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Three new gastrotrich species of the genus *Tetranchyroderma* (Macrodasyida: Thaumastodermatidae) from Korea*

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Abstract

Three new gastrotrich species of the *genus Tetranchyroderma* are described sublittoral sandy bottoms of the Yellow Sea and Jeju Island in South Korea. *Tetranchyroderma aethesbregmum* **sp. nov.**, which has a dorsal cuticular armature with pentancres only, is characterized by the peculiar shape of the head with a median trapezoidal lobe flanking three pairs of papillae. *Tetranchyroderma megabitubulatum* **sp. nov.** is clearly differentiated from other pentancrous species by the character combination of three pairs of cephalic tentacles, a pair of long dorsolateral adhesive tubes, and paired 'foot' ventral adhesive tubes. *Tetranchyroderma insolitum* **sp. nov.** is the only species possessing cuticular armature with tetrancres and triancres mixed, and also characteristic in having an earlobeprotrusion at the posterolateral corners of head.

Key words: Description, Gastrotricha, marine, South Korea, taxonomy

Introduction

The serial faunal studies on macrodasyidan gastrotrichs have been carried out in Korea, since Chang et al. (1998a) first recorded two *Thaumastoderm* species, *T. copiophorum* and *T. appendiculatum*. A total of 16 species from six genera in two families, Planodasyidae Rao & Clausen, 1970 and Thaumastodermatidae Remane, 1926 have been recorded from the Korean coast so far (Chang et al. 1998a, b; Chang & Lee 2001; Lee & Chang 2002, 2003, 2006, 2007, 2012; Lee et al. 2009). Among them, five species belong to the genus *Tetranchyroderma* Remane, 1926, which is the most diversified and representative marine gastrotrich genus (Todaro 2002).

Since we have recently confirmed three new *Tetranchyroderma* species, which were collected from sublittoral bottoms in the Yellow Sea and Jeju Island, we add them to the gastrotrich fauna of Korea. Herein we describe the three new species with taxonomic remarks on their affinities based on morphological characters. We also provide detailed illustrations and SEM photomicrographs of each species.

Material and methods

Material was collected from sublittoral sandy bottoms at four localities (Fig. 1): Baegripo Beach (station 1), Gasa Beach (station 2), Myeongsasipri Beach (station 3) in the Yellow Sea and Hwasun (station 4) in Jeju Island, Korea.

Samplings were accomplished by scooping the top (~10 cm) sediments into polyethylene vinyl bags or 700 ml volume plastic bottles by skin diving or using a dredge. General methods, including scanning electron microscopy, were carried out by following our previous papers (Lee & Chang 2003; Lee et al. 2009).

Type specimens were deposited in the National Institute of Biological Resources (NIBR), Incheon, Korea, and in the Department of Biological Science (DB), Daegu University, Korea.

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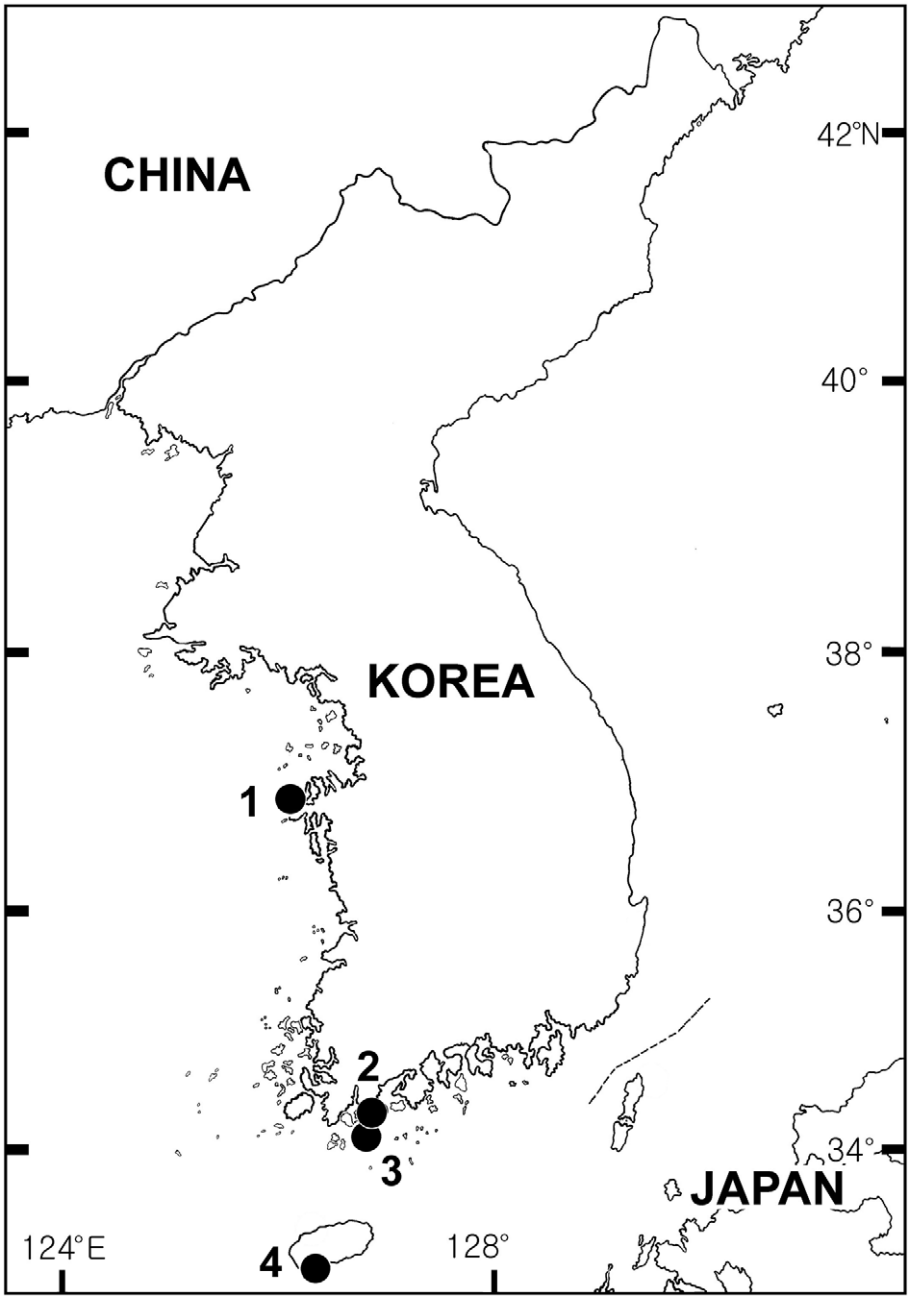

FIGURE 1. Sampling localities. 1, Baegripo Beach, Taean; 2, Gasa Beach, Joyakdo Island; 3, Myeongsasipri Beach, Sinjido Island; 4, Hwasun, Jeju Island.

Terminology used in the description mostly follows Ruppert (1991), Hummon et al. (1992) and Clausen (2000). Abbreviations used in the text and figures are as follows: Lt, total length, from anterior end of head to posterior tip of pedicles including adhesive tubes; PhJIn, junction between pharynx and intestine; TbA, anterior adhesive tubes; TbD, dorsal adhesive tubes; TbDL, dorsolateral adhesive tubes; TbP, posterior adhesive tubes; TbV, ventral adhesive tubes; TbVL, ventrolateral adhesive tubes; U, percentage unit of Lt, used for the location (U-) from anterior to posterior, or for the relative length (-U).

Taxonomic account

Order **Macrodasyida** Remane, 1925 [sensu Rao & Clausen, 1970]
Family **Thaumastodermatidae** Remane, 1926
Subfamily **Thaumastodermatinae** Remane, 1926

Genus ***Tetranchyroderma*** Remane, 1926

***Tetranchyroderma aethesbregmum* sp. nov.**
(Figs 2, 5A–C)

Type material. Holotype (DBG1701) and 11 paratypes (DBG1702–1709, NIBRIV0000245094, 0000245095) mounted in glycerin on H-S slides, 7 Oct. 2001, *leg*. J. Lee and C.Y. Chang.

Type locality. Hwansun, Jeju Island, Korea, 33°14′26″N 126°19′50″E, 4–5 m deep.

Etymology. The specific name, *aethesbregmum*, is taken from the Greek *aethes*, meaning "strange, unusual" and *bregma* "front part of head" which refers to the peculiar shape of the head with an extremely undulating oral hood and a median trapezoidal lobe flanking three pairs of papillae.

Diagnosis. A small *Tetranchyroderma* with an adult length to 384 µm; pharynx length to 96 µm; with peculiar shape of head bearing a median trapezoidal lobe of oral hood and three pairs of papillae; cephalic tentacles absent; dorsal cuticular armature with pentancres only; eight ventrolateral cirratum-type tubes per side behind foremost TbVL to posterior intestinal region; four TbA per side; 15–16 TbVL per side, leaf-shaped, foremost tube located in anterior pharyngeal region and others in intestinal region; a pair of TbV situated in front of anus; paired pedicles trifid with two distal tubes and a dorsal cirrate tube, three lateral tubes on either side of each pedicle, and a pair of medial tubes between the pedicles; testis reaching to middle of trunk; copulatory organ elongated, vesicle-shaped.

Description of holotype. Body (Fig. 2A, B) slender, Lt 353 µm; a little constricted just behind PhJIn, and gradually broadened to middle of intestinal region, then gently narrowing towards posterior end; caudal pedicle short and naked; widths of oral opening, neck, PhJIn, trunk, and caudal base 46/29/29/39/17 µm at U3/U18/U26/U50/U87, respectively.

Head (Figs. 2C, D, 5A, B) with extremely undulating oral hood dorsally, comprising a thin, broad, trapezoidal lobe bearing a median sensillum and paired long papillae each ornamented with membranous extension medially; a small, conical papilla arising from concavity of dorsal oral hood, flanking an elongated cylindrical papilla, which emerges from inside of the oral hood; oral opening flaring and undulating dorsolaterally, laterally and ventrally; sensory hairs scattered around oral opening; cephalic tentacles absent; about 10–12 hairs (9–14 µm long) aligned dorsolaterally and laterally throughout nearly whole body length (U8–U96).

Epidermal glands generally circular or ovoid, containing granules; seven to eight glands per side, along lateral side from posterior pharyngeal region to posterior intestinal region at U20, foremost one longest (9X19 µm in diameter), others mixed in size (6X7–7X17 µm); elliptical gland openings (stomata) with cuticularized lips (ca. 5–6 µm in diameter) dorsal surface of each gland.

Cuticular armature with pentancres only (Figs. 2E, 5C), spread over dorsal, lateral, and ventrolateral surfaces, except for front part of oral hood and caudum; arranged in 10–11 columns in mid-trunk region at U49, each column with 35–39 pentancres; pentancres 17 µm in diameter in most parts of the body, but smaller on oral hood (6 µm in diameter) and caudal base (5 µm in diameter); tines of pentancres are all similar in length.

Ventrolateral cirratum-tubes slender, minute granules, eight per side, aligned alongside TbVL; foremost (9 µm long) located just behind the first TbVL in anterior pharyngeal region at U13, others (9–12 µm long) more or less evenly spaced at intestinal region (U32–U81), asymmetrically arranged.

Adhesive tubes: four TbA per side, comprising a medial tube (7 µm long) at U3 and three ventrolateral tubes (6−8 µm long), lateralmost TbA pointing backward at U5. TbD(L) absent. TbVL 15–16 per side; foremost tube (9 µm long) slender and short, not foliaceaous, located in anterior pharyngeal region at U10; others (11–20 µm long) leaf-shaped, stumpy, much larger than foremost tube, aligned side by side in intestinal region from U35 to U83. A pair of TbV situated ahead of anus at U85, foliaceaous, 12–14 µm long. TbP seven per side, forming a feeble, trifid pedicle with two distal tubes (7 µm long) and a dorsal cirrate tube (5 µm long), accompanied with a medial foliaceaous tube (7 µm long) and three lateral foliaceaous tubes (6–13 µm long) at U92–U95.

Ventral locomotor ciliation arranged in a single column from behind oral opening to caudal base at U5.

Digestive tract: mouth terminal to 35 µm wide; pharynx 83 µm long (measured from ventral border of oral opening to PhJIn), pharyngeal pores at U22; intestine broad and narrowing toward posterior end; anus at U92.

Reproductive system (Fig. 2B): simultaneous hermaphrodite; single testis on right side, in dorsal view, short, reaching to U54, connected to copulatory organ via uncoiled vas deferens. A large ovum (28X51 µm) and a small oocyte present dorsally in mid-intestinal region at U51–U68. Seminal receptacle sac-like, located anterior to copulatory organ at U62–U74. Copulatory organ elongated, 69 µm long, vesicle-shaped, with anterior third narrowing, located at U71–U91.

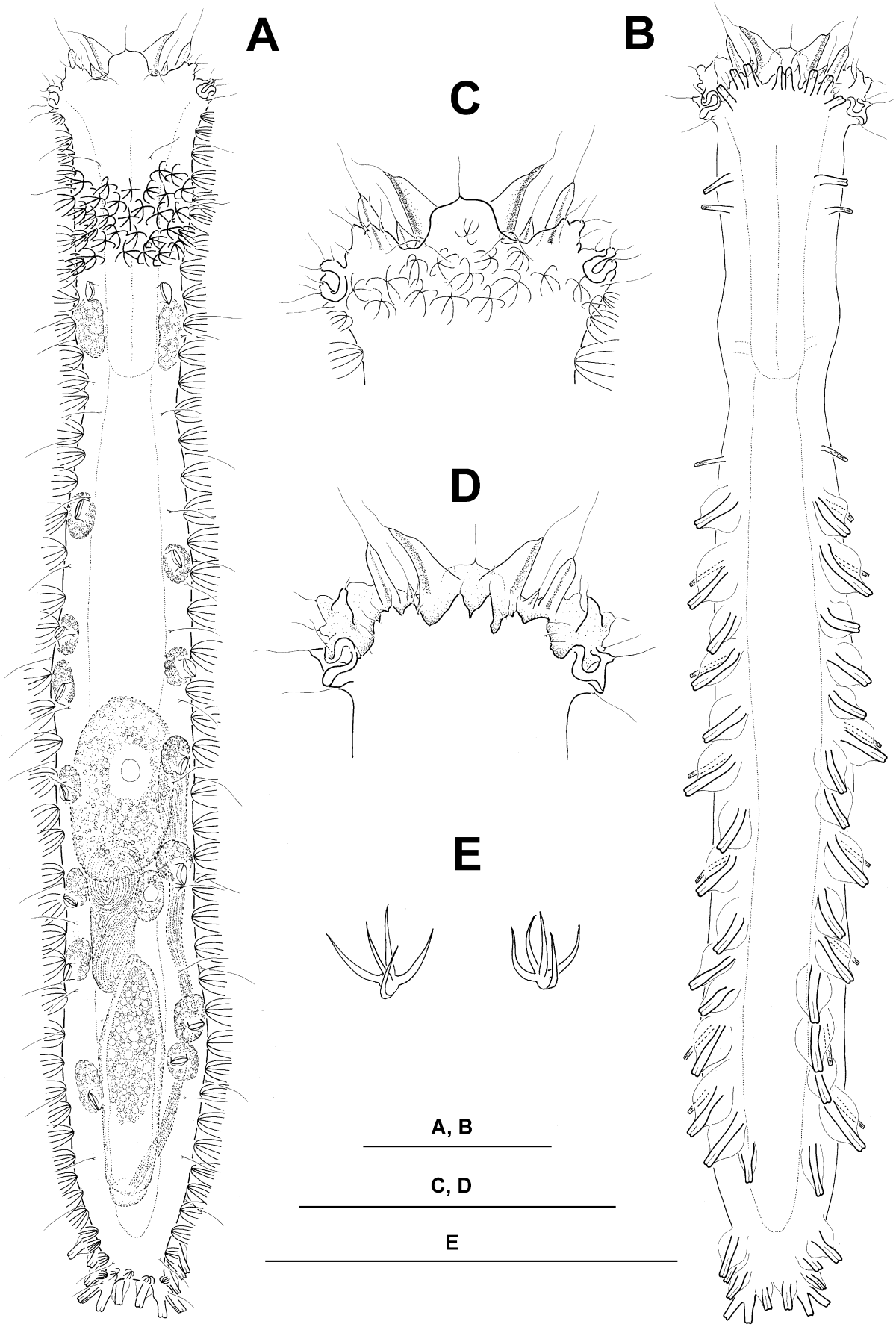

FIGURE 2. *Tetranchyroderma aethesbregmum* **sp. nov.** A, habitus, dorsal view; B, habitus, ventral view; C, head, dorsal view; D, head excluding TbA, ventral view; E, pentancres. Scale bars = 50 μm.

Ecology. The species occurred in sublittoral fine basaltic sandy bottoms at 4–5 m near Hwasun Harbor, Jeju Island, often together with *Tetranchyroderma multicirratum* Lee & Chang, 2007 and *Pseudostomella longifurca* Lee & Chang, 2002.

Measurements and Variability. Body lengths of 12 adult specimens mounted in glycerin range from 322–384 µm (mean 352 µm, standard deviation 23), maximum widths 40–52 µm (11U–15U).

The number and arrangement of adhesive tubes are a little variable: an additional ventrolateral TbA is shown in one side of only one specimen. TbVL in pharyngeal region is consistently single, but the number of TbVL in intestinal region is somewhat variable, ranging 13–16 per side. Number of TbP is rather consistent, except for lateral tubes, which range from two to four per side. Number of ventrolateral cirratum-type tubes in the intestinal region range from four to nine per side, asymmetrically arranged. Moreover, a specimen has an additional cirratum at the pharyngeal region in one side. A pair of TbV is consistently present.

Taxonomic affinities. The genus *Tetranchyroderma* currently comprises 75 valid species, of which four have a cuticular armature with triancres only, 29 with tetrancres only, 39 with pentancres only, and three with both tetrancres and pentancres (Todaro 2002; Hummon & Todaro 2010).

Tetranchyroderma aethesbregmum **sp. nov.** shares the cuticular armature of pentancres only with 39 species, however, it is most characteristic and easily differentiated from them by a unique shape of the head comprising a median trapezoidal lobe, three pairs of papillae beside the lobe and extremely undulating border of oral opening.

Besides the characteristic shape of head, *T. aethesbregmum* **sp. nov.** is allied to 11 species in lacking both cephalic tentacles and TbD(L): *T. polypodium* Luporini, Magagnini & Tongiorgi, 1971, *T. pacificum* Schmidt, 1974, *T. thysanophorum* Hummon, Todaro & Tongiorgi, 1993, *T. insulare* Balsamo, Fregni & Tongiorgi, 1994, *T. anomalopsum* Hummon, Todaro, Balsamo & Tongiorgi, 1996, *T. kontosomum* Hummon, Todaro, Balsamo & Tongiorgi, 1996, *T. tanymesatherum* Hummon, Todaro, Balsamo & Tongiorgi, 1996, *T. norvegicum* Clausen, 1996, *T. psilotopum* Hummon, Todaro, Tongiorgi & Balsamo, 1998, *T. pentaspersus* Nicholas & Todaro, 2006, and *T. oligopentancrum* Hummon & Todaro, 2009.

Among these 11 species, *T. anomalopsum*, *T. psilotopum* and *T. oligopentancrum* not fully covered with cuticular armature in contrast with the new species which is covered entirely. In *T. thysanophorum*, *T. tanymesatherum* and *T. pentaspersus*, the pentancres consist of a long central tine and four shorter peripheral ones, while pentancres with five equal tines are present in *T. aethesbregmum* **sp. nov.**

Moreover, *T. polypodium*, *T. insulare*, *T. kontosomum* and *T. pacificum* are distinguished from *T. aethesbregmum* **sp. nov.** in lacking cirratum-type tubes (versus eight pairs of cirrata in *T. aethesbregmum* **sp. nov.**).

Tetranchyroderma norvegicum is most similar to *T. aethesbregmum* **sp. nov.** in having cirratum-type tubes, TbV, and a trunk that is fully covered with pentancres of five equal tines. However, it differs from the new species by the arrangement of adhesive tubes: 7–8 TbA per side, 15 TbP per side, paired TbV consisting of seven tubes, and three pairs of dorsolateral cirrata.

Tetranchyroderma megabitubulatum sp. nov.

(Figs 3, 5D, E)

Type material. Holotype (DBG1901) and 12 paratypes (DBG1902–1910, NIBRIV0000245096, 0000245097) mounted in glycerin on H-S slides, 29 June 2006, *leg*. J. Lee.

Type locality. Baegripo Beach, Taean, Korea, 36°48′43″N 126°09′14″E, 1–3 m deep.

Etymology. The proposed specific name *megabitubulatum* alludes to a pair of large dorsolateral adhesive tubes.

Diagnosis. A small *Tetranchyroderma* an adult length to 464 µm; pharynx length to 100 µm; with fanwise head and slender body; armed with two pairs of rod-like cephalic tentacles and a pair of pestle organs; cuticular armature consisting of pentancres only; adhesive tubes: an oblique row of three TbA per side, comprising a medial and two ventrolateral tubes; a pair of long TbDL in mid-intestinal region; 14–15 TbVL per side, foremost tube located in anterior pharyngeal region and 13–14 TbVL in intestinal region; a pair of foot-type TbV consisting of two tubes; 5–7 TbP per side, forming trifid pedicles with two distal tubes and a dorsal cirratum, flanked by a medial and 2–3 lateral tubes.

Description of holotype. Body (Fig. 3A, B) slender and elongate, arched dorsally, flattened ventrally, 353 µm long; bothsides more and less parallel, except for a slight constriction in posterior pharyngeal region and caudal base; caudal pedicle elongate; widths of head/neck/PhJIn/trunk/caudal base 57/25/28/32/17 µm at U6/U27/U34/U60/U93, respectively.

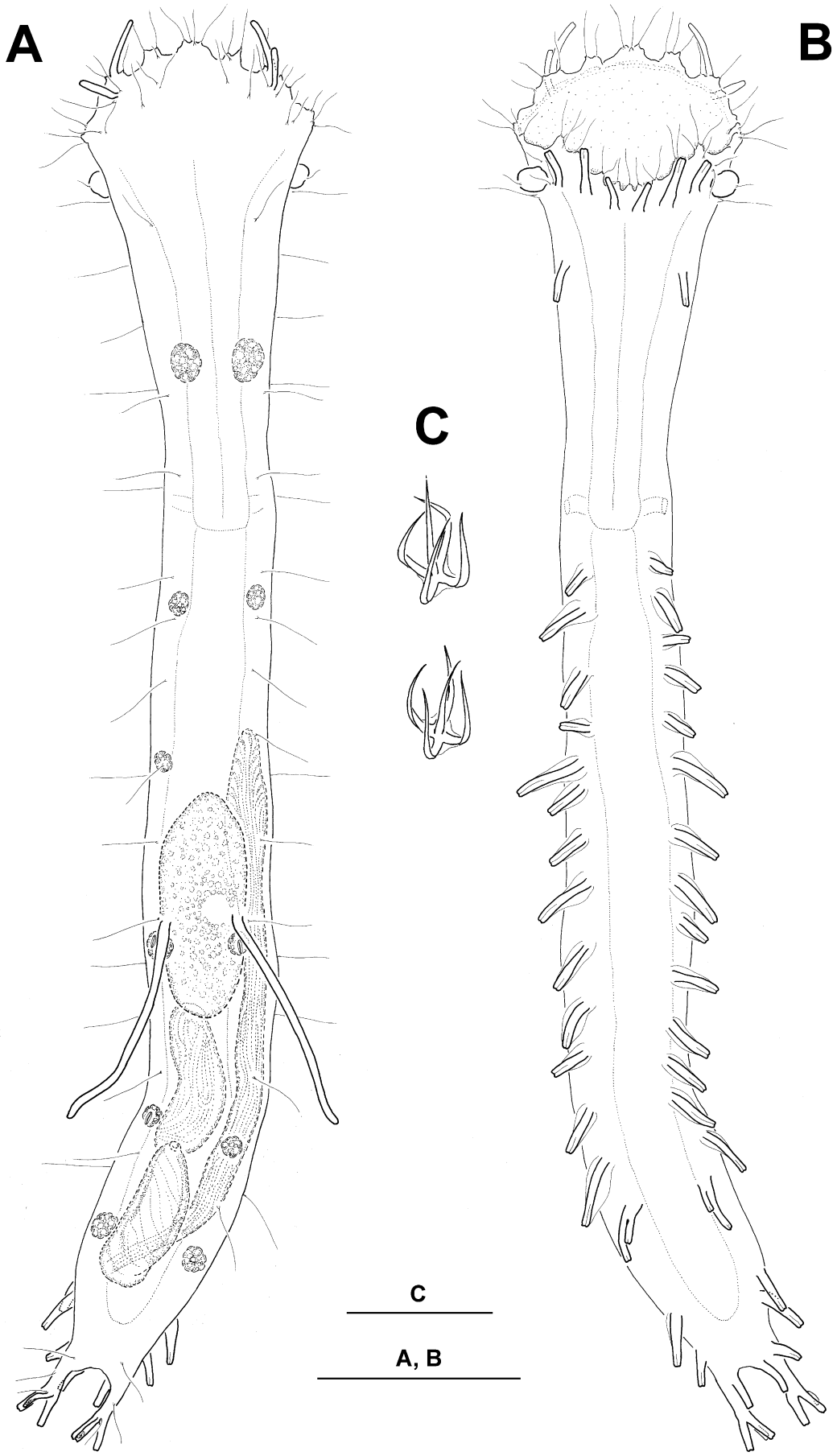

FIGURE 3. *Tetranchyroderma tritentaculatum* **sp. nov.** A, habitus, dorsal view; B, habitus, ventral view; C, pentancres. Scale bars = 50 μm (A, B), 10 μm (C).

Head broad and fanwise with 15 sensory hairs scattered on dorsal surface of oral hood; anterior margin convex and uneven, with seven peaks, each peak bearing 2–3 papillae with sensory hairs. Two pairs of rod-like cephalic tentacles present; first pair slender and long, 15 µm long, situated on anterolateral peak of oral hood at U2; second pair short, 10 µm, situated slightly dorsally just behind the preceding one at U3. A pair of pestle organs situated at posterolateral corner of head, beside ventrolateralmost TbA at U10, protruding ventrolaterally, each accompanied by two short hairs. Numerous paired sensory hairs (~17 µm long) dorsolateral and lateral surfaces behind pestle organ to middle of caudum (U12).

Epidermal glands of granular type, six per side, asymmetrically distributed from U21 to U86, with different size (4–7 µm in diameter).

Cuticular armature (Figs. 3C, 5E) with pentancres only, scattered all over dorsal surface excluding anteriormost part of oral hood and caudum; arranged in 13–15 columns in mid-trunk region (U53), each column with up to 50–55 pentancres; ancres with slender tines, 3 µm in diagonal length on head, 4 µm on caudal base, and 16 µm in mid-trunk region.

Adhesive tubes: three TbA per side arranged obliquely, consisting of a small medial tube, 8 µm long, pointing backward at U12 and two ventrolateral tubes, 13 µm and 9 µm long, U11 and U10, respectively; a pair of elongated TbDL (Fig. 5D), 57 µm long, situated in middle of intestinal region at U62; 14–15 TbVL per side, foremost tube 9 µm long, at U16, others more robust, from 9 µm in length, distributed intestinal region U36 to U78; paired foot-type TbV represented by two tubes at posterior intestinal region at U81, medial tube shorter than lateral tube, 9 µm and 15 µm long, respectively; 6–7 TbP per side, forming a little elongated pedicle with three tubes, two horizontal tubes and a dorsal, cirratum-type tube, 8 µm long; flanked by a medial tube (10 µm long) and 2–3 lateral tubes, of which the latter extends to the anus at U89.

Ventral ciliation aligned in a single column from just behind TbA to the anus (U13–U92).

Digestive tract: oral opening broad (52 µm wide) with oral hood extending forward above the mouth from U0 to U10; pharynx 85 µm long, narrows to half of posterior part at U23-U34; a pair of pharyngeal pores opens laterally, slightly in front of PhJIn at U32; intestine broad with both ends narrowing a little; anus opens ventrally at U89.

Reproductive system: simultaneous hermaphrodite; single testis on right side, extending far behind, at U47. A large ovum (20X56 µm in diameter) located dorsally in midtrunk region at U52–U68. Seminal receptacle between ovum and copulatory organ at U67–U78, elongated, ellipsoidal, 41 µm long, containing several spermatozoa. Copulatory organ elongated, protruding anteriorly, 39 µm long (U77–U94).

Ecology. Specimens occurred in low abundance in fine to medium sublittoral sands (1–3 m in depth), often together with *Tetranchyroderma multicirratum* Lee & Chang, 2007 and *Ptychostomella orientalis* Lee & Chang, 2003.

Measurements and variability. Body lengths of 12 type specimens mounted in glycerin range from 316 to 464 µm (mean 388 µm, standard deviation 39), maximum widths from 29–39 µm.

Number and arrangement of adhesive tubes show some variation. Two specimens have an additional ventrolateral TbA on one side. Foot-type TbV usually consists of two tubes, except for four specimens with three tubes on one side only. Single TbVL is present in the pharyngeal region consistently, but the number of tubes in the intestinal region is rather variable, 13–20 per side, asymmetrically distributed. TbP usually form a trifid pedicle flanking a medial tube, however, the number of lateral tubes are variable, ranging from 2 to 4 per side.

Taxonomic affinities. Among the allied congeners with cuticular armature of pentancres only, *T. megabitubulatum* **sp. nov.** is most similar to *T. quadritentaculatum* Todaro, Balsamo & Tongiorgi, 1992 in having two pairs of cephalic tentacles and a pair of TbDL. However, *T. megabitubulatum* **sp. nov.** is clearly distinguished from this species by the presence of pestle organs, a pair of TbV, a TbVL in the anterior pharyngeal region, much longer TbDL in the mid-intestinal region, and the fanwise shape of head (compared to a truncated anterior margin of the head in *T. quadritentaculatum*).

In the genus *Tetranchyroderma*, *T. megabitubulatum* **sp. nov.** shares two pairs of cephalic tentacles and pestle organs only with *T. multicirratum* Lee & Chang, 2007 from Korea. It is easily distinguished from *T. multicirratum* by a larger body size (353 µm in *T. megabitubulatum* versus 227 µm in *T. multicirratum*), absence of cirratum-type tubes, and a different composition of cephalic tentacles (consisting of two rod-like tentacles in *T. megabitubulatum*, while a rod-like tentalcle and a conical tentacle are present in *T. multicirratum*).

***Tetranchyroderma insolitum* sp. nov.**
(Figs 4, 5F)

Type material. Holotype (DBG1801) and four paratypes (DBG1802, 1803, NIBRIV0000245098, 0000245099) mounted in glycerin on H-S slides, 8 May 2009, *leg*. J. Lee and C.Y. Chang.

Type locality. Myeongsasipri Beach, Sinjido Island, off Wando Island, Korea, 34°19′35″N 126°48′34″E, 1–3 m deep.

Additional material examined. Ten individuals mounted in glycerin, Myeongsasipri Beach, Sinjido Is.,Wando Is., 8 Feb. 2003, *leg*. J. Lee and C.Y. Chang; eight individuals in glycerin, Gasa Beach, Joyakdo Island,15 Nov. 2010, *leg*. J. Lee and C.Y. Chang.

Etymology. The specific name, *insolitum*, is derived from the Latin *insolitus*, meaning "strange, odd, unusual, peculiar", which alludes to the unusual cuticular armature with both triancres and tetrancres and peculiar earlobe-like protrusions at ral corners head.

Diagnosis. A small *Tetranchyroderma*an adult length to 389 µm; pharynx length to 101 µm; with round anterior border of head and an earlobe-like protrusion at each posterolateral corner the head; cephalic tentacles absent; with combined cuticular armature consisting of tetrancres and triancres; four dorsolateral cirratum-type tubes and six lateral cirrata per side; four TbA per side; 6–18 TbVL per side; a pair of foot-type TbV, each consisting of two tubes with different lengths; a pair of pedicles, trifid with two distal tubes and a dorsal cirratum-type tube, accompanied with 2–4 medial and three lateral tubes; copulatory organ pyriform.

Description of holotype. Body (Fig. 4A, B) oblong and slender, Lt 320 µm, vaulted dorsally, flattened ventrally; pharyngeal region slightly slender, and both sides nearly parallel; caudal pedicle elongate and naked; widths of head/neck/PhJIn/trunk/caudal base 44/31/34/41/25 µm at U5/U22/U36/U54/U92, respectively.

Head broad with gently convex anterior border; a pair of drooping, earlobe-like protrusions (not pestle organs), present at posterolateral corner of head (U8) with a short hair at each tip; without cephalic tentacles;18 sensory hairs (11–13 µm) implanted along anterodorsal border of oral hood, where are ancres lacking; shorter hairs (3–5 µm) surrounding mouth opening; numerous hairs (13–20 µm) aligned dorsolaterally and laterally at U12–U93.

Epidermal glands: 7–8 per side, beginning at U25 and ending at U91; generally oval, mixed in size (4X5–8X17 µm); a few small gland openings (2 µm in diameter) occurred on dorso- and ventrolateral surfaces, irregularly.

Cuticular armature (Figs. 4C, D, 5F) with numerous tetrancres and a small proportion of interspersed triancres, densely covering dorsal, lateral and ventrolateral surfaces; arranged in 14–17 columns in mid-intestinal region, each column with up to 43–48 ancres; anterior and mid-dorsal surfaces of trunk with tetrancres only; remaining surfaces from dorsolateral to ventrolateral and posterior part of trunk mixed with tetrancres and triancres; tetrancres (Fig. 4C), 14 µm in diagonal length between opposite tines at mid-trunk region, a little smaller at anteriormost part of head (7 µm) and caudal base (6 µm); triancres (Fig. 4D), one side of triangles ca. 6 µm long, at posterior part of trunk region (U84), each tine arising from its own base; triancres distributed irregularly and rarely.

Dorsolateral cirratum-type tubes four per side, slender, containing fine granules; more or less evenly spaced from U17 to U61, with foremost cirratum (12 µm long) in pharyngeal region at U17, and three cirrata from PhJIn to middle of intestinal region (15 µm, 10 µm, and 17 µm long) at U36, U46 and U61, respectively; third cirratum a little shorter, located more dorsally. Lateral cirrata six per side, 7–10 µm long, distributed from just ahead of PhJIn to posterior trunk region at U31–U79.

Adhesive tubes: TbA four per side, forming a feeble arc with a pair of subconical medial tubes (5 µm) and three ventrolateral tubes (6 µm) behind oral opening; a pair of foot-type TbV consisting of two tubes with different lengths (outer one usually much longer), fused at base, situated at posterior trunk region (U81 and U84), asymmetrically distributed; TbVL 16–18 per side, foremost tube (7 µm) located in anterior pharyngeal region at U13, remaining ones much larger, ranging from 9 µm to 23 µm in length, distributed from PhJIn to front of TbV at U32–U76; TbP, eight tubes on right side, 10 on left, forming little elongated pedicles (23 µm), each with two distal tubes and a shorter dorsal cirratum (6 µm) between them, pedicles flanked by 2–4 medial (6–8 µm)and three lateral tubes (6–9 µm).

Ventral cilia covering mid-ventral surface entirely, just behind TbA to base of caudum at U9–U92.

Digestive tract: oral opening broad (36 µm wide) with oral hood extending forward above the mouth from U0 to U07; pharynx 87 µm long, with paired pharyngeal pores opened at U31; intestine narrow and gradually broad toward posterior end; anus opens ventrally at U91.

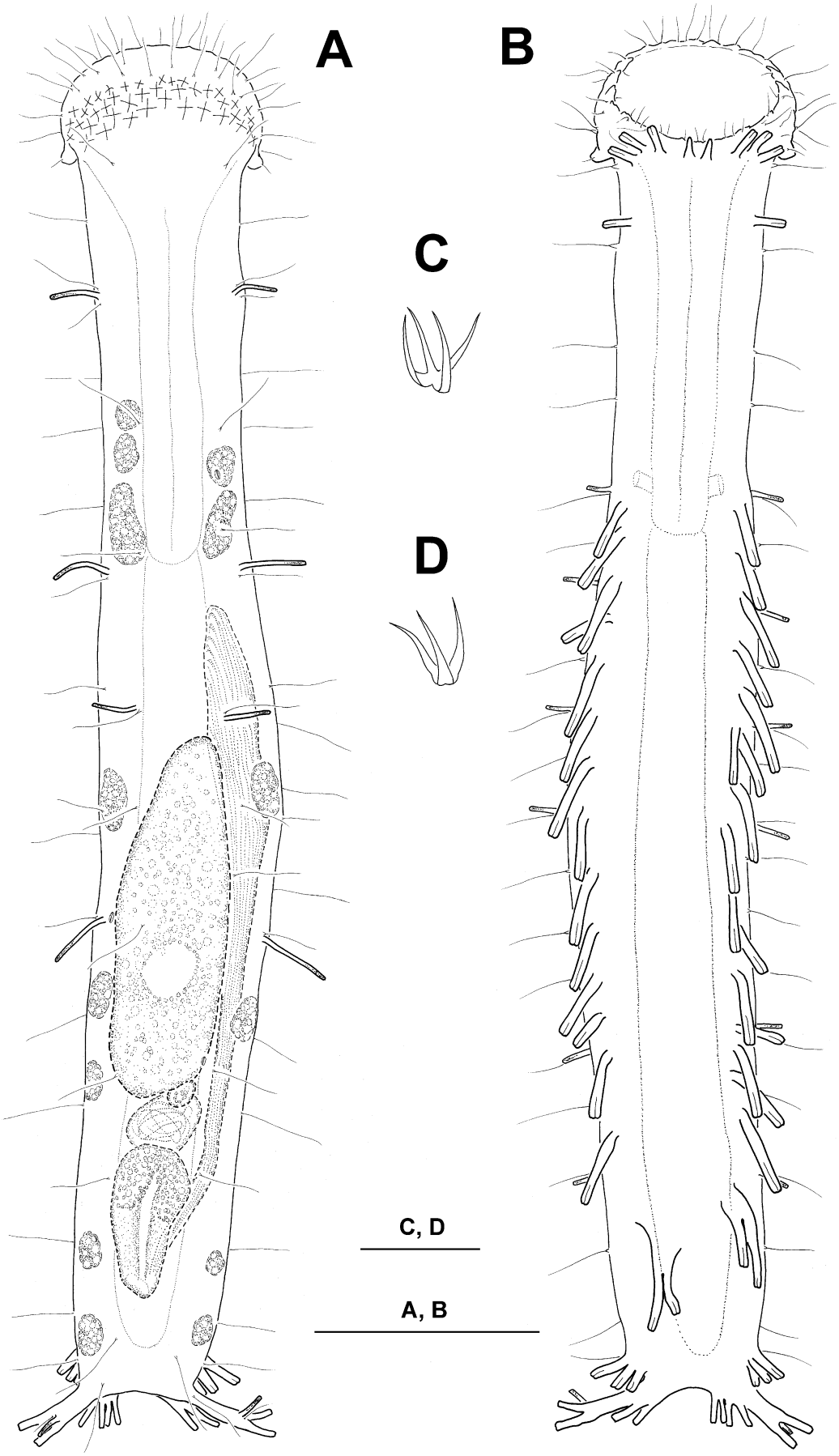

FIGURE 4. *Tetranchyroderma insolitum* **sp. nov.** A, habitus, dorsal view; B, habitus, ventral view; C, tetrancre; D, triancre. Scale bars = 50 μm (A, B), 10 μm (C, D).

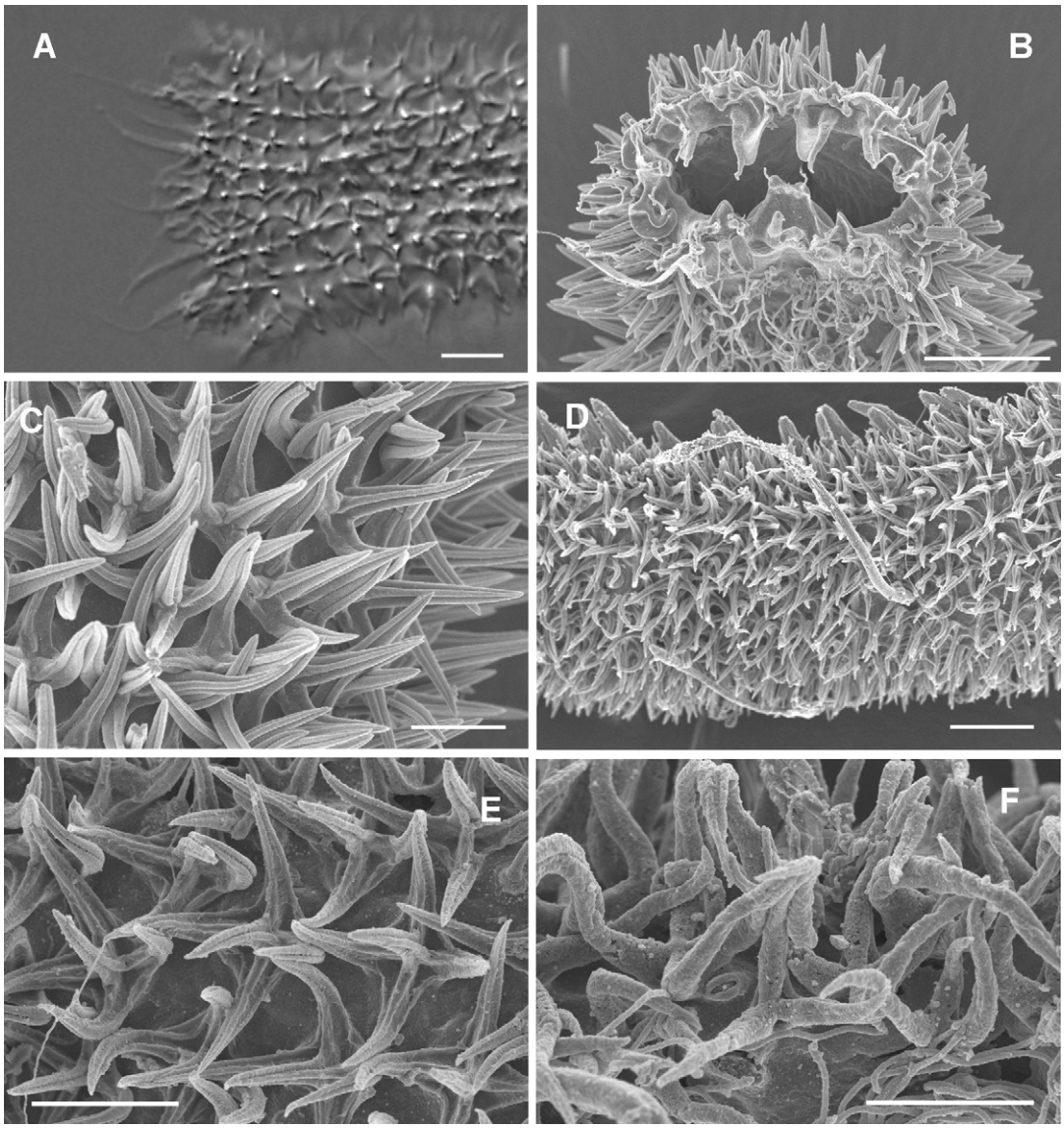

FIGURE 5. A–C, *Tetranchyroderma aethesbregmum* **sp. nov.:** A, head, dorsal view, DIC micrograph; B, head, frontal view, SEM micrograph; C, pentancres, SEM micrograph. D–E, *Tetranchyroderma tritentaculatum* **sp. nov.**, SEM micrographs: D, mid-intestinal region showing a pair of dorsal adhesive tubes; E, pentancres. F, *Tetranchyroderma insolitum* **sp. nov.**, cuticular armature with tetrancres and triancres mixed, SEM micrograph. Scale bars = 10 µm (A, B, D), 5 µm (C, E, F).

Reproductive system (Fig. 5A): simultaneous hermaphrodite; single testis on right side in dorsal view, extending to behind PhJIn at U39. Vas deferens extending straight with its posterior end slightly bent, approaching to rear of copulatory organ. A well-developed ovum (25X80 µm in diameter) and a small oocyte (6X7 µm in diameter) situated dorsally at mid-trunk (U48–U74). Seminal receptacle ovoid, 15 µm in diameter, located between ovum and copulatory organ at U72–U77. Copulatory organ pyriform, anterior portion broad and gradually narrowing posteriorly, located at U76–U87.

Ecology. Specimens were collected among fine to medium sublittoral sands, from 1–3 m.

Measurements and variability. Body lengths of five type specimens and 18 additional specimens mounted in glycerin range from 255–389 µm (mean 325 µm, standard deviation 36) with maximum widths from 28 µm (9U–14U).

The number and arrangement of dorsolateral and lateral cirrata, TbA, TbVL, and TbP show some variability, ranging from 3 to 5 dorsolateral cirrata, 3–7 lateral ones, 3–4 TbA, 12–18 TbVL, and 6–10 TbP per side, respectively. However, medial TbA, anteriormost TbVL at pharyngeal region, the number and arrangement of TbV, and trifid pedicle are consistent.

Taxonomic affinities. Three species, *T. paradoxum* Thane-Fenchel, 1970, *T. paralittoralis* Rao, 1991, and *T. tentaculatum* Rao, 1993, are known to have a mixed cuticular armature with tetrancres and pentancres. *Tetranchyroderma insolitum* **sp. nov.** is most characteristic in having an unusual combination of cuticular armature, consisting of triancres and tetrancres. This type of armature is the first case in the genus to our knowledge. Moreover, *T. insolitum* **sp. nov.** is the only species in the genus bearing peculiar drooping earlobe-like protrusions posterolateral corners of head, which are apparently different from pestle organs.

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