

Two New *Tetranchyroderma* Gastrotrichs (Macrodasyida, Thaumastodermatidae) from South Korea

Cheon Young Chang* and Ji Min Lee

Department of Biology, College of Natural Sciences, Taegu University, Kyungsan 712-714, Korea

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Two new gastrotrich species belonging to genus *Tetranchyroderma* are described on the basis of the specimens from intertidal or sublittoral sand bottoms of South Korea. *Tetranchyroderma heterotentaculatum*, n. sp. is clearly differentiated from its congeners by the character combination: the cuticular armature with pentancre, modified rod-like cephalic tentacles, and three pairs of dorsolateral adhesive tubes. *Tetranchyroderma hoonsooi*, n. sp. possesses tetrancre, paired lateral cephalic tentacles, and ventrolateral adhesive tubes along whole lateral margin, while lacks dorsal adhesive tubes. Affinities with its congeners and variability within the species are discussed, with brief notes on morphological discrepancies between adults and juveniles.

Tetranchyroderma is a representative genus of marine gastrotrichs. It is the most diversified group, comprising over 15% of all marine gastrotrich species currently recognized. Furthermore, members of this genus commonly and ubiquitously occur from various habitats, especially from the interstices of intertidal or shallow sublittoral sands of various grain sizes. For accustomizing themselves to these peculiar habitats, they have developed the typical adaptive organs such as dorsal cuticular armature of numerous hooks with 3-5 prongs, paired cephalic tentacles, and adhesive tubes along ventrolateral and posterior margin of the trunk as well as posterior border of the oral opening, which are the key characters for classifying these tiniest metazoans.

Since Remane (1926) established the genus *Tetranchyroderma* to accommodate *Tetranchyroderma hystrix* from the North Sea (Kiel, Germany), 46 species have been known to be valid in the genus to date. In the West Pacific, however, taxonomic studies on marine gastrotrichs are nearly lacking (cf. Chang et al., 1998b), and only two species are recorded in the genus *Tetranchyroderma*: *T. dentricum* Saito from Hiroshima, Japan (Saito, 1937) and *T. gracilium* Chang, Lee and Clausen from Jeju Island, South Korea (Chang et al., 1998b).

This article deals with description of two new *Tetranchyroderma* species, *T. heterotentaculatum* and *T. hoonsooi*, from South Korea. According to their morphological characters, they are fully described and illustrated with photomicrographs by scanning electron

microscopy and differential interference contrast microscopy. Affinities with its congeners and intraspecific morphological variations as well as morphological discrepancies between adults and juveniles are also remarked.

Materials and Methods

Materials were collected from the intertidal or shallow sublittoral bottom sands at several locations around the west and south coast of Korea.

Samplings were made by scooping the top sediments into 500 ml plastic bottles, and then were extracted by the anesthetization (using 7% MgCl₂)-decantation technique in the laboratory. The extracted specimens were fixed in 5% buffered formalin.

Specimens were mounted in glycerin on H-S slide (Shirayama et al., 1993) after treatment in a solution of 5% glycerin in 95% ethyl alcohol for 1-2 days, and observed under a differential interference contrast microscope with Nomarski optics. All drawings and measurements were made using a camera lucida. Minute morphological characters like sensory hairs and inner genital organs were examined and video-recorded when alive using CCD camera.

The detailed method of preparations for scanning electron microscopy was referred to Chang et al. (1998a, b).

Terminology used in the description follows Ruppert (1991) and Clausen (2000). Abbreviations are shown in Table 1.

* To whom correspondence should be addressed.
Tel: 82-53-850-6454, Fax: 82-53-850-6459
E-mail: cychang@taegu.ac.kr

Table 1. Morphological abbreviations and definitions

Lt	total length, from anterior tip of head to posterior tip of caudum, or pedicles including adhesive tubes
U	percentage units of Lt, used for the location (U-) from anterior to posterior or for the relative length to Lt (-U)
PhJIn	junction between pharynx and intestine
TbA	anterior adhesive tubes
TbD	dorsal adhesive tubes
TbDL	dorsolateral adhesive tubes
TbV	ventral adhesive tubes
TbVL	ventrolateral adhesive tubes
TbP	posterior adhesive tubes

Descriptions

Family Thaumastodermatidae Remane, 1926
 Subfamily Thaumastodermatinae Ruppert, 1978
 Genus *Tetranchyroderma* Remane, 1926

Tetranchyroderma heterotentaculatum, new species
 (Figs. 1, 3A-E)

Material examined: 12 individuals (1 juv.), Gimnyeong beach (33° 33' 21" N, 126° 45' 41" E), Jeju I., 20 Jul. 2001, C.Y. Chang, J.M. Lee and Y.H. Song. Holotype (EWNHM60263) and 1 paratype (EWNHM-60264) mounted in glycerin are deposited in the Natural History Museum of Ewha Womans University. Other paratypes are kept in the collection of the authors.

Additional materials examined: 3 inds., Mongsanpo, 24 May 1996, C.Y. Chang and H.S. Rho; 1 ind., Guryongpo, 17 Nov. 1996, C.Y. Chang and H.S. Rho; 3 inds. (1 juv.), Guryongpo, 3 Jul. 1997, C.Y. Chang and H.S. Rho; 7 inds., Pyoseon, Jeju I., 7 Jun. 2001, J.M. Lee; 6 inds., Hamdeok, Jeju I., 17 Jul. 2001, C.Y. Chang, J.M. Lee and Y.H. Song; 3 inds., Hyeobjae, Jeju I., 18 Jul. 2001, C.Y. Chang, J.M. Lee and Y.H. Song; 5 inds., Gimnyeong, Jeju I., 19 Jul. 2001, C.Y. Chang, J.M. Lee and Y.H. Song.

Diagnosis: *Tetranchyroderma* with slender and elongated body; bearing a pair of long rod-like cephalic tentacles, unusually constricted at its distal third with sensory hairs; cuticular armature of pentancreas only; 5 TbA per side, comprising 1 medial and 4 ventrolateral ones; 3 TbDL per side, first tube just behind PhJIn, second one in mid-trunk region and third one at posterolateral edge of body; 15-16 TbVL per side; caudum bilobed; 7 TbP per side, forming a well-developed pedicle with 3 distal, 1 medial and 3 lateral tubes; copulatory organ pyriform.

Description of the holotype: Body (Figs. 1A-B, 3A) slender and elongated, somewhat flattened dorsoventrally; Lt 489 µm long including TbP, maximum width 65 µm at mid-trunk (at U51); both sides largely sub-parallel, slightly swollen at mid-trunk region, then narrowing gradually to bilobed caudum; widths of head/neck/PhJIn/trunk/caudal base 43/43/50/65/19 µm at U02/

U18/U33/U51/ U95, respectively.

Head a little protruding anteriorly. Sensory hairs situated along anterior margin of oral hood and posterior margin of elliptical oral opening (ca. 36 µm in diameter), ranging 5-11 µm in length; at least 9 hairs scattered on anterodorsal surface of oral hood, and 10-12 hairs per side inserted on lateral or dorsolateral surface from neck to trunk region (U07-U95). Paired rod-like cephalic tentacles situated just behind posterolateral corner of head (U03), protruding anterolaterally; tentacle slim and elongated, 35 µm long, unusually constricted at its distal third with 2 or more sensory hairs. A pair of tufts located behind posterolateral edge of oral opening, each including more than 3 hairs, issuing from a small protuberance (U04).

Epidermal glands aligned subdorsally or ventrolaterally along nearly whole length from neck to trunk (U11-U96), with generally circular shape, mixed in size (3-12 µm in diameter).

Cuticular armature (Figs. 1C, 3B) with pentancreas only, arranged in 29-33 columns in mid-trunk region, each column with up to 129-141 pentancreas; size of pentancreas variable, 1 µm long between opposite tines at head portion (U03), 4 µm at mid-trunk (U53), and 5 µm near caudum (U91), respectively.

Adhesive tubes: 5 TbA per side, comprising 1 sub-conical tube occurring medially at U07 (10 µm long), 1 robust and longer subventral tube (14 µm long), remaining 3 tubes forming a ventrolateral column (ranging 7-10 µm in length). Three TbDL per side; first tube 14 µm long, situated a little behind PhJIn at U37; second one 14 µm long, in mid-trunk region (U65); last one shorter than others, 11 µm long, locating near posterolateral edge of body (U89). TbVL 15-16 per side, ranging ca. 10-17 µm in length, more or less evenly spaced from U38 to U83. Seven TbP per side forming a well-developed pedicle, consisting of 2 distal tubes with 1 slender tube and 1 bristle inserted dorsally between the furca, flanked by 3 lateral tubes (8-9 µm long) and 1 medial tube (8 µm long).

Testis (Fig. 1B) single on right side, its distal end reaching U43, far behind PhJIn. Vas deferens straight (not coiled or folded), internally joining copulatory organ, and containing numerous spermatozoa. Copulatory organ (Fig. 3D) pyriform with its anterior margin rather flat, surrounded by thin muscles, located in U82-U87. Seminal receptacle elongated, suboval (17 µm × 39 µm), situated anterior to copulatory organ (U72-U80), including a motile spermatozoon. Spermatozoa apparently seen within testis and seminal receptacle (Figs. 1B, 3E), ca. 186 µm long, with proximal quarter spiraled, as in Fig. 1D. One fertilized egg (maximum diameter ca. 31 µm) maturing dorsally in mid-intestinal region.

Occurred abundantly among fine sands on the subtidal bottom (3-5 m in depth), often together with the succeeding species *Tetranchyroderma hoonsooi*, and occasionally with *T. gracilium*.

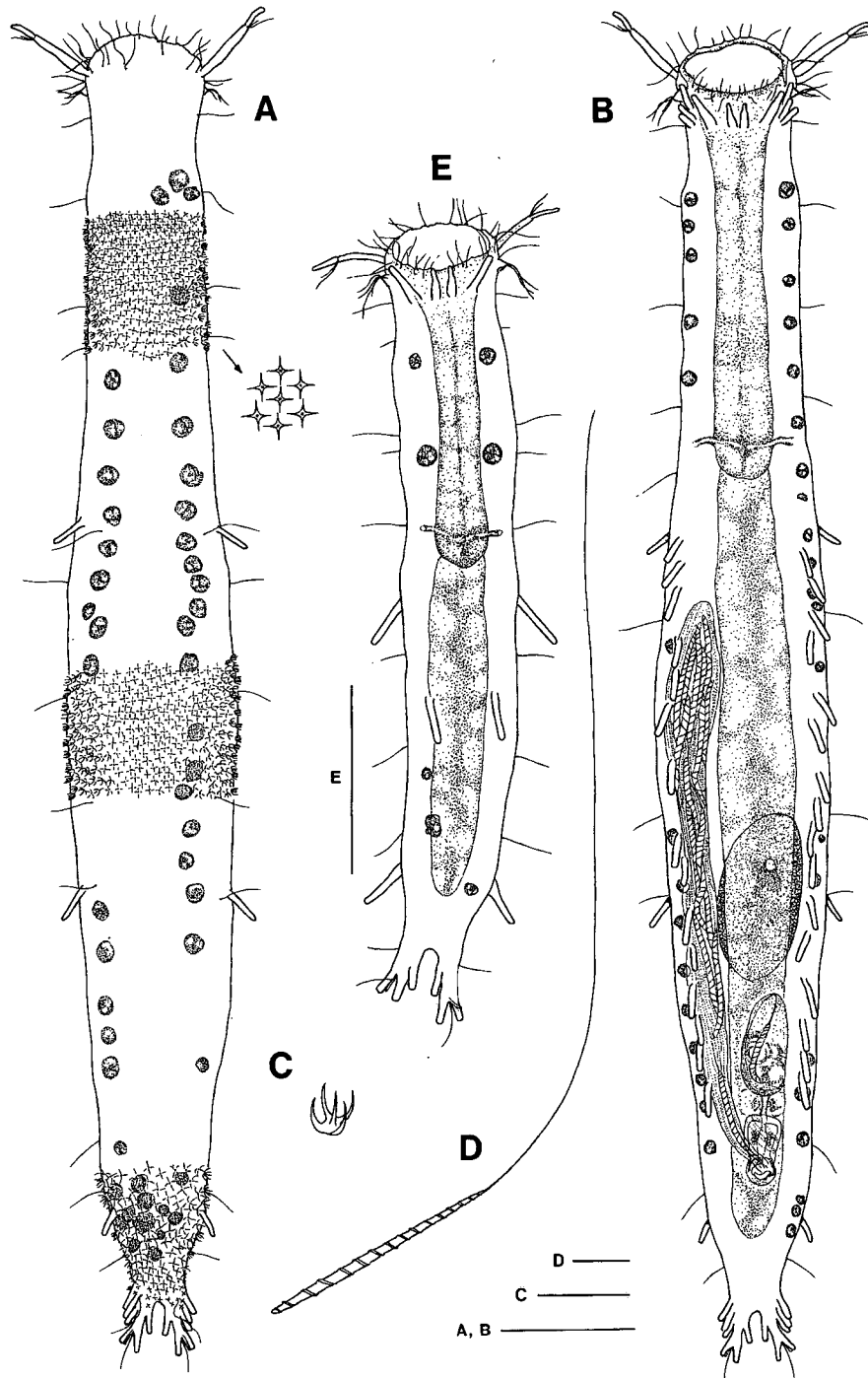


Fig. 1. *Tetranchyroderma heterotentaculatum*, new species. A-D, Holotype. A, Habitus, dorsal. B, Habitus, ventral. C, Pentacre. D, Spermatozoon. E, Juvenile, ventral. Scale bars = 10 μm (C, D) and 50 μm (A, B, E).

Juvenile: Only one juvenile was found among all the materials examined. Lt 213 μm long, maximum width 32 μm behind PhJln at U47. Compared with adults, a juvenile specimen has a stumpy appearance with fewer adhesive tubes, as in Fig. 1E. TbA consisting of only 2 medial pairs, lacking ventrolateral tubes; TbDL

of only 2 tubes per side, anterior one (15 μm long) located just behind PhJln at U48, and posterior one (13 μm long) near posterolateral corner of body (U82); only 1 pair of TbVL present, situated rather ventrally in mid-intestinal region (U59); each pedicle bearing 3 distal TbP flanked by 1 medial tube on each side as in

Table 2. Character comparisons of *Tetranchyroderma heterotentaculatum*, n. sp. with its allied congeners

Species	Lt (μm)	Cephalic tentacles		TbD(L)	TbA	TbVL (tubes in pharyngeal region)	Pedicel (distal tubes)
		Rod-like	Knob-like				
<i>T. pappii</i>	210	2 pairs (anterolateral & lateral)	absent	absent	4 pairs	15 (1)	trifid
<i>T. suecica</i>	450	1 pair (anterolateral)	absent	absent	5 pairs	20-30 (scarce)	bifid
<i>T. antennatum</i>	280-316	1 pair (anterolateral)	present	absent	4 pairs	20-21 (3)	bifid
<i>T. enallosa</i>	287	1 pair (anterolateral)	present	4 pairs	1 pair	11 (2)	trifid
<i>T. esarabdo-phorum</i>	330-345	1 pair (anterolateral)	present	3 pairs	3 pairs	22 (1)	trifid
<i>T. sardum</i>	258-358	1 pair (anterolateral)	present	absent	4 pairs	15-22 (1)	trifid
<i>T. quadri-tentaculatum</i>	300-480	2 pairs (anterolateral & lateral)	absent	1 pair	5 pairs	17 (absent)	trifid
<i>T. hetero-tentaculatum</i> , n. sp.	487-547	1 pair (lateral, modified form)	absent	3 pairs	5 pairs	15-16 (absent)	trifid

adults, but lacking lateral tube.

Measurements and Variability: Body lengths of 12 adult type specimens ranging from 487 μm to 547 μm ($511 \pm 18 \mu\text{m}$), maximum widths 55-67 μm (11U-13U), when mounted in glycerin.

The arrangement and number of adhesive tubes show some variability according to individuals. Eight specimens including holotype have 5 pairs of TbA, one paratype 6 pairs, and two other paratypes 5 tubes on one side and 6 on the other asymmetrically. One specimen among the additional materials has only 4 tubes at one side. Normally 3 pairs of TbDL are present, but two paratypes show some variation in the number of tubes, that is, one has 1 additional tube behind second TbDL at one side only, and another has 2 additional pairs both anteriorly and posteriorly to second TbDL. The number of TbVL is also variable, ranges 11-16, usually showing asymmetrical arrangement. Pedicles are normally furnished with 2-3 lateral TbP at both sides, but some variants have 1 or 4-5 tubes in one side asymmetrically.

Etymology: The proposed specific name is taken from the Latin *heterotentaculatum* (*hetero*, abnormal, modified + *tentaculatus*, of tentacle), which refers to the abnormal shape of lateral cephalic tentacle of this species.

Remarks: Forty-six species are currently recognized in the genus *Tetranchyroderma* Remane. They should be grouped explicitly according to the dorsal cuticular armature, as adopted by Clausen (1965): the first group armed with pentancre includes 25 recorded species and the present new species, second one with tetrancre consists of 19 species, the third one with triancre comprises only one species, *T. tribolosum* Clausen, 1965, and last one is also represented by a single species *T. paradoxa* Thane-Fenchel, 1970 with triancre, tetrancre and pentancre combined.

In the first group above, armed with pentancre only, *T. heterotentaculatum* shares the paired cephalic

tentacles with seven species: *T. pappii* Gerlach, 1953, *T. suecica* Boaden, 1963, *T. antennatum* Luporini, Magagnini and Tongiorgi, 1970, *T. enallosa* Hummon, 1977, *T. esarabdophorum* Tongiorgi and Balsamo, 1984, *T. sardum* Todaro, Balsamo and Tongiorgi, 1988, and *T. quadritentaculatum* Todaro, Balsamo and Tongiorgi, 1992. However, the present new species is most characteristic in having a pair of lateral rod-like tentacles unusually constricted at its distal third with sensory hairs, as suggested in the specific name. The shape of tentacle in *T. heterotentaculatum* is so unique that it is easily discriminated from the seven allied species as well as all congeners in this genus.

In addition, *T. heterotentaculatum* differs from them by the character combination, as shown in Table 2: the body size, the number of cephalic tentacles including knob-like tentacles (or pestle organ), the arrangement of adhesive tubes, and the shape of pedicle. Four of the above seven species (*T. antennatum*, *T. enallosa*, *T. esarabdophorum* and *T. sardum*) are distinguished from *T. heterotentaculatum* in possessing knob-like tentacles and 1-3 TbVL in pharyngeal region. Furthermore, *T. heterotentaculatum* has 3 TbDL, while *T. antennatum* and *T. sardum* do not, and *T. enallosa* has 4 TbDL. *T. esarabdophorum* also bears 3 TbDL, but its arrangement is different from that of *T. heterotentaculatum* (two of three TbDL situated at trunk region in *T. esarabdophorum*, against all three tubes at trunk region in this species).

T. pappii and *T. quadritentaculatum* lack the knob-like tentacles as *T. heterotentaculatum*, but they are discernible from the new species in having 2 pairs of rod-like cephalic tentacles with different lengths from each other (while *T. heterotentaculatum* possesses only one pair). Moreover, *T. pappii* is remarkably small (210 μm long, against 489 μm long in the new species), and lacks TbDL. On the other hand, *T. quadritentaculatum* has a pair of TbDL, compared to 3 pairs in *T. heterotentaculatum*.

Lastly, *T. suecica* is clearly distinguished from *T. heterotentaculatum* by the number of TbVL (20-30 tubes in *T. suecica*, against 15-16 in *T. heterotentaculatum*),

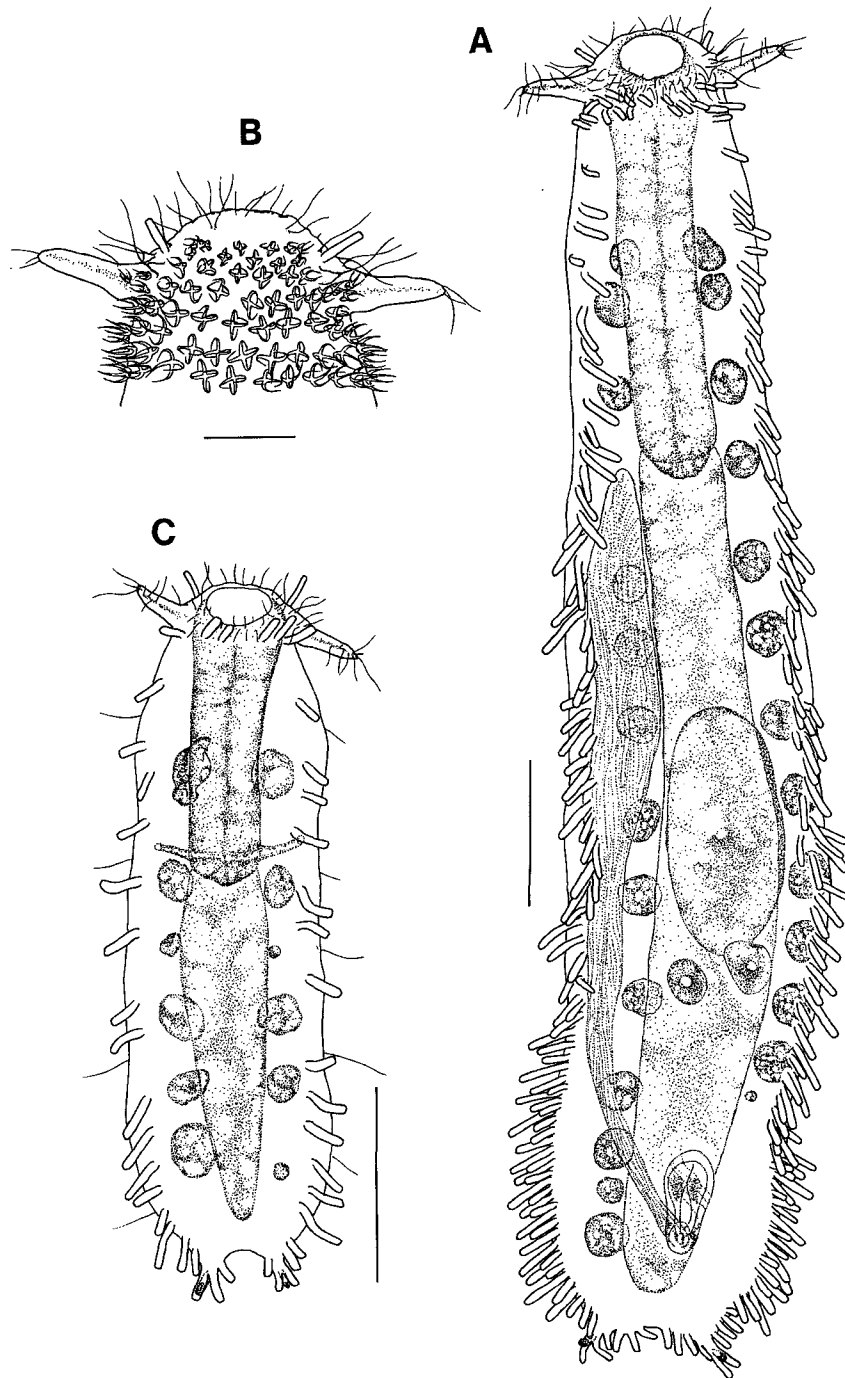


Fig. 2. *Tetranchyoderma hoonsooi*, new species. A-B, Holotype. A, Habitus, ventral. B, Head, dorsal. C, Juvenile, ventral. Scale bars = 20 μm (B) and 50 μm (A, C).

the bifid pedicle (trifid pedicle in *T. heterotentaculatum*), as well as the deficiency of lateral cephalic tentacle and TbDL.

Tetranchyoderma hoonsooi, new species
(Figs. 2, 3F-I)

Materials examined: 15 individuals (1 juv.), Gujora beach (34° 48' 19" N, 128° 41' 39" E), Geoje I., 13 Mar. 2001, C. Y. Chang and J. M. Lee. Holotype (EWNHM60265) and 1 paratype (EWNHM60266) mounted in glycerin are deposited in the Natural History Museum of Ewha Womans University. Other

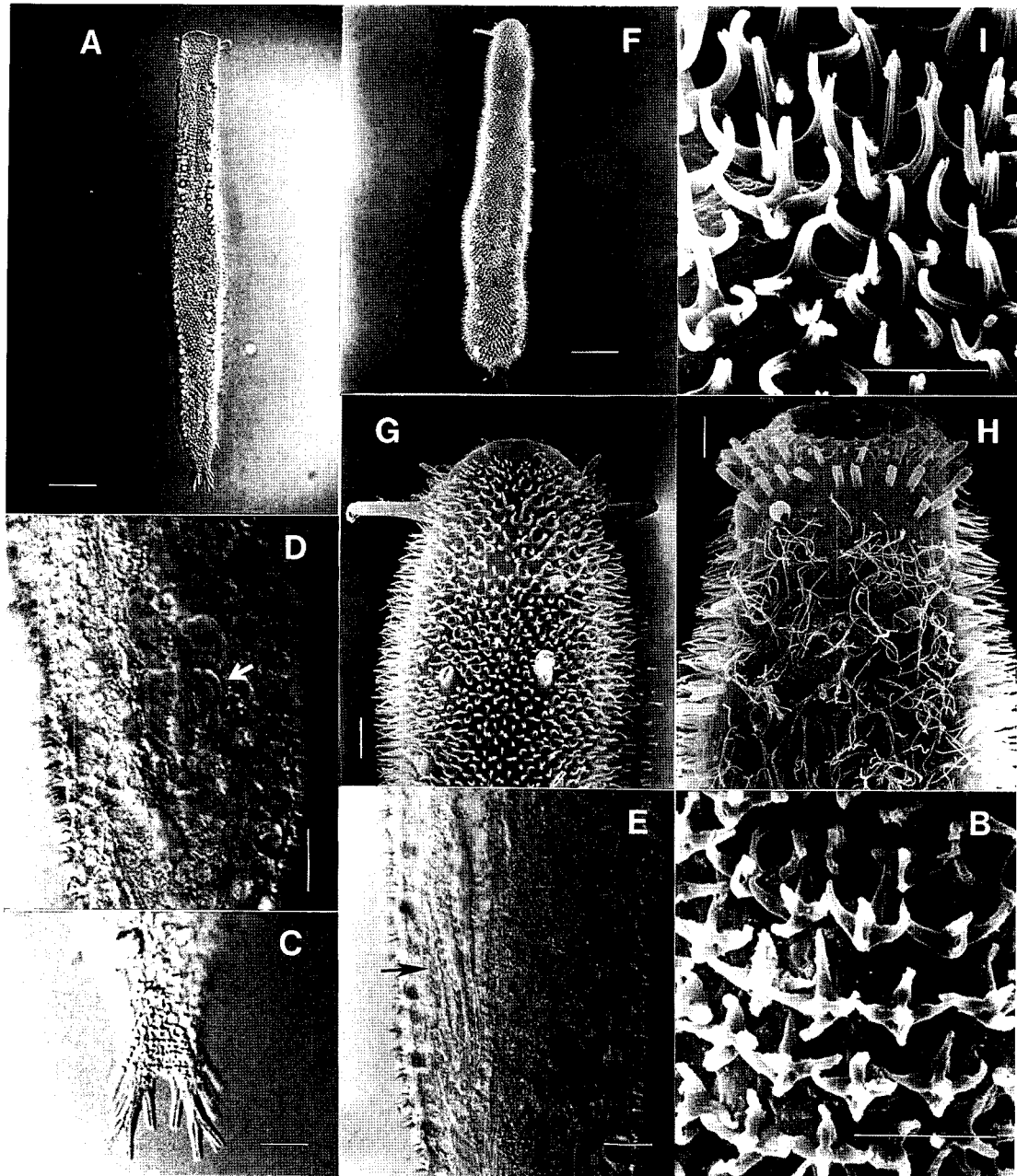


Fig. 3. A-E, *Tetranchyroderma heterotentaculatum*, new species. A, Habitus, dorsal. B, Pentacres (mid-trunk region), dorsal. C, Caudum with pedicles, dorsal. D, Copulatory organ (arrow). E, Testis (part) in mid-trunk, ventral (arrow indicating spermatozoa). F-I, *Tetranchyroderma hoonsooi*, new species. F, Habitus, dorsal. G, Head and neck, dorsal. H, Head and neck, ventral. I, Tetrancres. Scale bars = 5 μ m (B, I), 10 μ m (C-E, G, H), and 50 μ m (A, F).

paratypes are kept in the research collection of authors.

Additional materials examined: 2 inds. (juv.), Yangpo, Pohang, 27 Sep. 1997, J.W. Choi; 2 inds., Supseom I., Jeju I., 22 Jan. 1997, H.S. Rho and J.W. Choi; 5 inds., Udo I., Jeju I., 3 May 2000, J.W. Choi and H.S. Ahn; 7 inds., Gujora, Geoje I., 3 Apr. 2001, J.M. Lee and Y. H. Song.

Diagnosis: Body elongated; dorsal cuticular armature

with tetrancres only; cephalic tentacles comprising a slender anterolateral tentacle and a stout lateral rod-like tentacle with several sensillae ventrally; 10 pairs of TbA forming double arcs; TbD and TbV lacking; 83-90 TbVL per side, along whole lateral margin; a pair of feeble pedicles trifid with 2 distal tubes and a dorsal cirrate tube, accompanied with usually 8-9 medial TbP in total; copulatory organ pyriform.

Description of the holotype: Body (Figs. 2A, 3F) more or less elongated but looks rather stout; somewhat arched dorsally from the frontal view; distal portion of trunk swollen laterally, with weakly bilobed caudum. Lt 457 μm long; widths of head/neck/PhJIn/trunk/caudal base 39/64/69/85/42 μm at U02/U20/U31/U62/U96, respectively.

Anterior margin of head (Figs. 2B, 3G) convex, with 13-14 sensory hairs. Two sensory hairs inserted anterior to anterolateral cephalic tentacles; numerous minute sensory hairs implanted along posterior rim of oral opening (U05). Paired anterolateral cephalic tentacles short and slim, 9 μm long, situated dorsally near anterolateral margin of head (U02). A pair of stout lateral cephalic tentacles located at lateral corner of head (U05), 26 μm long (about 2.8 times as long as the anterior tentacles); tentacles shaped as rod-like hairpin, become narrowing distally, with at least 7-8 sensory hairs (sensillae) on its ventral surface, which are so crowded at the tip of tentacle and easily misunderstood as a tuft; 1-2 sensory hair(s) situated near base of each tentacle anterodorsally. Two pairs of papillae adjacent to lateral tentacles medially or anteriorly, each with 1 bristle and 2 sensory hairs, respectively. Epidermal glands 12-13 per side, aligned from mid-pharyngeal region to distal part of intestinal region (U15-U92), with generally circular shape, mixed in size (from 9 to 15 μm in diameter), relatively big and much developed compared with those of congeners.

Cuticular armature (Fig. 3I) with tetrancres only, in about 18-21 columns and 88-98 rows at mid-trunk region; each tine of tetrancres trifid at its tip (under SEM microscope); size of tetrancres variable, 3 μm between opposite tines at head portion (U02), 7 μm at mid-trunk region (U54), and 6 μm near caudum (U95), respectively.

Adhesive tubes: 10 pairs of TbA (Figs. 2A, 3H), ca. 5-8 μm long, forming double arcs behind oral opening at U06-U08. TbD (or TbDL) and TbV lacking. TbVL 83-90 per side, situated along whole lateroventral margin at U10-U96, varying in lengths from 5 to 20 μm long; 13-14 tubes inserted in pharyngeal region, and succeeding 70-76 tubes in trunk region, gradually crowded posteriorly (most crowded at the level of copulatory organ) with alternately different sizes. A pair of feeble pedicles trifid with 2 distal tubes and a dorsal cirrate tube, accompanied with usually 8 medial TbP, ca. 8 μm long.

Testis (Fig. 2A) single on right side, its tip slightly reaching past PhJIn (U33). Vas deferens not coiled or folded, internally connected to copulatory organ; numerous spermatozoa apparently observed within testis and vas deferens. Copulatory organ (Fig. 2A) pyriform upside down, located in U83-U91, wrapped with thin muscles. Seminal receptacle not apparently detected. Three eggs situated dorsally in mid-intestinal region (U51-U72); anteriormost one large and suboval, others spherical and rather small (ca. 44 μm and 14-17 μm

in maximum diameter, respectively).

Collected from fine to medium sands on sublittoral bottom (3-5 m depth) or in the lower intertidal zone. Often co-occurred with *T. heterotentaculatum*, but supposedly *T. hoonsooi* might prefer a little more coarse sediments than *T. heterotentaculatum*, considering the sediment types of the localities.

Juvenile: A juvenile (Fig. 2C) among the type specimens showed several morphological discrepancies from adults: (1) body rather stubby (Lt 176 μm , width 47 μm ; width to length ratio is 0.27 against 0.19 in adult holotype); (2) relative length of pharynx to Lt exceeding 0.42 (against about 0.30 in adults); (3) TbA of only 3 pairs, arranged in a transverse row (not forming arcs as in adults), ca. 5-10 μm in length; (4) TbVL much fewer, 15-16 tubes per side (against usually 83-90 in adults), ranging 6-14 μm long, first 4 tubes located in pharyngeal region, and others sparsely inserted in trunk region; (5) 4 TbP on each pedicle, comprising 2 distal tubes with 1 dorsal cirrate tube, flanked only by 1 medial tube.

Measurements and Variability: Body lengths of 14 adult type specimens in glycerin ranging from 363 μm to 498 μm (mean 413 μm , standard deviation 65), maximum widths 65-115 μm .

Testes of holotype and two paratypes extend slightly over PhJIn, but those of all other specimens examined do not or nearly reach PhJIn, although this species has relatively elongated testis compared to its allied congeners.

The arrangement and number of adhesive tubes showed some variability according to individuals. Normally 10-11 pairs of TbA are present, but several specimens lack 2-3 ventrolateral TbA, while 2 specimens possess 1-2 pairs more. The number of TbVL is also somewhat variable, ranging 45-90, usually with asymmetrical arrangement. Anterior TbVL in pharyngeal region are rather consistent with the number of 10-15, but quite variable in intestinal region according to their body lengths. Pedicles show high consistency in all specimens examined, except for only one specimen which has bifid dorsal cirrate tube and except for three specimens with 5-6 medial TbP in total (compared with 8-9 tubes normally).

Etymology: Specific name is in honor of Professor Hoon Soo Kim in recognition of his contribution to the development of invertebrate zoology in Korea.

Remarks: As mentioned in the "Remarks" section of the preceding species, 14 species are currently known to possess the cuticular armature of tetrancres, sharing with *T. hoonsooi*. However, the new species is easily differentiated from them, for it is at present the only member in the group that has 2 pairs of cephalic tentacles including stout rod-like lateral tentacles, and

the numerous TbVL along whole lateral margin of trunk.

Of the 14 congeners, only *Tetranchyoderma aphe-notigmum* Hummon, Todaro, Tongiorgi and Balsamo, 1998 has the rod-like cephalic tentacles. However, *T. hoonsooi* is equipped with stout 'lateral' tentacles, against *T. aphe-notigmum* with the peculiarly prominent 'anterior' tentacles. Moreover, *T. hoonsooi* is clearly different from *T. aphe-notigmum* in possessing very crowded TbVL and trifid pedicle, on the other hand, in lacking TbD (or cirrata), TbV and pestle organs (or knob-like tentacles).

Thaumastoderma sp. sensu Valbonesi and Luporini, which was once reported from Somalian coast, the east coast of Africa on the basis of only one adult and one juvenile (cf. Valbonesi and Luporini, 1984), looks much alike *T. hoonsooi*, in having the cuticular armature of tetrancres, lateral cephalic tentacles resembling a rod-like hairpin, TbVL along whole lateral margin, and trifid pedicle. We presume that it should be relegated to the genus *Tetranchyoderma*, considering that it lacks the diagnostic features of the genus *Thaumastoderma*, such as the spatulate tentacle and the cirrate TbD. Anyway, it is obviously discernible from *T. hoonsooi* by the wedge-shaped cephalic tentacles with terminal sensory bristles, 8 pairs of TbA forming an arc (against 10-11 pairs forming double arcs in *T. hoonsooi*), fewer TbVL in pharyngeal region, and possession of TbDL and different shape of copulatory organ (pyriform shape bottomed downward against pyriform upside down in *T. hoonsooi*).

Tetranchyoderma hoonsooi as well as *T. hetero-tentaculatum* evidently differs from the other oriental species, *T. dendricum* Saito from Japan and *T. gracilium* Chang, Lee and Clausen from Korea by the possession of stout lateral cephalic tentacles and TbVL

along whole lateral margin. Both *T. dendricum* and *T. gracilium* share tetrancres with *T. hoonsooi*, but the former is discernible from *T. hoonsooi* by the knoblike tentacles, 6 Tb(D)L, and lack of medial TbP, while the latter differs from *T. hoonsooi* by the knob-like tentacles, well developed pedicles, fewer TbDL, and elongated copulatory organ.

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