한국동물분류학회지 제21권 제1호
The Korean Journal of Systematic Zoology
Vol. 21, No. 1: 57-66 (May 2005)

Taxonomic Study of Marine Nematodes from the Philippines I. Genus *Tenuidraconema* (Desmodorida: Draconematidae)

Hyun Soo Rho and Won Kim*
(School of Biological Sciences, Seoul National University, Seoul 151-747, Korea)

ABSTRACT

Tenuidraconema philippinensis, a new species of free-living marine nematode, collected from the shallow subtidal coarse sediments of the Philippines, is described. The new species differs from *T. fiersi* Decraemer, 1989 and *T. koreensis* Rho and Kim, 2004, by the following characteristics: the position of 12 cephalic adhesion tubes in both sexes (all 12 cephalic adhesion tubes inserted on the body annules), the number of posterior sublateral adhesion tubes (12 in male and 11 in female) and posterior subventral adhesion tubes (16 in male and 17 in female), and the absence of the intermingled somatic setae in male. This is the first discovery of the genus *Tenuidraconema* in the Philippines.

Key words: Nematoda, Draconematidae, *Tenuidraconema*, the Philippines

INTRODUCTION

The genus *Tenuidraconema* Decraemer, 1989 is differentiated from all other genera of the Draconematidae Filipjev, 1918 by its unique habitus, that is, long slender body (Decraemer, 1989; Decraemer et al., 1997). Currently, only two species, *T. fiersi* Decraemer, 1989 and *T. koreensis* Rho and Kim, 2004, of the genus *Tenuidraconema* have been recorded from the western Pacific ocean. *Tenuidraconema fiersi* was described from the sediment between roots of the mangrove, *Avicennia* sp., which was sampled by hand dredging at the intertidal zone of Motupore Island,

* To whom correspondence should be addressed
Tel: 82-2-880-6695, Fax: 82-2-872-1993, E-mail: wonkim@plaza.snu.ac.kr

Papua New Guinea (Decraermer, 1989). Recently, *T. koreensis* was described from the subtidal coarse sediments and various invertebrates (hermit crabs, sponges and bryozoans), which were taken from a fishing net set in 150 to 250 m depth at Namae harbor in the eastern coast of South Korea (Rho and Kim, 2004a).

As one of the serial reports on the free-living marine nematode fauna of the Philippines, we now describe a new species of the genus *Tenuidraconema* collected from the shallow subtidal coarse sediments at Batangas. This is the first taxonomic report on the genus *Tenuidraconema* in the Philippines.

MATERIALS AND METHODS

The nematodes were obtained from the washings of shallow subtidal coarse sediments, which were collected from 45 m deep by Nitrox SCUBA diving at the western coast of Batangas, the

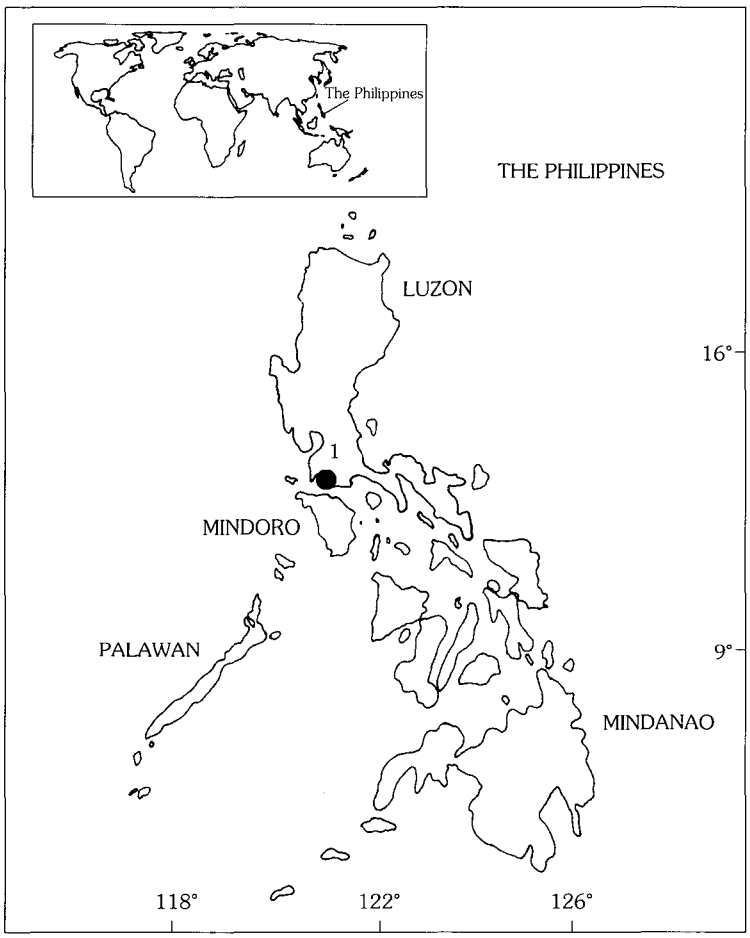

Fig. 1. A map showing the localities. 1. Batangas.

Philippines (Fig. 1). Samples were filtered in the field through a plankton net (67 μm in pore diameter) after rinsing with freshwater for less than a minute for osmotic shock (Kristensen, 1989), and then fixed in 5% formalin. Specimens were mounted in anhydrous glycerin between two coverslips on H-S slides (Shirayama et al., 1993), and measured and photographed using a differential interference contrast (DIC) microscope (Olympus BX-60) equipped with Nomarski optics. All drawings were made with the aid of a camera lucida. Scale bars in figures are indicated in μm. Terminology follows Rho and Kim (2004b).

SYSTEMATIC ACCOUNTS

Family Draconematidae Filipjev, 1918

Subfamily Draconematinae Filipjev, 1918

Genus **Tenuidraconema* Decraemer, 1989

****Tenuidraconema philippinensis n. sp. (Figs. 2-4)**

Material examined. Holotype (male) will be deposited in the nematode collection of the Royal Belgian Institute of Natural Sciences, Brussels, Belgium. Paratype (female) is kept in the authors' collection at the specimen room of the School of Biological Sciences, Seoul National University (SNUP101).

Type locality and habitat. Batangas (13° 45′27″N, 120° 55′48″E), the Philippines, collected on 6 Feb. 2005 by H. S. Rho. The nematodes were obtained from the washings of shallow subtidal coarse sediments, which were collected from 45 m deep.

Diagnosis. Body slender, shallow sigmoid. Swollen anterior body region 10% of total body length. Body cuticle thin, with vacuolar ornamentation in swollen pharyngeal region. Twelve CAT with widened base and blister-shaped tip: all 12 CAT inserted on body annules. Amphideal fovea loop-shaped in male (dorsal arm shorter than ventral arm; ventral arm reaching to first body annulus) and spiral in female. Stoma narrow, unarmed. Posterior adhesion tubes: sublateral rows with 12 adhesion tubes in male and 11 in female, and subventral rows with 16 adhesion tubes in male and 17 in female. Intermingled somatic setae absent in both sexes. Three pairs of subventral anal setae in male: one pair anterior to cloacal opening and two pair posterior to cloacal opening. One pair of small somatic setae inserted on non-striated tail end.

Measurements.

Holotype male. L = 940, mbd = 40, (mbd) = 12, mbd Ph = 33, ph = 82, abd = 14, t = 122, tmr = 38, spic = 34, gub = 7, SlATl = 40, SlATn = 12, SvATn = 16, a = 23.5, b = 11.5, c = 7.7, c′ = 8.7.

Allotype female. L = 913, mbd = 37, (mbd) = 12, mbd Ph = 35, ph = 71, abd = 11, t = 117, tmr = 45, SlATl = 36, SlATn = 11, SvATn = 17, a = 24.7, b = 12.8, c = 7.8, c′ = 10.6, V = 57.

Holotype male. Body long, slender, shallow sigmoid (Fig. 2A). Pharyngeal region 10% of total body length, slightly swollen, and about as wide as mid-body region. Tail narrow, cylindro-conoid (Fig. 2D). Body cuticle striated; cuticular rings broader in anterior and posterior body regions; laterally interrupted by well marked narrow lateral field (lateral differentiation) in mid-body region.

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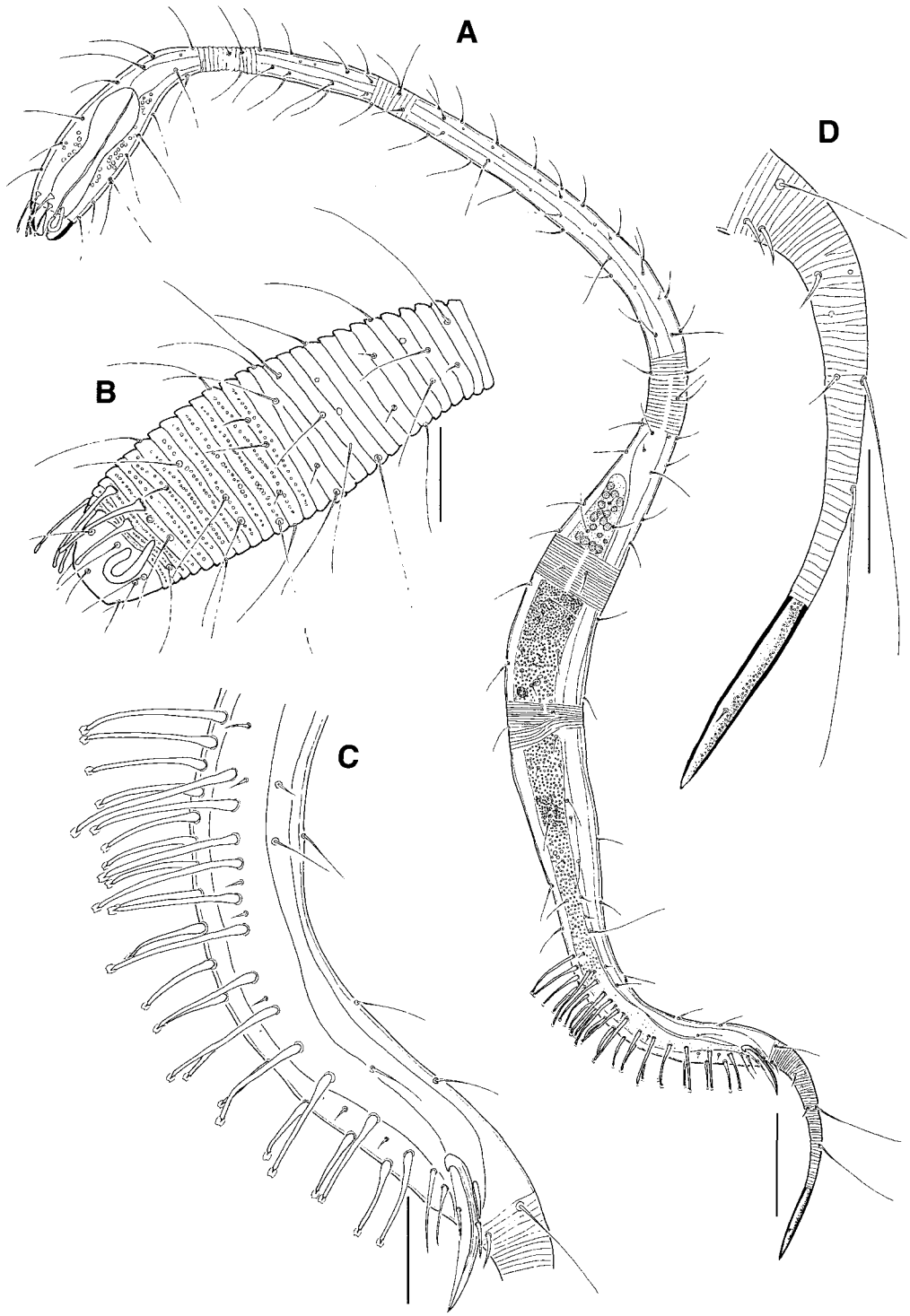

Fig. 2. *Tenuidraconema philippinensis* n. sp., male. A, habitus, lateral view; B, head, lateral view; C posterior adhesion tubes, lateral view; D, tail region, lateral view. Scale bars = 50 μm (A), 20 μm (B-D).

Annules in anterior body region ornamented with fine vacuoles (Fig. 2B); annules smooth in mid-body region, and faintly vacuolated in anal region. Somatic setae arranged in 8 longitudinal rows (2 subdorsal, 4 sublateral, and 2 subventral) in pharyngeal region; 2 predominant lengths (40 μm and 27 μm); longest somatic setae (47 μm) inserted on subdorsally in pharyngeal region (Fig. 2B).

Head rostrum with vacuolar ornamentation and numerous subcephalic setae (22 μm). Lip region rarely extruded in fixed specimen (Fig. 2A, B). Four cephalic setae 41 μm long, located in front of head border. Twelve CAT with widened base and blister-shaped tip, arranged in 2 transverse rows: all 12 CAT inserted on body annules (Fig. 2B). Amphidial fovea large, loop-shaped; longer ventral arm reaching to anterior annules (Figs. 2B, 4A).

Stoma narrow, unarmed. Pharynx largely cylindrical, ending on muscular posterior bulb without cuticularized valve. Intestine cylindrical, straightforward, gradually widening posteriorly, and lying dorsal of genital system.

Male reproductive system typical of Draconematidae, with single testis extending anteriorly (Fig. 2A). Spicules slender, slightly curved, 34 μm long, with well developed knob-like capitulum, small ventral apophysis and well-developed cuticularized velum. Gubernaculum, 7 μm long, parallel to spicules (Fig. 2C). Three pairs of subventral anal setae: 1 pair anterior to cloacal opening (anus) and 2 pair posterior to cloacal opening (Fig. 2C). Anal flap not crenate. Adhesion tubes: all PAT with well marked bell-shaped end (Fig. 2C). PAT arranged on 4 longitudinal rows: 2 sublateral rows each consisting of 12 (left side) and 12 (right side) adhesion tubes and 2 subventral rows each consisting of 16 (left side) and 16 (right side) adhesion tubes. Intermingled somatic setae absent. Posterior sublateral adhesion tubes with more or less alternating long and short tubes. Posterior subventral adhesion tubes becoming obviously shorter caudally. All PAT anterior to cloacal opening.

Tail 122 μm long, tapered to very slender cylinder. Non-striated end finely vacuolated, 38 μm long, 31% of total tail (Fig. 2D). One pair of small somatic setae inserted on non-striated tail region.

Female. Similar to male in most respects, but mid-body swelling more pronounced (Fig. 3A). Annulation and cuticular ornamentation as in male (Fig. 3A, B). Twelve CAT with widened base and blister-shaped tip, arranged in 2 transverse rows: all 12 CAT inserted on body annules (Fig. 3B). Amphidial fovea spiral, with 2 coils and ventrally whirled, 11 μm in diameter (Figs. 3B, 4B). Digestive system as in male. Ovaries paired, opposed and reflexed (Fig. 3A). Vagina not well-cuticularized. Two pairs of paravulval setae present (Fig. 3A). Vulva at 57% of total body length from anterior.

Adhesion tubes: all posterior adhesion tubes (PAT) with well marked bell-shaped end. PAT arranged on 4 longitudinal rows: 2 sublateral rows each consisting of 11 (left side) and 11 (right side) adhesion tubes, without intermingled somatic setae, and 2 subventral rows each consisting of 17 (left side) and 17 (right side) adhesion tubes, without intermingled somatic setae. Posterior sublateral adhesion tubes with more or less alternating long and short tubes. Posterior subventral adhesion tubes becoming shorter caudally. All PAT anterior to cloacal opening/anus.

Tail 117 μm long, tapered to very slender cylinder. Non-striated end finely vacuolated, 45 μm long, 38% of total tail (Fig. 3D). One pair of small somatic setae inserted on non-striated tail region.

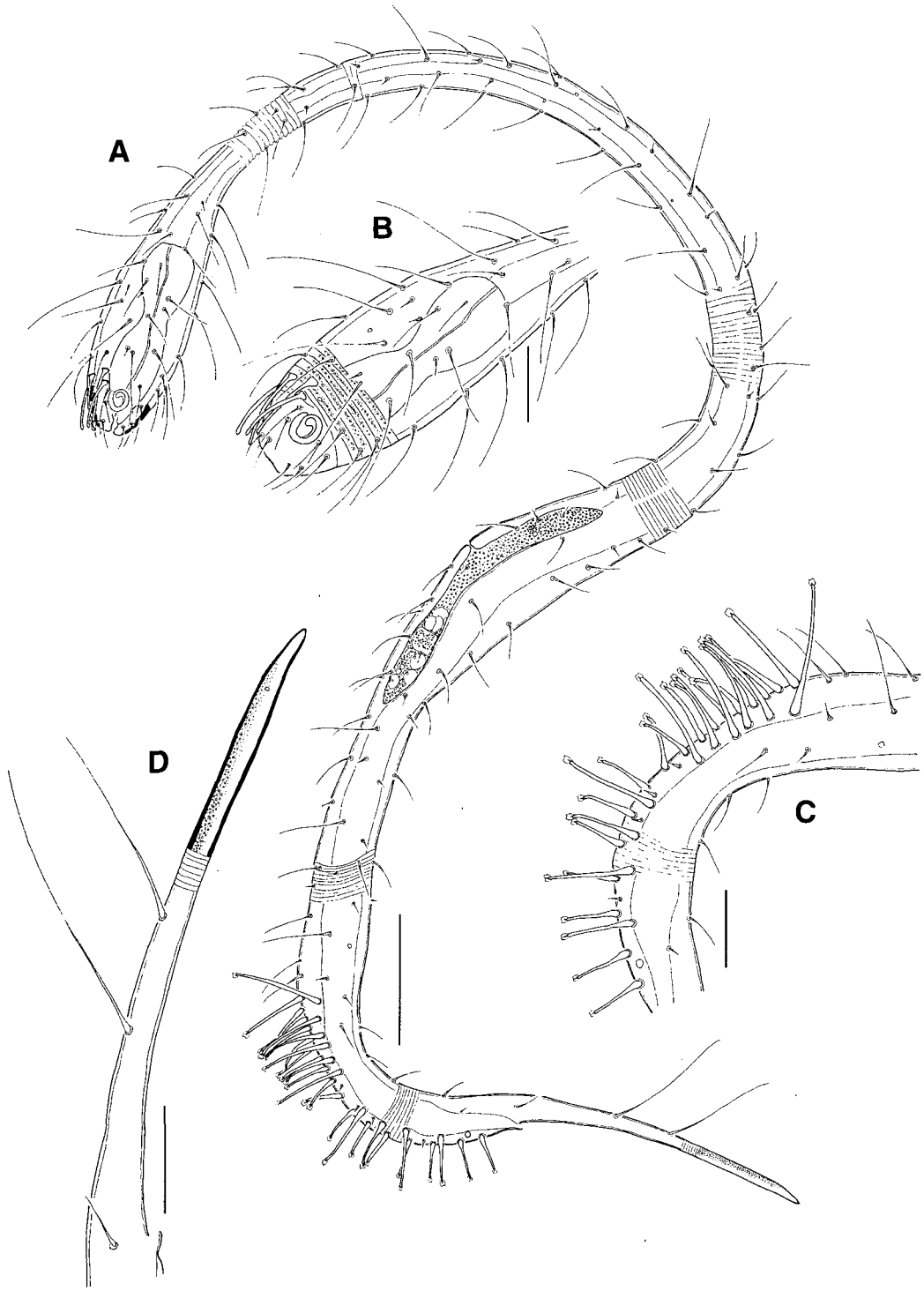

Fig. 3. *Tenuidraconema philippinensis* n. sp., female. A, habitus, lateral view; B, head region, lateral view C, posterior adhesion tubes, lateral view; D, tail region, lateral view. Scale bars = 50 μm (A), 20 μm (B-D).

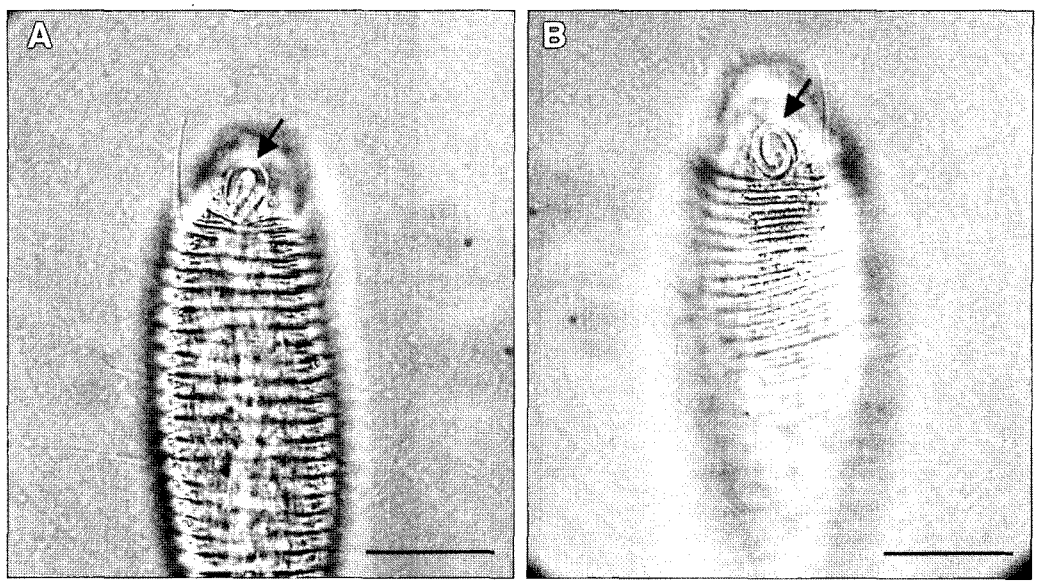

Fig. 4. *Tenuidraconema philippinensis* n. sp. A, head region in male, lateral view. B, head region in female, lateral view. Arrow indicates a amphideal fovea. DIC micrographs. Scale bars = 20 μm (A, B).

Table 1. Character comparison of *Tenuidraconema philippinensis* n. sp. with its congeners.

Characters	*T. philippinensis* n. sp.	*T. koreensis* Rho and Kim, 2004	*T. fiersi* Decraemer, 1989
Labial sensilla	Setiform	Setiform	Papilloid
CAT	All inserted on body annules	Six inserted on rostrum & six inserted on body annules	All inserted on rostrum
Amphideal frovea	Reaching to the first body annulus	Not reaching to the first body annulus	Reaching to the first body annulus
SlATn	12 in male & 11 in female	12 in male & 13 in female	10-12 in male & 10-12 in femlae
SvATn	16 in male & 17 in female	15 in male & 19 in female	10-11 in male & 12-13 in female
Spicules	Slender and with a well developed cuticularized velum	Stout and with a well developed cuticularized velum	Slender and with a weakly cuticularized velum
"a" value	23.5 in male & 24.7 in female	25 in male & 16 in female	33.8-36.4 in male & 23.4-32.9 in female
Intermingled setae in male	Absent	Between SlAT 11 and SlAT 12	Between SlAT 1 and SlAT 2
Habitat	Shallow subtidal coarse sediments	Subtidal sediment & various invertebrates	Intertidal sediment between roots of mangrove
Locality	The Philippines (Batangas)	Korea (Namae)	Papua New Guinea (Motupore Island)

Etymology. The specific name is taken from the Philippines, the type locality.

Remarks. The genus *Tenuidraconema* Decraemer, 1989 in the family Draconematidae Filipjev, 1918 was established by Decraemer (1989) to incorporate a single species, *T. fiersi*. Until now, only two species, *T. fiersi* Decraemer, 1989 from the intertidal zone of Motupore Island, Papua New Guinea and *T. koreensis* Rho and Kim, 2004 from the subtidal coarse sediments of Namae harbor in the eastern coast of South Korea, have been recorded (Decraemer, 1989; Rho and Kim, 2004a).

Tenuidraconema philippinensis n. sp. is mainly characterized by the following characteristics: (1) short setiform labial sensilla, (2) all cephalic adhesion tubes (12 CAT) inserted on the body annules, the most characteristic in the present new species, (3) large loop-shaped amphideal fovea in male, and spiral shaped in female, (4) PAT arranged on four longitudinal rows: two sublateral rows with 12 adhesion tubes in male and 11 adhesion tubes in female, and two subventral rows with 16 adhesion tubes in male and 17 adhesion tubes in female, (5) absence of intermingled somatic setae inserted between posterior sublateral adhesion tubes in both sexes, and (6) lower "a" value of 23.5 in male.

Tenuidraconema philippinensis n. sp. is related to *T. fiersi* by having a long slender body, similar amphideal fovea (large loop-shaped in male and spiral shaped in female), the position of amphideal fovea in male (ventral arm of amphideal fovea reaching to the first body annulus), and a slender elongated cylindro-conoid tail. As shown in Table 1, however, the present new species differs from *T. fiersi* in the shape of labial sensilla (setiform vs papilloid), the position of cephalic adhesion tubes (all inserted on the body annules vs all inserted on the rostrum), the number of posterior adhesion tubes (12 sublateral and 16 subventral PAT in male, and 11 and 17 in female vs 10-12 sublateral and 10-11 subventral PAT in male, and 10-12 and 12-13 in female), the shape of spicules (slender and with a well-developed cuticularized velum vs slender and with a weakly cuticularized velum), the position and number of intermingled somatic setae inserted between posterior sublateral adhesion tubes (absent vs a pair of intermingled somatic setae inserted between posterior SlAT 1 and SlAT 2), and lower "a" value in male (23.5 vs 33.8-36.4).

The present new species, *T. philippinensis*, also shares with *T. koreensis* in having the following characteristics: a long slender body, setiform labial sensilla, same number of posterior sublateral adhesion tubes in male (12 SlAT), and a slender elongated cylindro-conoid tail. However, *T. philippinensis* n. sp. is different from *T. koreensis* by the position of cephalic adhesion tubes (all inserted on the body annules vs anterior six CAT inserted on the rostrum and posterior six CAT inserted on the body annules), the position of amphideal fovea in male (ventral arm of amphideal fovea reaching to the first body annulus vs not reaching to the body annulus), the number of posterior adhesion tubes (12 sublateral and 16 subventral PAT in male, and 11 and 17 in female vs 12 sublateral and 15 subventral PAT in male, and 13 and 19 in female), the shape of spicules (slender and with a well-developed cuticularized velum vs stout and with a well-developed cuticularized velum), the position and number of intermingled somatic setae inserted between posterior sublateral adhesion tubes (absent vs a pair of intermingled somatic setae inserted between posterior SlAT 11 and SlAT 12), and lower "a" value in male (23.5 vs 25).

The discovery of *T. philippinensis* n. sp. from the shallow subtidal coarse sediments sampled at a depth of 45 m expands the range of hitherto known habitats for the genus *Tenuidraconema*,

from intertidal (Decraemer, 1989) and subtidal (Rho and Kim, 2004a) to shallow subtidal zone (this report).

ACKNOWLEDGEMENTS

We would like to thank "IANTD (Korea Technical Divers)" members for their assistance in collecting samples. This work was supported by the Korea Research Foundation Grant (KRF-2002-070-C00080).

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RECEIVED: 30 March 2005
ACCEPTED: 4 May 2005

필리핀산 해양 선충류의 분류학적 연구
I. 가는도마뱀선충속 (Desmodorida목: 도마뱀선충과)

노 현 수·김 원*
(서울대학교 생명과학부)

요 약

필리핀 바탕가스의 조하대 저질에서 채집한 자유 생활하는 해양 선충류 1신종 필리핀가는도마뱀선충 (*Tenuidraconema philippinensis*)을 기재하였다. 필리핀가는도마뱀선충은 두부 감각기관의 위치(12개 두부감각기관 모두가 체환 위에 있음), 후미흡착기관의 수 (측면 아래에 수컷은 12개, 암컷은 11개를 가지며, 배면 아래에 수컷은 16개, 암컷은 17개를 가짐), 후미흡착기관 사이에 있는 감각모가 없는 점 등의 중요 분류학적 형질에서 근연종인 *T. fiersi*와 *T. koreensis*로부터 쉽게 구분되어진다. 이 논문은 필리핀의 가는도마뱀선충속 해양 선충류에 대한 첫 보고이다.