventral groove	
<i>T. fusiformis</i> Kudenov, 1975	Gulf of California, Pacific Ocean; Intertidal
<i>T. hobsonae</i> Santos, 1977	Caribbean Sea; Tampa Bay, Florida, USA
<i>T. thailandensis</i> sp. nov.	Offshore the Gulf of Thailand (50 to 80 m)
B2. Without ventral groove	
<i>T. amadoi</i> Elías, Bremec, Lana & Orensanz, 2003	Atlantic Ocean, northern Patagonia to southern Brazil
<i>T. amoyanus</i> Yang, Wu, Wang, Zhao, Hwang & Cai, 2022	Shore at Xiamen city, China, South China Sea
<i>T. antarctica</i> Hartman, 1967	Antarctic Ocean, South Georgia, USA
<i>T. araciae</i> Rizzo & Salazar Vallejo, 2020	Campos Basin, off Rio de Janeiro, Brazil
<i>T. brevis</i> Moore, 1923	Pacific Ocean, off San Diego, California, USA
<i>T. carnea</i> Verrill, 1873	Atlantic Ocean, New England, USA
<i>T. chiloensis</i> Kükenthal, 1887	Chilean part of the south Pacific Ocean
<i>T. chinensis</i> Grube, 1869	Pacific Ocean, China
<i>T. concinna</i> Kinberg, 1866	South Africa
<i>T. doellojuradoi</i> Rioja, 1944	Atlantic Ocean, Argentina
<i>T. elongata</i> Grube, 1866	Pacific Ocean, Peru
<i>T. foetida</i> Hartman, 1969	Pacific Ocean, southern California, USA
<i>T. forbesii</i> Johnston, 1840	Western Wadden Sea, the Southern Bight
<i>T. gigas</i> Hartman, 1938	Pacific Ocean, southern California, USA
<i>T. granulata</i> Moore, 1923	Northeast Atlantic Ocean
<i>T. horsti</i> Caullery, 1944	Atlantic Ocean, northern sector, Indonesia
<i>T. japonica</i> Fujiwara, 1933	Pacific Ocean, Japan
<i>T. kerguelensis</i> McIntosh, 1885	Kerguelen Islands, France
<i>T. lithophila</i> Kinberg, 1866	Port Jackson, New South Wales, Australia,
<i>T. monroi</i> Maciolek & Blake, 2006	Antarctic Peninsula
<i>T. oksae</i> Hartmann-Schröder & Parker, 1995	South Australia, Upper Spencer Gulf, Australia
<i>T. olens</i> Ehlers, 1897	Strait of Magellan
<i>T. oregonensis</i> Fauchald & Hancock, 1981	Pacific Ocean, off Oregon, USA
<i>T. palmeri</i> Maciolek & Blake, 2006	Antarctic Peninsula
<i>T. parva</i> Day, 1973	North Carolina Shelf, Northwest Atlantic
<i>T. profundus</i> Chamberlin, 1919	Pacific Ocean, off Peru
<i>T. pupa</i> Moore, 1906	Gulf of Georgia, Yes Bay, Alaska, USA
<i>T. sanrikuensis</i> Kobayashi & Kojima, 2021	Off Miyagi, Japan, the northwestern Pacific

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TABLE 1. (Continued)

Species	Distribution
<i>T. tincta</i> Maciolek & Blake, 2006	Off Lima, Peru, Pacific Ocean
<i>T. zieglerae</i> Wiklund, Neal, Glover, Drennan, Rabone & Dahlgren, 2019	Eastern Clarion-Clipperton Zone, central Pacific Ocean

The aim of this paper is to describe two new species of *Travisia*, one collected from an offshore area in the Gulf of Thailand, and one from Andaman coast, Southern Thailand. A key including all *Travisia* species from the Indo-Pacific region is also provided.

Materials and methods

Sediment samples were collected from two sites during different projects. The first site is an offshore area in the Gulf of Thailand, where a project called “Long-term environmental monitoring at the offshore Petroleum Production Area in the Gulf of Thailand” was conducted from 2009 to 2020. The project assessed benthic diversity at several stations in offshore petroleum concession areas. The second site is in the Andaman Sea at Pak Bara Bay, Mu Ko Phetra National Park, Satun Province, Southern Thailand. This project was one of a series conducted during 2012 and February 2018 by the Marine National Park Operation Center to advance research into benthic fauna biodiversity in Pak Bara Bay. The specimens described in the present work were collected from sediment taken from these two areas (Fig. 1).

Two different methods were used to collect specimens. In the Gulf of Thailand (8°22'53"–10°46'59"N, 100°48'03"–102°05'25"E), a Van Veen grab (0.04 m²) was used at depths ranging from 50 to 80 m. At Pak Bara Bay, specimens were collected by SCUBA diving at 1.3–24 m depths (6°49'42"–6°51'08"N, 99°42'41"–99°44'08"E). The collected samples were sieved in the field with 2.0 mm, 1.0 mm and 0.5 mm mesh screens. Later, seawater and sediment from the sieved grab samples were passed through a 300 µm filter bag. Retained specimens were separately fixed with a 10% formalin solution in seawater. In the laboratory, samples were washed with freshwater and transferred to 70% ethanol.

Polychaetes were sorted into taxonomic groups using a stereo microscope, and those belonging to the new species were examined under a light stereo microscope and a compound microscope. Light photographs and measurements of the specimens were made with a stereo microscope (Olympus SZX16) with a digital camera (DP74). Photographs of multifocal shots were merged into a single photograph with the Helicon Focus digital image processing software. Specimens were critical-point dried, mounted on stubs and coated with gold. Scanning electron microscope (SEM) images were made with a field emission scanning electron microscope (Apreo, FEI).

Morphological measurements of the holotype are included in the taxonomic description along with information on variability exhibited by the paratypes. The confirmation of the taxonomic status of the new species was based on the diagnostic characters of all recognized species of *Travisia* Johnston, 1840. For comparative purposes, tables are included with the main diagnostic characters of the new species and the most closely related ones.

Type specimens were deposited in the Princess Maha Chakri Sirindhorn Natural History Museum, Prince of Songkla University (PSUZC), Thailand. Additional materials are maintained in the personal collections of JP and SP at Marine Ecoscience Management Co. Ltd. (MEM) and Phuket Marine Biology Center (PMBC).

Results

Systematics

Family *Travisiidae* Hartmann-Schröder, 1971

Genus *Travisia* Johnston, 1840

Diagnosis (after Maciolek & Blake 2019). Body stout, pointed at both ends, fusiform or grub-like, without lateral or ventral grooves. Prostomium small, smooth, rounded, or truncate conical, without eyes; nuchal organs present. Mouth opening surrounded by upper and lower lips derived from elongated annulations of chaetiger 1 for the upper lip and chaetiger 2 for the lower lip. Segments annulated; posterior segments telescoped or forming folds ending in dorsal lappets. Parapodia reduced. Branchiae cirriform, branched or missing, may be annulated, from chaetiger 2 or 3. Interramal lateral sensory organs present. Lateral eyes absent. Chaetae simple capillaries, may be hispid. Pygidium small, cylindrical, longitudinally furrowed, with ring of stout unequal anal cirri, or with smooth margin.

***Travisia satunensis* sp. nov.**

Figs 2–7

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Material examined. Thailand, Andaman Sea. Mu Ko Phetra National Park, Pak Bara Bay. Eleven specimens, coll. Marine National Park Operation Center, Trang, SCUBA diving, fine mud mixed with fine sand. Holotype: PSUZC-POL-0358, Sta. PAK-04 (6°50'06"N, 99°43'58"E), 6 Jan. 2012, 2 m. Paratypes: ten specimens; Sta. PAK-01 (6°49'42"N, 99°43'07"E), 5 Jan. 2012, 2 m; PSUZC-POL-0359 (1 spec.), Sta. PAK-01 (B1); PSUZC-POL-0360 (2 specs., 1 spec. on SEM stub), Sta. PAK-01 (B2); PSUZC-POL-0361 (1 spec.), Sta. PAK-01 (B3); Sta. PAK-04 (same locality as holotype); PSUZC-POL-0362 (2 specs., 1 on SEM stub), Sta. PAK-04 (B1); PSUZC-POL-0363 (3 specs., 2 specs. on SEM stubs), Sta. PAK-04 (B3); PSUZC-POL-0364 (1 spec.), Sta. PAK-05 (6°50'33"N, 99°43'07"E), 17 Feb. 2018, 2.7 m.

Additional material. Thailand, Andaman Sea. Previously identified as *T. cf. japonica* Fujiwara, 1933. Sta. 1026 (6°59'11"–6°58'39"N, 99°31'00"–99°30'26"E), 18 Jan. 1966, 14 m: PMBC-12393 (1 spec.); PMBC-12403 (1 spec.), 18 Jan. 1996; Sta. 1037 (7°43'54"–7°44'18"N, 98°57'36"–98°57'35"E), 22 Jan. 1966, 12 m: PMBC-12399 (1 spec.); PMBC-12404 (2 specs.). All label as *T. cf. japonica* Fujiwara, 1933.

Diagnosis. *Travisia* with branched branchiae from chaetiger 2; last two chaetigers without branchiae. Parapodial lappets well developed from chaetiger 15. Pygidium with 10 anal cirri alternately arranged: six digitiform and four short cirri.

Description. Holotype complete, 30.6 mm long, 7.4 mm wide, 37 chaetigers. Paratypes complete, 9.7–16.1 mm long, 1.1–2.7 mm wide, 35–37 chaetigers. Non-type specimens small, about 6.0–10.3 mm long and 1–3 mm wide, 35 chaetigers. Body long stout (Figs 2A–B, 4A, C); integument with small epidermal polygonal papillae, visible under stereo microscope, each 16–29 µm in diameter (Fig. 4F). Body light tan, without pigmentation in alcohol.

Prostomium small, conical, acute (Figs 2C–E, 3A, 4B); nuchal organs small, round. Eyes absent. Mouth located ventrally at chaetiger 2 (Figs 2E, 4C–D).

Anterior region with 14 chaetigers, triannulate, except chaetiger 1. First six chaetigers longer than following ones, weakly triannulate. Chaetigers 15 to 26 biannulate; following chaetigers uni-annulate to pygidium (Figs 2A–C, 4A, C, E, 5A).

Interramal sensory pores large (visible under stereo microscope), present between notochoetae and neurochoetae from chaetiger 1 and throughout body (Figs 2D, 3A–B, 4E).

Lateral nephridial pores present along chaetigers 3 to 14, most small, conspicuous along chaetigers 3–6, markedly larger on chaetigers 7–10, then becoming small conspicuous pores from chaetiger 11 to chaetiger 14 (Fig. 2C). Posterior chaetigers without neuropodial pores. Neuropodial pores not visible on paratypes.

Branchiae all branched annulate, each ring with a single filament subdistal ring without filament; 34 pairs of branchiae starting from chaetiger 2, continue throughout body, missing in last two chaetigers. First branchiae smaller than second branchiae, and progressively larger through mid-body chaetigers (Figs 2F, 3D, 4E, 5A–C). Most branchiae longer than notopodial lappets. From chaetiger 26, branchiae becoming progressively shorter than parapodial lappets, hidden together with chaetae between parapodia (Figs 2G, 3C–D, 5A, 5F). Last branchiae smallest, digitate (Figs 5A, 6C).

Parapodia reduced anteriorly, with low conspicuous lobes. Parapodial lappets well developed in both noto- and neuropodia from chaetiger 15, continue to posterior chaetigers (Figs 3C–D, 4A, C, 5A).

All chaetae spirally spinulose capillaries, emerging from deep depressions, present in all chaetigers (Figs 5B–C, 6A).

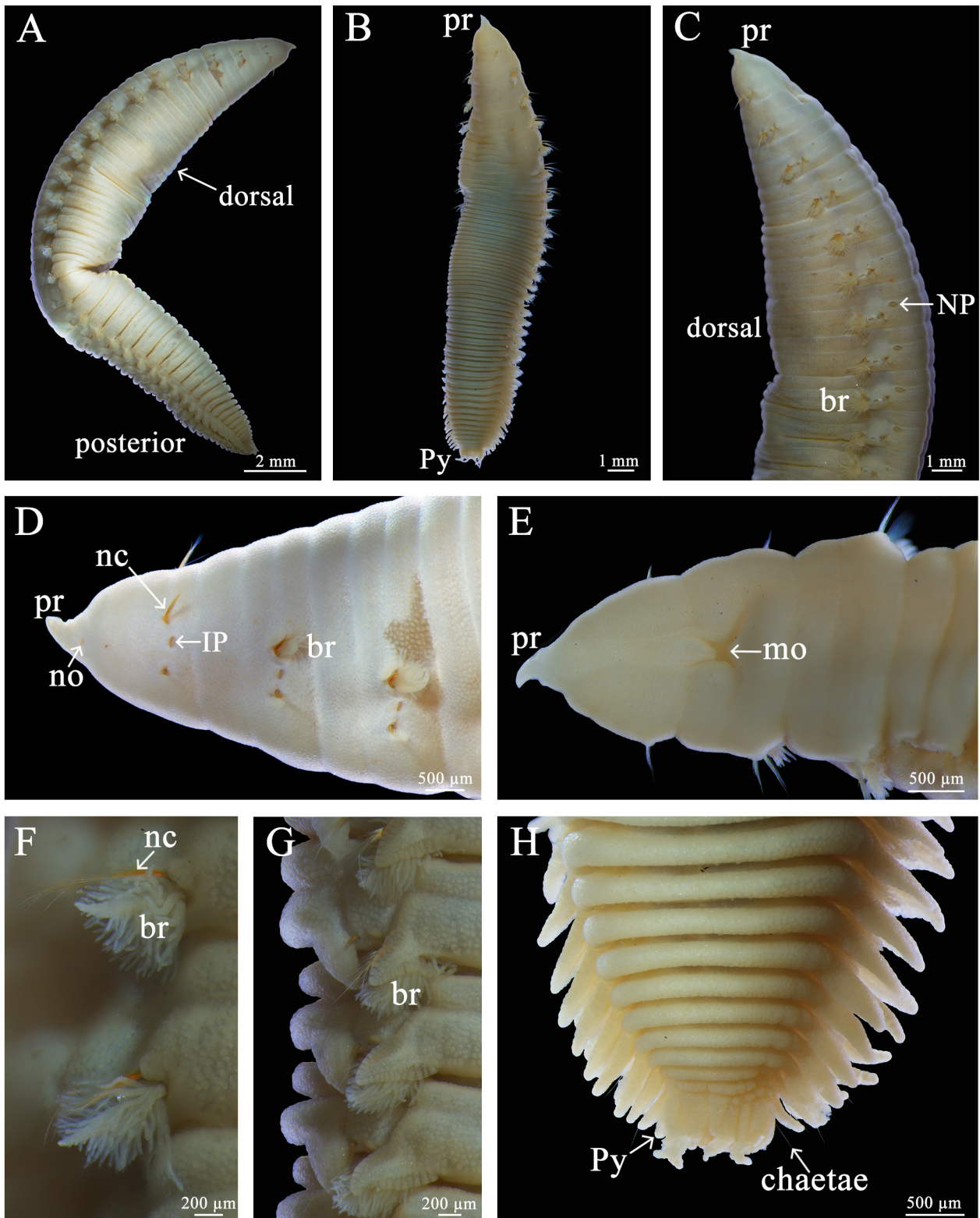


FIGURE 2. *Travisia satunensis* sp. nov. (A, C, D, F–H, holotype, PSUZC-POL-0358; B, E, PSUZC-POL-0359). A. Holotype, left lateral view; B. Paratype, dorsal view; C. Anterior region, right lateral view; D. Anterior end, left lateral view; E. Anterior end, ventral view; F. Anterior region, close-up of branchiae, lateral view; G. Midbody parapodia, lateral view; H. Posterior region, dorsal view. Abbreviations: br, branchiae; IP, Interramal papilla; mo, mouth; nc, notochaetae; no, nuchal organ; NP, nephridiopore; pr, prostomium; Py, pygidium.

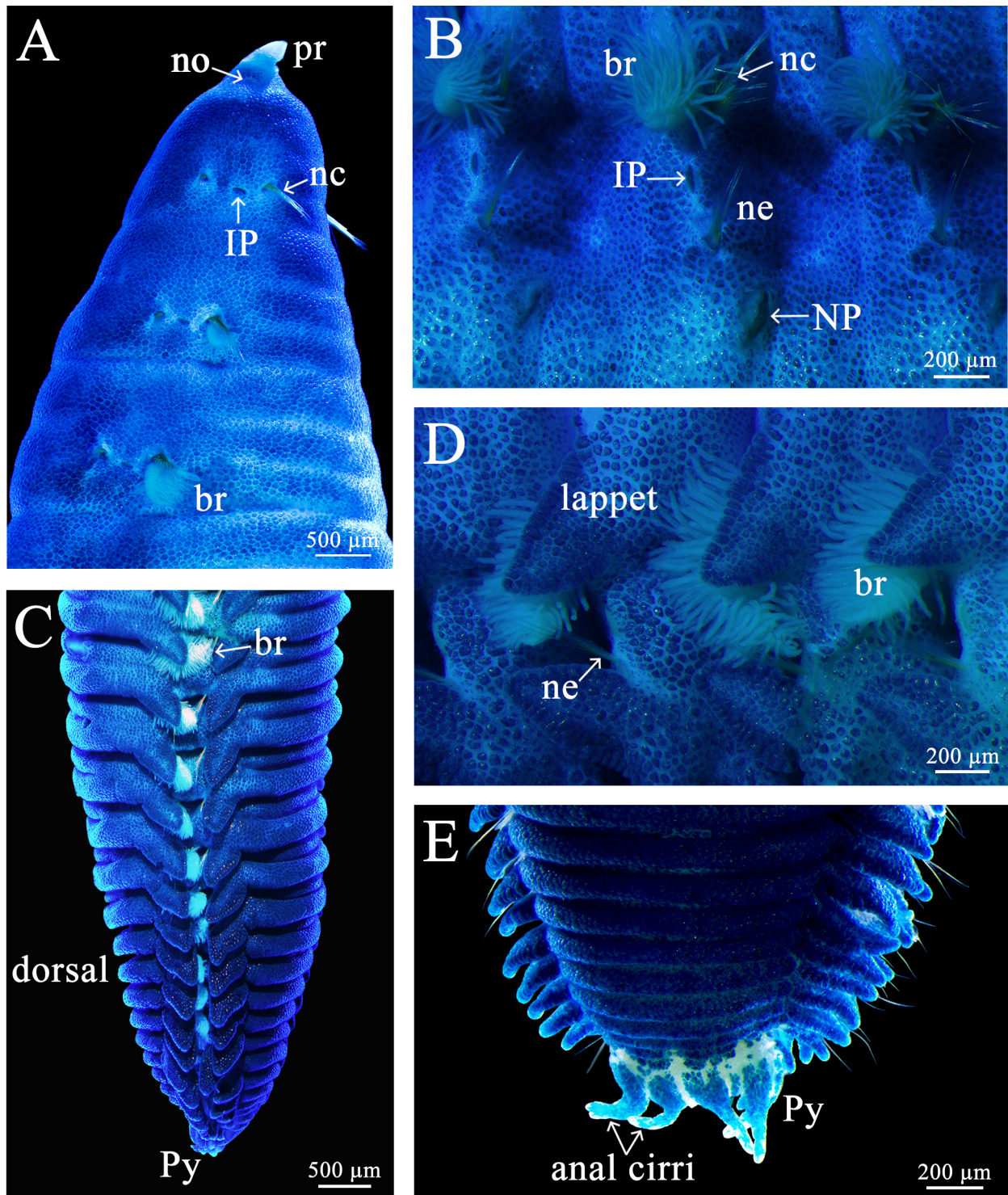


FIGURE 3. *Travisia satunensis* sp. nov., Methyl green-stained (A–D, holotype, PSUZC-POL-0358; E, PSUZC-POL-0359). A. Anterior end, left lateral view; B. Anterior parapodia, frontal view; C. Posterior region, left side showing lappets, lateral view; D. Midbody segments showing branchiae, frontal view; E. Posterior region, dorsal view. Abbreviations: br, branchiae; IP, interramal pore; nc, notochaetae; ne, neurochaetae; no, nuchal organ; NP, nephridiopore; pr, prostomium, Py, pygidium.

Oocytes present in two paratypes (SEM specimens), very small, about 2.5–3.6 μm in diameter (Fig. 7A–B).

Posterior end tapered; pygidium with anus terminal, with about 10 anal cirri of two types: six digitiform equal in size, and four short cirri, alternately arranged (Figs 3C, E, 6C–D).

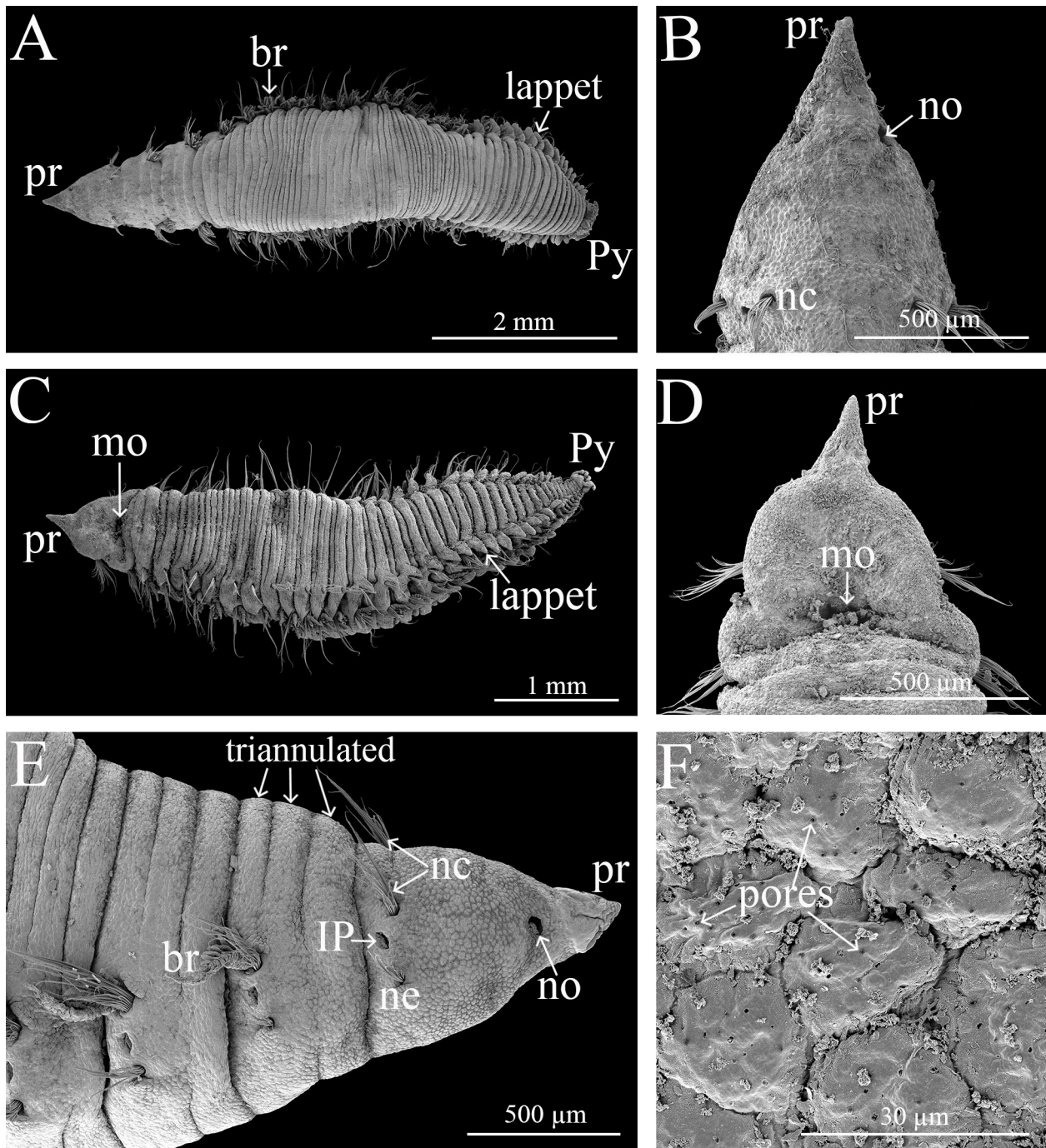


FIGURE 4. *Traviaisia satunensis* sp. nov., (A, B, PSUZC-POL-0360; C, D, PSUZC-POL-0362; E, F, PSUZC-POL-0363). A. Complete specimen, dorsal view; B. Prostomium, dorsal view; C. Complete, ventral view; D. Anterior end, ventral view; E. Anterior end, right lateral view; F. Integument, close-up of areolation. Abbreviations: br, branchiae; IP, interramal pore; mo, mouth; nc, notochaetae; ne, neurochaetae; no, nuchal organ; pr, prostomium; Py, pygidium.

Variation. In small specimens, the number of branchiae may be as few as 29–30 pairs because the posterior chaetigers and noto- and neuropodial lappets are large and cover all branchiae, making it difficult to see. Neuropodial pores are present only in holotype. Additional specimens are poorly preserved and branched branchiae start from chaetiger 2 and include 29–30 pairs.

Etymology. The specific epithet “*satunensis*” is derived from Satun, the name of the province of Thailand where the new species was collected.

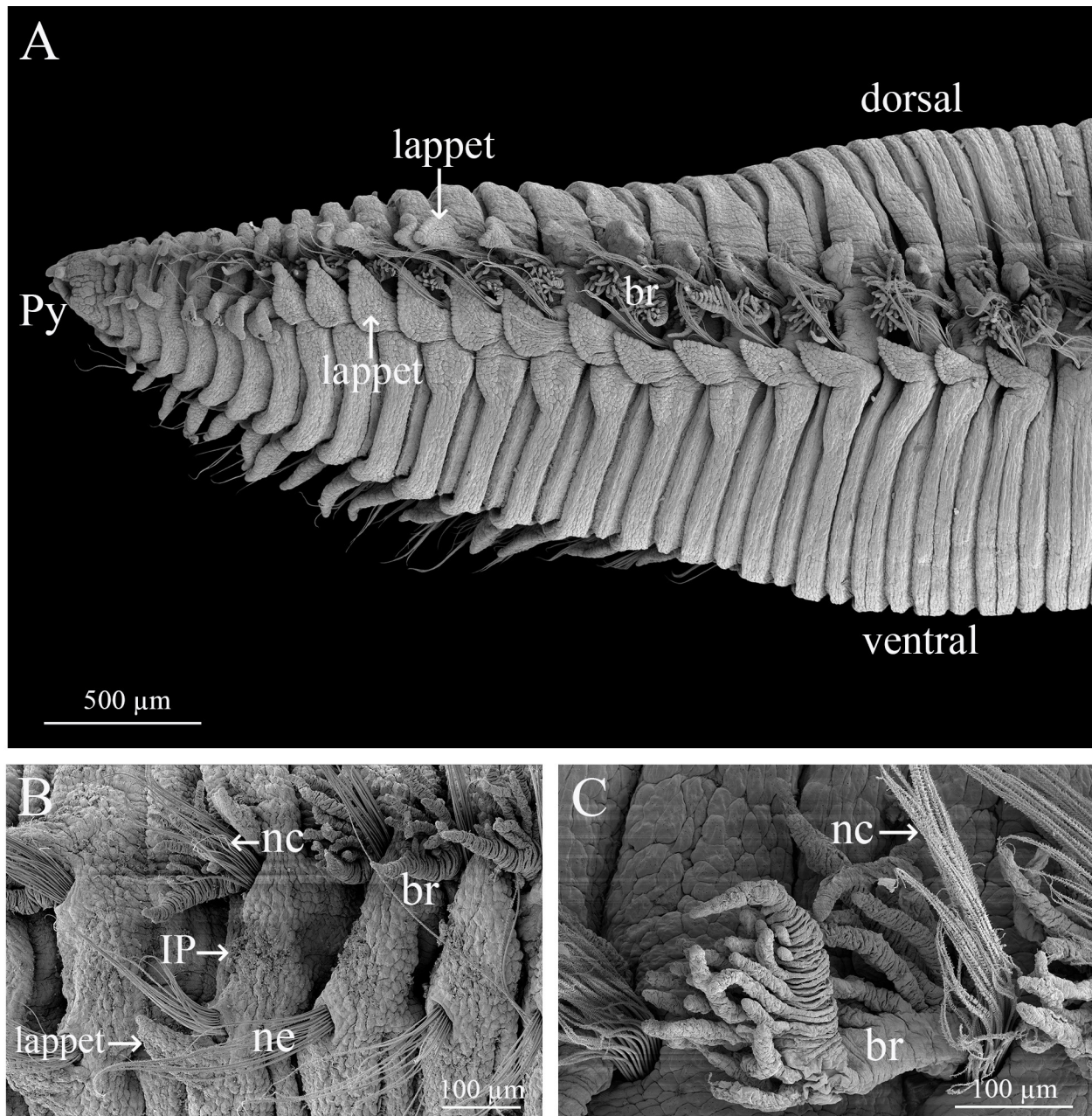


FIGURE 5. *Traviaisia satunensis* sp. nov. (A, B, PSUZC-POL-0362; C–G, PSUZC-POL-0363). A. Posterior region, lateral view; B. Parapodia chaetigers 14–16 (starting from right), lateral view; C. Close-up branchia, lateral view. Abbreviations: br, branchiae; IP, interramal pore; nc, notochaetae; ne, neurochaetae; Py, pygidium.

Habitat. Fine mud mixed with fine sand, about 2–14 m depth, off the Andaman coast, in Southern Thailand.

Methyl green staining pattern. The tips of prostomium and branchiae are not stained. Epidermal papillae and pygidium are stained. Dark green color in anterior parapodia, lappets and large papillae of posterior chaetigers. In the pygidium, only the surface of the anal cirri is stained because of epidermal glands (Fig. 3E).

Remarks. *Traviaisia satunensis* sp. nov. belongs to the subgroup having branched branchiae (Table 2); *T. satunensis* sp. nov. most closely resembles *T. arborifera* Fauvel, 1932 from the Indian Ocean in having pectinate branchiae from chaetiger 2. However, *T. satunensis* sp. nov. has 10 anal cirri and they are in two alternating types (digitiform and short cirri), whereas *T. arborifera* which has 6–8 anal cirri, all short, as indicated in the key below.

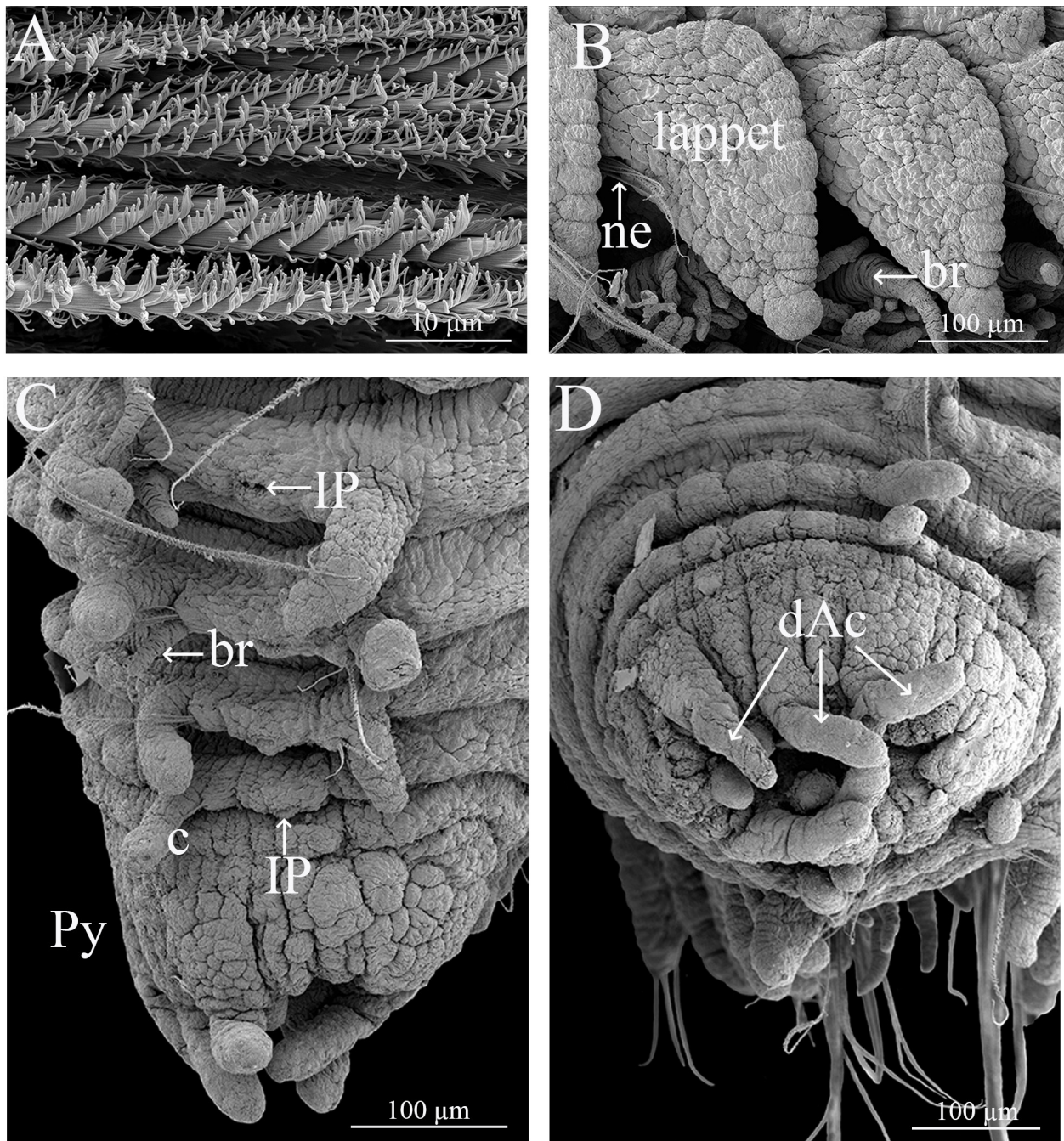


FIGURE 6. *Travisia satunensis* **sp. nov.** A. Close-up of spirally spinulose capillaries; B. Close-up of neuropodial lappets; C. Posterior end, lateral view; D. Pygidium, frontal view. Abbreviations: br, branchiae; c, cirriform dorsal lappet; dAc, digitate anal cirri; IP, interramal pore; ne, neurochaetae; Py, pygidium.

In addition, the holotype of *T. satunensis* **sp. nov.** is 30.6 mm long and has 34 pairs of branchiae, absent from the last two chaetigers; whereas in *T. arborifera* with bodies up to 38 mm long, there are 29-30 pairs of branchiae, absent from the last 6–7 chaetigers (Fauvel 1932).

On the other hand, *T. satunensis* **sp. nov.** differs from *T. filamentosa* de León-González, 1998 by having the first branchiae from chaetiger 2, nephridial pores along chaetigers 3 to 14, and pygidium with 10 anal cirri, whereas *T. filamentosa* has the first branchiae from chaetiger 3, nephridial pores are present along chaetigers 1–14, and its pygidium has 6 dorsal anal cirri, and lacks lateral cirri (de León-González 1998).

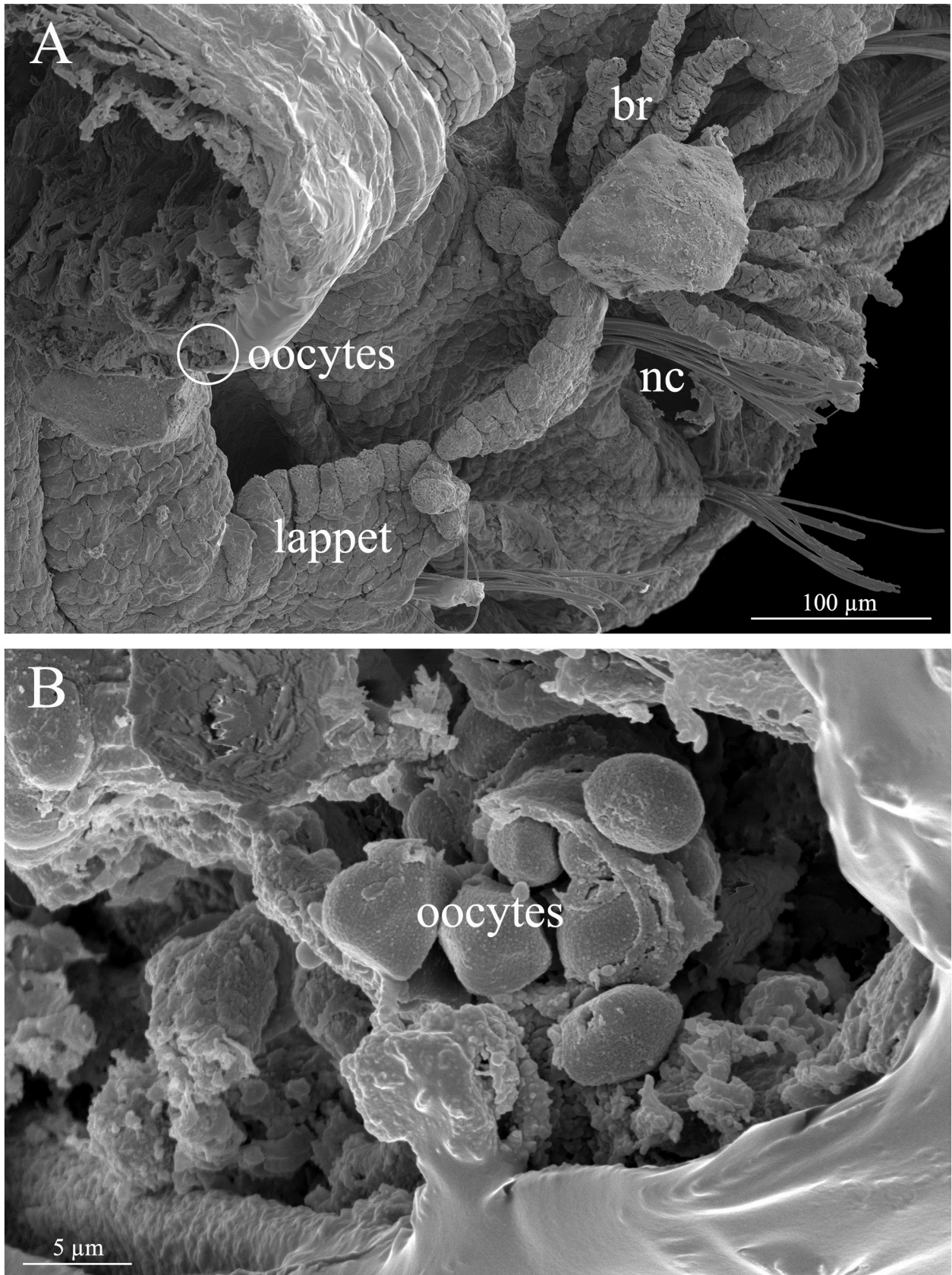


FIGURE 7. *Travisia satunensis* sp. nov. A. Close-up of a posterior parapodia, and its body wall and coelom, frontal view; B. Same, close-up of oocytes. Abbreviations: br, branchiae; nc, notochaetae.

TABLE 2. Comparison of holotypes of *Travisia* species with branched branchiae.

Species/Morphology	<i>T. arborifera</i> Fauvel, 1932	<i>T. filamentosa</i> de León-González, 1998	<i>T. satunensis</i> sp. nov.
Chaetigers	36	33	37
Body length (mm)	38	68	30.6
Body width (mm)	10–11	12	7.4
Prostomium	Rounded with a small conical tip	Mucronate	Rounded with conical tip
Distribution of branchiae (chaetigers)	2 to last 6–7 chaetigers	3 to last 5–6 chaetigers	2 to last 2 chaetigers
Branchiae (pairs)	29	28	34
Branchiae shape	Some branched, some pectinated	Branched	Branched and last three digitiform
Interramal sensory pits visible from chaetiger	1, conspicuous	1–14	1, large (can see under stereomicroscope)
Anal cirri	6–8 short cirri	6	10 cirri: 6 digitate and 4 short
Depth (m)	4.5–96.9	55	2–14

Furthermore, at 30.6 mm long and 7.8 mm wide, the body of *T. satunensis* sp. nov. is smaller and shorter than the bodies of *T. arborifera* and *T. filamentosa*, which are respectively 38 mm long and 11–12 mm wide, and 68 mm long and 12 mm wide.

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

Travisia thailandensis sp. nov.

Figs 8–12

Type material. Thailand, Gulf of Thailand. Offshore Petroleum Production Area. Nine specimens, coll. Marine Ecosearch Management Co., Ltd. and TetraTech Inc., mud mixed with sand and shells. Holotype. PSUZC-POL-0349, Sta. GT-T2 (8°54'06"N, 101°29'01"E), 27 Apr. 2011, 72 m. Paratypes. Eight specimens; PSUZC-POL-0350 (1 spec.), Sta. GT-U9 (8°22'60"N, 101°49'05"E), 22 Mar. 2009, 80 m; PSUZC-POL-0351 (1 spec., on SEM stub), Sta. GT-UB (8°28'24"N, 101°52'42"E), 25 Mar. 2010, 76 m; PSUZC-POL-0352 (1 spec., on SEM stub), Sta. GT-T2-2 (8°29'48"N, 101°42'46"E), 9 Sep. 2015, 71 m; PSUZC-POL-0353 (1 spec.), Sta. GT-T2-3 (8°54'06"N, 101°29'01"E), 27 Apr. 2011, 72 m; PSUZC-POL-0354 (1 spec., juvenile), Sta. GT-T3 (8°33'52"N, 101°37'02"E), 27 Apr. 2011, 72 m; PSUZC-POL-0355 (1 spec., juvenile), Sta. GT-I (9°38'49"N, 101°12'59"E), 18 Sep. 2015, 68 m; PSUZC-POL-0356 (1 spec.), Sta. GT-ER (8°59'51"N, 101°19'12"E), 19 Sep. 2015, 50 m; PSUZC-POL-0357 (1 spec.), Sta. GT-UB-2 (8°28'24"N, 101°53'43"E), 22 Mar. 2020, 80 m.

Additional material. Thailand, Gulf of Thailand. The offshore Petroleum Production Area, the Gulf of Thailand: 2 specs., juveniles: Sta. GT-FR (8°55'17"N, 101°37'42"E), 20 Mar. 2010, 80 m; Sta. GT-W2 (8°29'48"N, 101°42'46"E), 9 Sep. 2015, 71 m.

Diagnosis. *Travisia* with cirriform branchiae from chaetiger 2, 21 pairs of branchiae and 26–28 chaetigers. Prostomium small, conical, pointed. Eye spots absent. Mid-ventral groove present. Interramal pores from chaetiger 1, continued throughout body. Lateral neuropodial pores on chaetigers 7–14. Lappets very small, conspicuous. Last two segments achaetous. Pygidium short, without anal cirri.

Description. Holotype complete, 12.9 mm long, 2.9 mm wide, 26 chaetigers. Paratypes all complete: six larger specimens 5.7–14.0 mm long, 1.9–3.4 mm wide, 26 chaetigers and two juvenile paratypes 2.1–3.4 mm long, 1.0–1.4 mm wide, with 20–24 chaetigers. Body robust, grub-like, mid-ventral groove present from peristomium. Color in alcohol white to light tan, semi-transparent, without pigmentation (Fig. 8A–B). Body surface rugose, with transverse rows of small, tightly packed spherical tubercles (Fig. 9A–B).

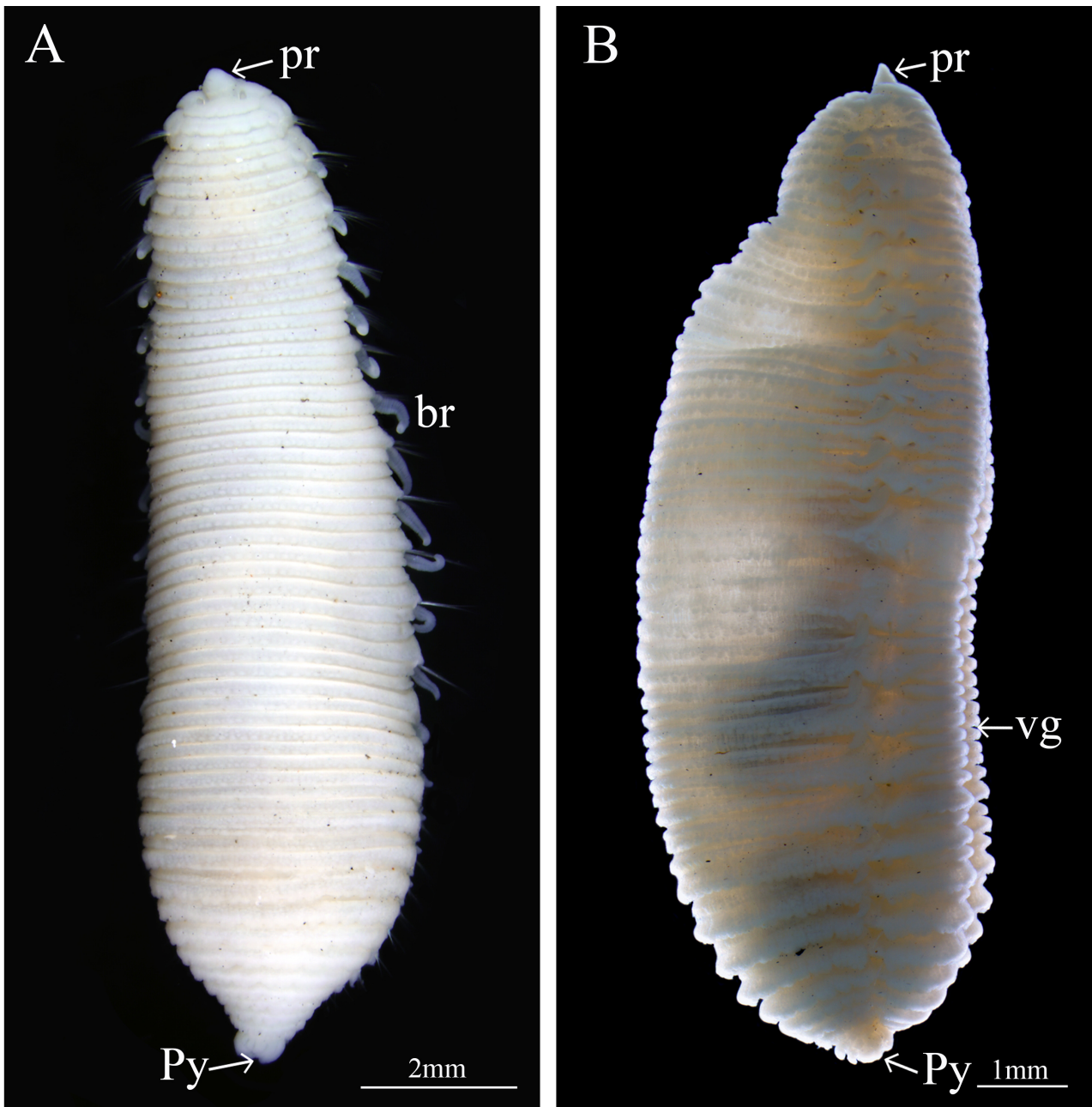


FIGURE 8. *Travisia thailandensis* sp. nov., paratypes (A, PSUZC-POL-0351; B, PSUZC-POL-0352) A. Whole specimen, dorsal view; B. Another specimen, right lateral view. Abbreviations: br, branchiae; pr, prostomium; Py, Pygidium; vg, ventral groove.

Prostomium small, conical, pointed; nuchal organs small, dorsolateral, slightly everted in two paratypes (PSUZC-POL-0351–2) (Fig. 10B, D); eyes absent (Figs 8A–B, 9A–C). Mouth between chaetigers 1 and 2 (Figs 9B–C, 10C); dorsal lip from ventral portion of segment 1, ventral lip from segment 2. Pharynx everted in one paratype, sac-like, folded, smooth (Fig. 9C).

Peristomium annulate, achaetous, rugose, with small, packed, spherical tubercles, appearing in two rows dorsally, anterior row with tubercles conical, posterior one crenulate (Fig. 10B, D).

Epidermal tubercles with packs of papillae forming spherical to rounded lobes, visible under stereo microscope. Tubercles arranged in single rows per segmental ring, each tubercle with papillae of various sizes; smaller papillae along anterior edge, larger, more spherical papillae along posterior, lower edge (Fig. 10A–E).

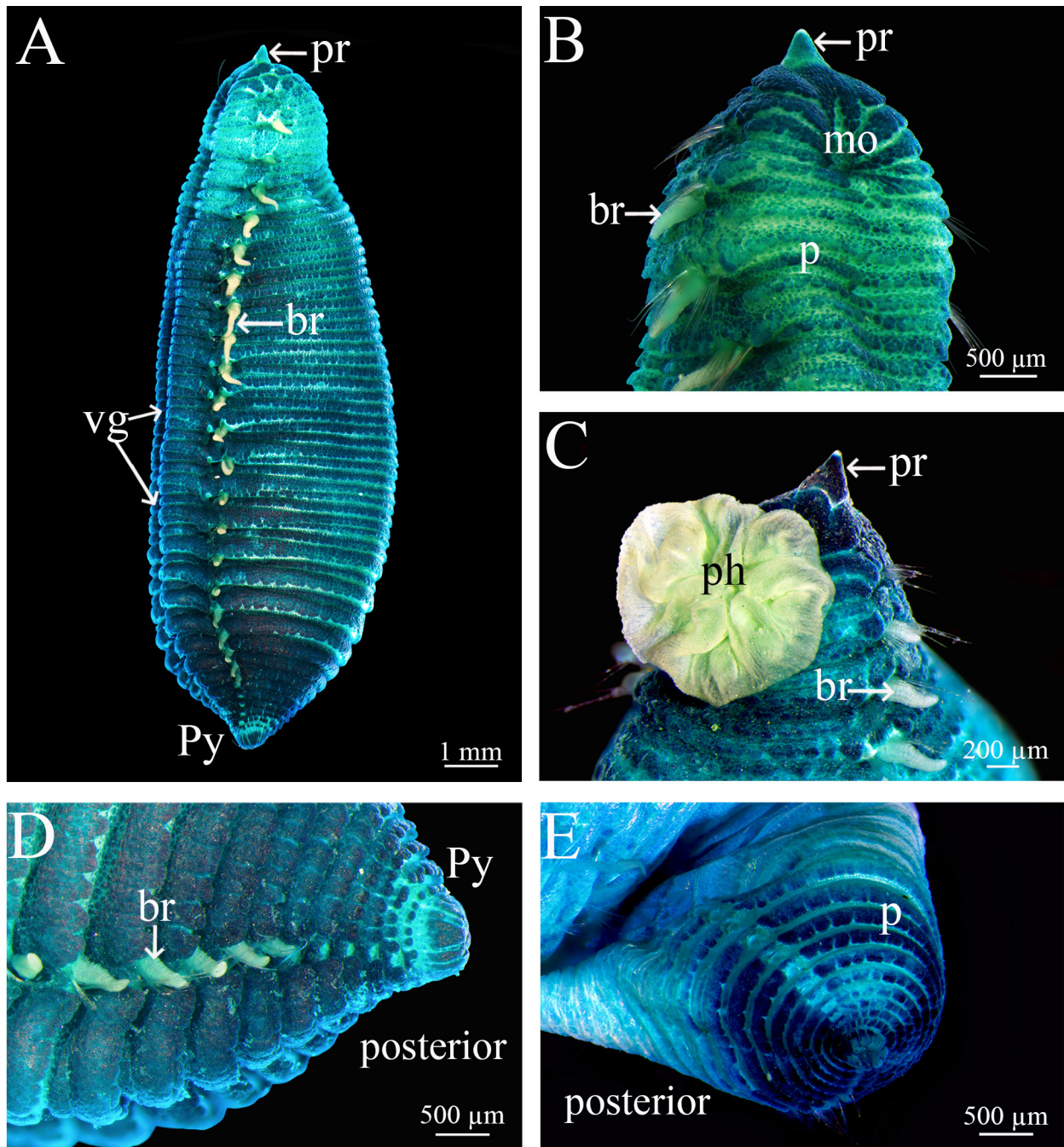


FIGURE 9. *Traviaia thailandensis* sp. nov., Methyl green-stained (A, B, D, holotype PSUZC-POL-0349; C, PSUZC-POL-0350; E, PSUZC-POL-0356). A. Holotype, left lateral view; B. Anterior end, ventral view; C. Another specimen, pharynx exposed; D. Posterior end, left lateral view; E. Same, oblique frontal view. Abbreviations: br, branchiae; mo, mouth; p, papillae; ph, pharynx; pr, prostomium; Py, pygidium; vg, ventral groove.

Body divided into two regions by shape of neuropodial lappets; anterior region with 14 chaetigers, neuropodial lappets small; chaetiger 1 biannulate, and chaetigers 2–14 triannulate with transverse rows of small, spherical lobes. Posterior region with neuropodial lappets becoming progressively larger. Chaetigers 15 to 18 biannulate, following chaetigers uni-annulate to end of body (Figs 9A, 10A, D).

Interramal sensory pores ciliated, present from first chaetiger to last one (Figs 10A, 11A, C).

Nephridiopores present along chaetigers 7 to 14 in holotype and paratypes (Figs 10A, 11A).

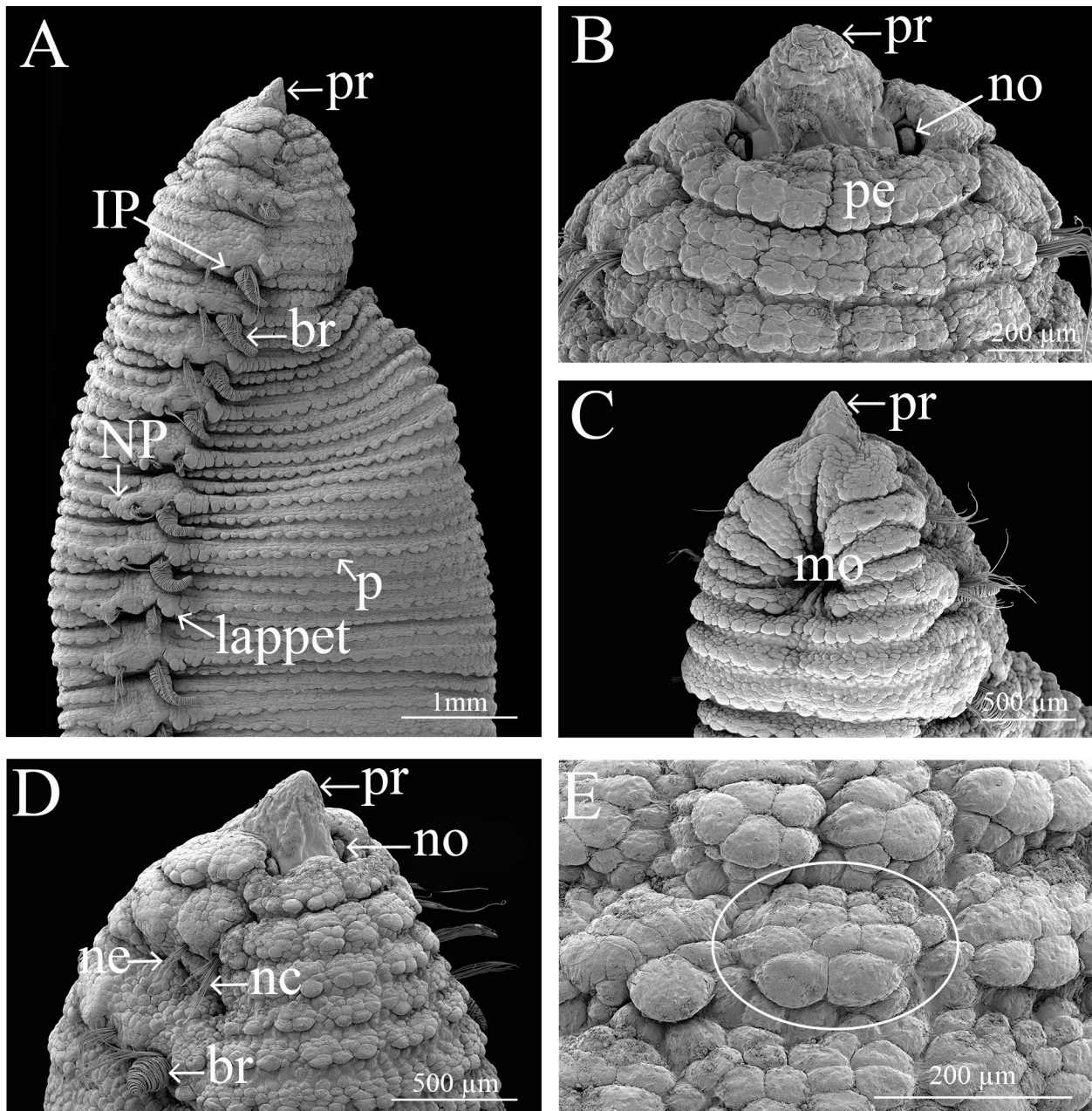


FIGURE 10. *Travisia thailandensis* sp. nov., paratypes (A, C, D, E, PSUZC-POL-0352; B, PSUZC-POL-0351). A. Anterior region, left lateral view; B. Anterior end, dorsal view; C. Same, ventral view; D. Anterior end, oblique dorsal view; E. Close-up of a pack of papillae, dorsal view. Abbreviations: br, branchiae; IP, interramal pore; mo, mouth; nc, notochaetae; ne, neurochaetae; no, nuchal organ; NP, nephridiopore; p, papillae; pe, peristomium; pr, prostomium.

Branchiae cirriform, annulate, 21 pairs along chaetigers 2 to 22. First pair short, increasing in size towards chaetiger 12, decreasing in size along chaetigers 13–22, missing from chaetiger 23. Mid body and posterior branchiae distinct, not hidden between parapodia, last branchiae smallest (Figs 8A, 9A–C, 10A–B).

Parapodia biramous. Parapodial lappets round poorly developed with small, low conspicuous lobes along chaetigers 1–14; in chaetigers 15–20 neuropodial lobes larger, then progressively smaller in posterior region (Figs 10A, D, 11A–B).

Notochaetae and neurochaetae with long spirally spinulose capillaries, present from chaetiger 1; last two chaetigers achaetous, inserted in a pit, near parapodia. In branchial chaetigers, notochaetae located ahead of branchiae (Figs 8A, 9A–C, 10A–D, 11A–B, E–F).

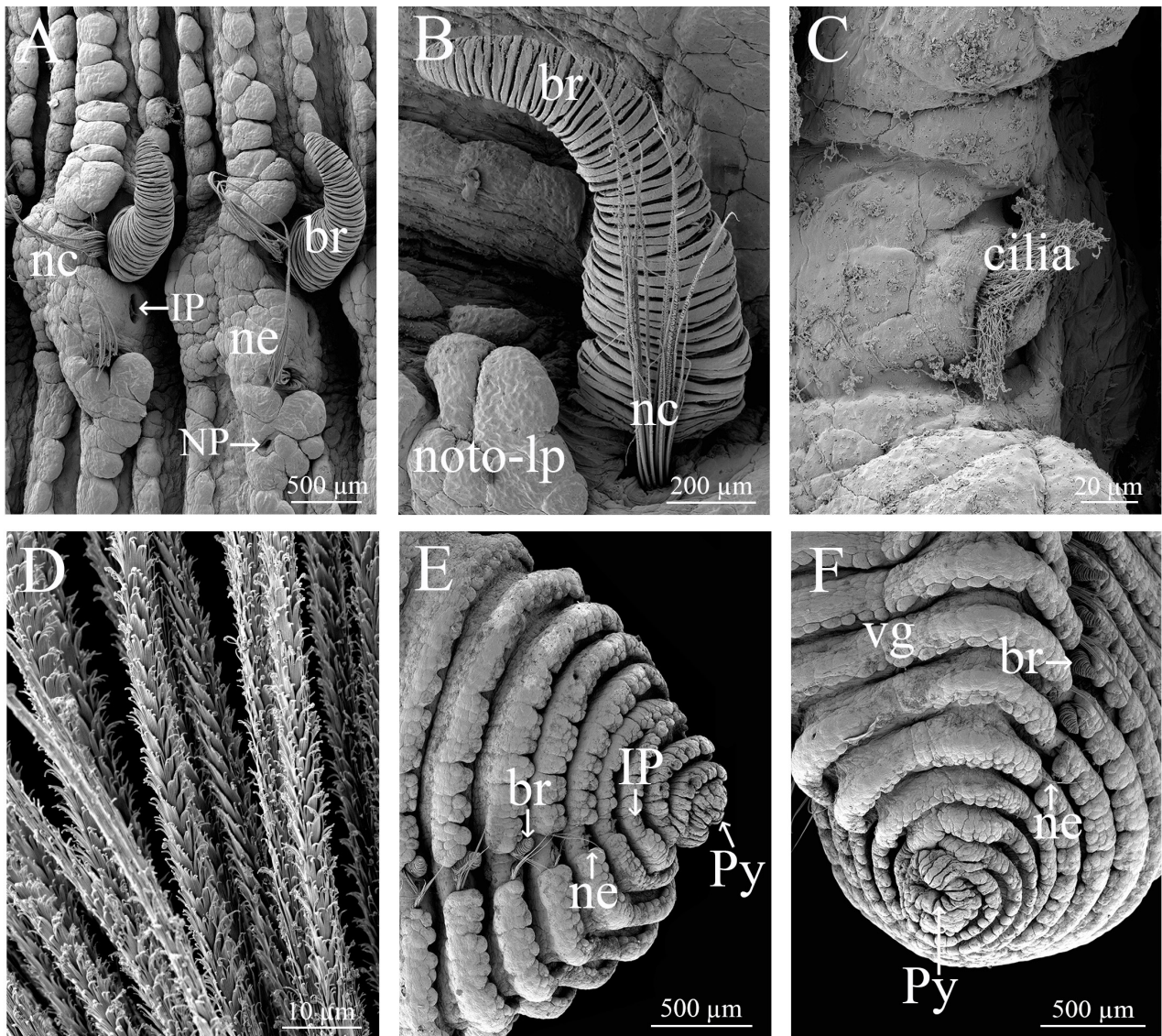


FIGURE 11. *Trivisia thailandensis* sp. nov. (PSUZC-POL-0352) A. Anterior parapodia, chaetigers 8–9, frontal view; B. Branchia, close-up; C. Close-up of an interrampal pore opening with cilia; D. Close-up of basal regions of spirally spinulose capillaries; E. Posterior region, lateral view; F. Same, oblique frontal view. Abbreviations: br, branchiae; IP, interrampal pore; nc, notochaetae; ne, neurochaetae; noto-lp, notopodial lappet; Py, pygidium; NP, nephridiopore; vg, ventral groove.

Sperm and egg sacs present in two paratypes (SEM specimens). Sperm sacs abundant, present along anterior chaetigers, with small spermatids, each about 0.6–5 μm in diameter (Fig. 12A–B). Other globular structures, herein regarded as oocyte sacs, are 22–31 μm in diameter (Fig. 12C–E).

Pygidium short, thick, spiraled, with 3 rings; anus terminal with more than 10 lobes in a circle (Figs 8A–B, 9A, D–E, 11E–F).

Variation. Number of chaetigers are invariable in larger specimens have (26 chaetigers); whereas smaller or juveniles have fewer chaetigers (20–24). However, in poorly preserved specimens, it was difficult to count the number of chaetigers.

Etymology. Named after the country where the new species was collected.

Habitat. Found at 50–80 m depth, in muddy sediments mixed with sand and shells, offshore the Gulf of Thailand.

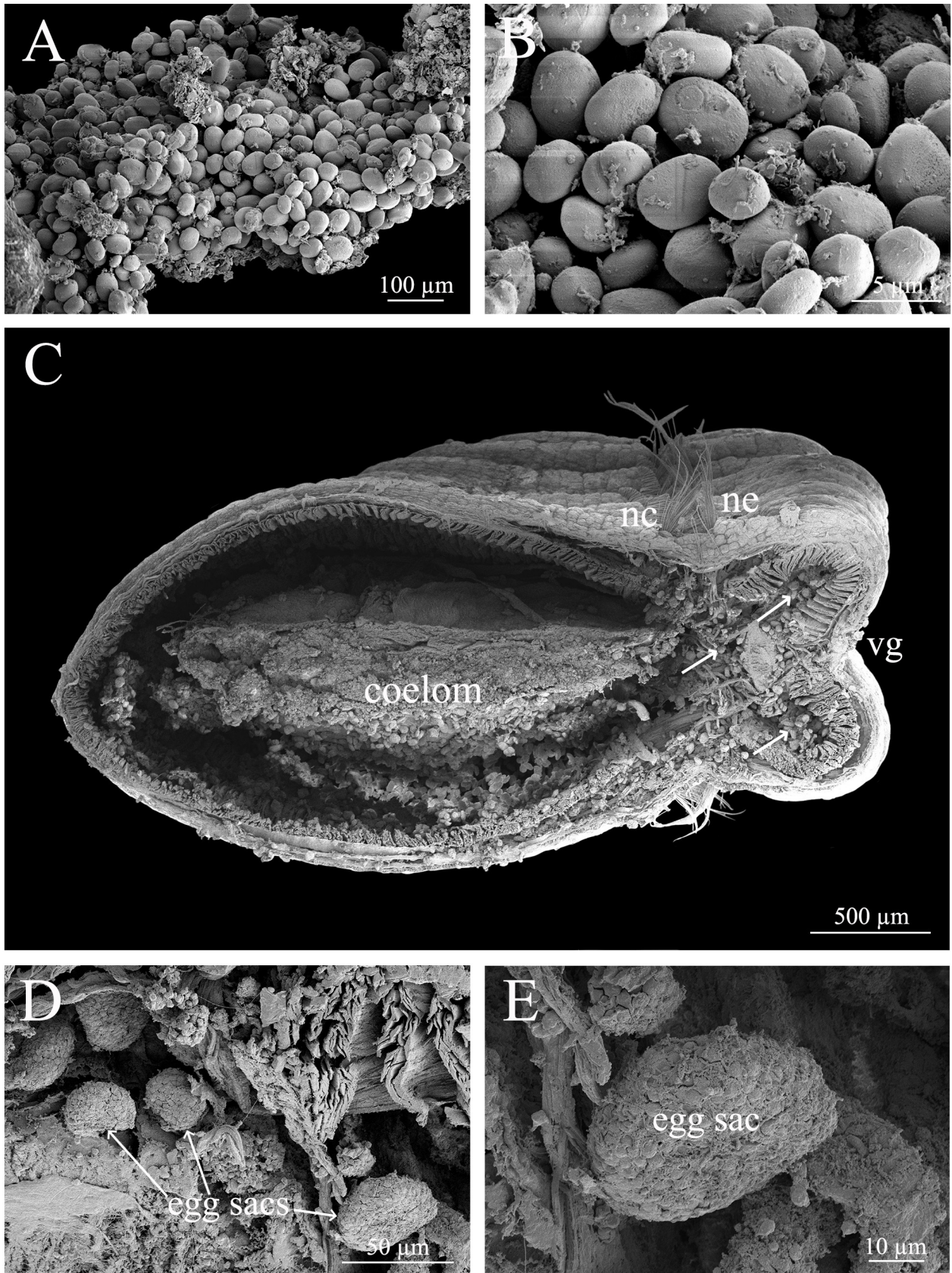


FIGURE 12. *Travisia thailandensis* sp. nov. A–B. Spermatids; C. Cross section of posterior chaetiger, arrows point to oocyte sacs, front view; D–E. Egg sacs, lateral view. Abbreviations: nc, notochaetae; ne, neurochaetae; vg, ventral groove.

Methyl green staining pattern. Prostomium is colorless. Epidermal papillae on the body and pygidium are stained intensely. Peristomium, anterior lips and chaetiger 1 are dark green ventrally. Rows of large papillae of each segmental annulus are more strongly stained as dark green transverse bands than small papillae. Staining persisted for longer than 7 days (Fig. 8). Staining began to fade from the anterior region before other areas, followed by segmental bands between annulations of the posterior segments.

Remarks. *Travisia thailandensis* **sp. nov.** belongs to the group of species having cirriform branchiae and a mid-ventral groove. This group comprises only three species: *T. hobsonae* Santos, 1977 from Florida, USA, *T. fusiformis* Kudenov, 1975, from the Gulf of California, Mexico and the new species, *T. thailandensis* **sp. nov.** from the Gulf of Thailand (Table 3).

TABLE 3. Comparison of adult *Travisia* with cirriform branchiae and mid-ventral groove.

Species/Morphology	<i>T. hobsonae</i> Santos, 1977	<i>T. fusiformis</i> Kudenov, 1975	<i>T. thailandensis</i> sp. nov.
Branchiae (pairs)	28–29	33–34	21
Chaetigers	30–31	34–35	26
Body length (mm)	14	35	12.6
First branchiae from chaetiger	3 to 30–31	2 to 34–35	2 to 22
Nephridiopores	3–14	3–14	7–14
Notopodial/ Neuropodial lappets	Notopodial lappets conspicuous throughout; neuropodial lappets inconspicuous from chaetigers 2–16, well developed from chaetiger 17 to the end of the body	Anterior chaetiger conspicuous, small lobes, well developed from chaetiger 17 to the end of the body; triangular with rounded apices	Poorly developed, small, conspicuous
Integument surface	Small rounded pustulae	Large circular pustules	Clusters of spherical to rounded lobes of papillae
Pygidium shape/number of anal cirri or lobes	Round lobes, 5–9 anal papillae of different width	Cylindrical as long as the last two segments (truncate).	Spiral shape, short, thick, with 3 rings. Terminal anus with more than 10 lobes in a circle

Travisia thailandensis **sp. nov.** differs from *T. hobsonae* by having 21 pairs of branchiae, starting from chaetiger 2, and a total of 26 chaetigers. *Travisia hobsonae* has 28–29 pairs of branchiae starting from chaetiger 3, and a total of 30–31 chaetigers (Santos 1977; Rizzo & Salazar-Vallejo 2020). *Travisia thailandensis* **sp. nov.** also differs from *T. hobsonae* by having nephridiopores on chaetigers 7–14, while *T. hobsonae* has nephridiopores on chaetigers 3–14 (Santos 1977).

Travisia thailandensis **sp. nov.** differs from *T. fusiformis* by having 26 chaetigers, whereas *T. fusiformis* has 34–35 chaetigers (Kudenov 1975; Rizzo & Salazar-Vallejo 2020). The new species has 21 pairs of branchiae, whereas *T. fusiformis* has more than 30 (33–34 pairs) (Kudenov 1975). Moreover, parapodial lappets in *T. thailandensis* **sp. nov.** are poorly developed throughout the body, with very short, low conspicuous lobes, whereas in *T. fusiformis*, parapodial lappets are well-developed from chaetiger 17 to the end of the body (Kudenov 1975).

Furthermore, nephridiopores are only present in *T. thailandensis* **sp. nov.** on chaetigers 7 to 14, while they are present in *T. fusiformis* on chaetigers 3 to 14 (Kudenov 1975). Epidermal papillae in *T. thailandensis* **sp. nov.** are rectangular clusters of papillae of various sizes and shapes, whereas those in *T. fusiformis* are circular in frontal view, set closely together, and are separated by narrow channels.

Also, the pygidium in *T. thailandensis* **sp. nov.** is short, spiral and without anal cirri, whereas *T. fusiformis* has a long, cylindrical pygidium with 6 or 7 flat, digitate papillae (Kudenov 1975). In addition, the pygidium of *T. hobsonae* has 5–9 anal papillae of different widths (Santos 1977). Finally, *T. thailandensis* **sp. nov.** is smaller and shorter than both the other species.

Distribution. Only known from the offshore area of the Gulf of Thailand (Fig. 1).

Key to *Travisia* species of Indo-Pacific Ocean

(Modified from Rizzo & Salazar-Vallejo 2020)

1. Branchiae branched 2
- Branchiae cirriform 3
2. One type of anal cirri with 6–8 short cirri *T. arborifera* Fauvel, 1932; Indian Ocean
- Two types anal cirri, 6 digitiform alternating with 4 small short cirri *T. satunensis* sp. nov.; Andaman coast, Indian Ocean
3. Mid-ventral groove present; first branchiae from chaetiger 2, 21 pairs; posterior lappets poorly developed, conspicuous; pygidium short *T. thailandensis* sp. nov.; Gulf of Thailand, Western Pacific
- Mid-ventral groove absent 4
4. Body with 44–53 chaetigers; posterior parapodia not projected from lobes or lappets; pygidium with 7 anal papillae *T. lithophila* Kinberg, 1866; Australia
- Body with less than 40 chaetigers 5
5. Body with 39–40 chaetigers *T. japonica* Fujiwara, 1933; Japan
- Body with 34–35 chaetigers *T. amoyanus* Yang, Wu, Wang, Zhao, Hwang & Cai, 2022; China, south China Sea
- Body with less than 30 chaetigers 6
6. Body with 23 chaetigers; posterior parapodia barely projected into lateral lappets; pygidium pigmented *T. horsti* Caullery, 1944; Indonesia
- Body with 23–29 chaetigers 7
7. Body with 27 chaetigers *T. chinensis* Grube, 1869; China
- Body with 20–25 chaetigers 8
8. Branchiae 19–20 pairs, last five segments achaetous *T. sanrikuensis* Kobayashi & Kojima, 2021; Japan
- Branchiae 22 pairs *T. oksae* Hartmann-Schröder & Parker, 1995; Australia

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