

Two Species of Genus *Chordodes* (Gordioidea, Nematomorpha) from Korea

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한국산 흑연가시 속(유선형동물 문, 철선충 목)의 2종

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적 요

1988년 10월부터 1992년 10월 사이에 남한의 4개 지역에서 채집된 철선충속 *Chordodes*속의 속하는 1신종 *Chordodes koreensis*, n. sp.와 1미기록종 *Chordodes japonensis* Inoue, 1952를 기재한다. 본 *Chordodes*속은 한국에서 처음 발표되며 2종의 큐티클을 주사전자현미경으로 관찰, 기재하였다.

Key words: *Chordodes*, Gordioidea, Nematomorpha, New species, Korea

INTRODUCTION

The present paper deals with horse-hair worms of the genus *Chordodes* (order Gordioidea) from Korea. The *Chordodes* is, as the case of the genus *Gordius*, one of the largest genus of the order Gordioidea. This genus has following distinctive features: 1) the body is cylindrical and markedly tapered anteriorly; 2) posterior part of the male is swollen, not lobulated; 3) various papillae and hyaline hairs present on the surface of the cuticle. Among them cuticular papillae patterns (form, arrangement and number) and length of hyaline hairs have always been dealt with as the main characters to differentiate species. Therefore, Montgomery (1898a, 1898b), Camerano (1915),

Heinze (1937, 1941), Carvalho (1942), etc. determined the species of *Chordodes* by means of sections and portions of the cuticle in glycerine or some clearing solution (lacto-phenol solution, cedar oil, etc.) through the light microscope. But regional variability over the surface of a single individual, the masking of underlying cuticular layers and the lack of depth of focus of the light microscope, as well as the scarcity of worms, made systematics difficult. In the genus *Chordodes* papillae patterns and hyaline process are best seen by SEM, although imperceptible in the light microscope. In this study, various figures of cuticular pattern which is important in taxonomy are prepared using SEM photography.

MATERIALS AND METHODS

This study was based on the materials collected from four areas in Korea during the period from October 1988 to October 1991. The materials were preserved in 10% neutral formalin. Preliminary light microscopic studies were made on midventral cuticular slivers following Muller's (1927) methods but using lacto-phenol solution, recommended by Carvalho (1942). They were mounted in shallow well-slide with coverslips. For Scanning electron microscope (SEM) study, each worm was cut into 2-5 mm long cylinders and processed by standard SEM method. The samples were gold-coated with ion sputter (JFC-1100) and examined with JSM-35CF type. The system of classification is based on Camerano (1915), Inoue (1952), and Kirjanova and Spiridonova (1989). The type specimens are retained in the Department of Biology, Kon-Kuk University, Seoul, Korea.

RESULTS

Order Gordioidea Rauther, 1930

Family Chordodidae May, 1919

***Chordodes koreensis*, n. sp.** 오디혹연가시 (신칭) (Fig. 1; Pl. 1, Figs. 1-6)

Type-series. Holotype: ♂, Pakdal, Kyongju-gun, Kyongsangbuk-do, collected from a stream in front of Pakdal Elementary School, Apr. 20, 1990 (CSM 59). Allotype: ♀, Pakdal, Kyongju-gun, Mar. 27, 1990 (CSF 66). Paratypes: 3 ♂♂, Pakdal, Kyongju-Gun, Mar. 27, 1990.

Other material examined. 3 ♂♂, 1 ♀ Pakdal, Kyongju-gun, Oct. 15, 1988; 2 ♂♂, 1 ♀, Mt. Chogye, Chollanam-do, May 19, 1989; 5 ♂♂, 1 ♀, Pakdal, Kyongju-gun, Apr. 20, 1990; 1 ♀, Mt. Worak, Choongchungbuk-do, Oct. 26, 1992.

Male (holotype). Body slender and cylindrical, measuring 129 mm long by 1.0 mm broad at thickest portion and markedly tapered anteriorly. Body color blackish brown in preserved condition (10% formaline). Anterior end slightly attenuated and truncated. Anterior tip somewhat lighter in color; mouth present at center of it (Fig. 1-2).

Posterior extremity (Fig. 1-1) not bilobed but swollen, slenderer than mid-portion of body. This swelled portion most pronounced on ventral side. Shallow groove on ventral surface extending from cloacal aperture to distal end. Posterior part spirally inrolled. Cloacal aperture situated on 0.5 mm distance anterior to end. On surface view of cuticle, papillae tightly spaced each other and irregularly

polygonal in shape (Fig. 1-5; Pl. 1, Figs. 1-6).

Papillae type 1: Composed of two papillae standing in close contact with each other. Largest one measuring 10-15 μm in height and 8-12 μm in diameter, usually of rounded-conical shape (Pl. 1, Figs. 2, 3). Hyaline hairs, nearly absent or, if present, only several very short ones (less than 5 μm , especially in female) restricted to upper margin of papillae. One slender process (Pl. 1, Fig. 3) demonstrated between paired component.

Papillae type 2: Arranged in circle around papillae type 1, numbering 7-17. Forms vary, but usually either finger or club-shaped (Pl. 1, Figs. 4, 5); height and diameter three-fourths of papillae type 1. Several short, fine hyaline hairs (less than 3 μm) occurring occasionally.

Papillae type 3: These papillae usually occurring paired among papillae type 5, occasionally forming cluster by 3 or 4 papillae; oval and roundish in shape; a little higher and larger than papillae type 5; no hairs and granules on top of papillae (Pl. 1, Figs. 3-5).

Papillae type 4: Singly scattered among papillae type 5; oval and roundish form in surface view. Single short spine-like strong hyaline process (less than 5 μm) present at center of it (Pl. 1, Figs. 4, 5). This spine thickest at base.

Papillae type 5: These papillae most abundant around papillae types 1-4, irregular mulberry shaped. Smallest, least elevated, ones from one fourth to half length of papillae type 1. Papillae tightly spaced each other.

Female (allotype). Body larger and more robust than that of male. Length 283 mm, and diameter 1.7 mm at thickest portion. Color blackish brown. Posterior portion of body (Fig. 1-3) narrower than middle point, but distal extremity swollen (obliquely truncated). This swelled portion greater in diameter than immediate preceding portion. Cloacal aperture located on center of its apex. Anterior part widely conical compared to male, and its apex round. Anterior tip somewhat lighter in color; mouth present at center of it (Fig. 1-4).

Lengths of all specimens 158-213 mm in female, 220-235 mm in male. Diameter 0.8-1.2 mm in female, 0.6-1.4 mm in male. Color of all specimens blackish brown.

Discussion. *Chordodes koreensis*, n. sp. is related to *C. japonensis* Inoue, 1952 and *C. puerilis* Montgomery, 1898a in having the following features: Papillae type 2, in finger shape has several very short hyaline hairs (less than 3 μm); papillae type 4 is singly scattered with spine-like hyaline process; hyaline hairs are absent on top of papillae type 5. But the new species can be distinguished from these two species by the following accounts: The new species has five kinds of papillae on the surface of cuticle, while *C. puerilis* has four kinds of papillae; hyaline hairs are nearly absent or, if present, only several very short ones (less than 5 μm) on papillae type 1 in the new species, whereas long hyaline hairs (20-200 μm) are present on top of it in *C. japonensis*; a vast number of small papillae in the new species is so irregular that it seems to have a structure covered with many granules as mulberry, whereas it is conical shaped in *C. puerilis*.

***Chordodes japonensis* Inoue, 1952** 긴털혹연가시 (신칭) (Pl. 2, Figs. 1-6)

Chordodes japonensis Inoue, 1952 (pp. 400-402, figs. 1-5).

Chordodes ferganensis Kirjanova and Spiridonova, 1989 (pp. 360-362, figs. 3-5).

Material examined. 15 ♂♂, 3 ♀♀, Pakdal, Kyongju-gun, Kyongsangbuk-do, Oct. 15 1988; 1 ♀, Seoul, Oct. 20, 1989; 1 ♂, 2 ♀♀, Mt. Moak, Chollabuk-do, May 19, 1989; 1 ♂, 1 ♀, Sakimak,

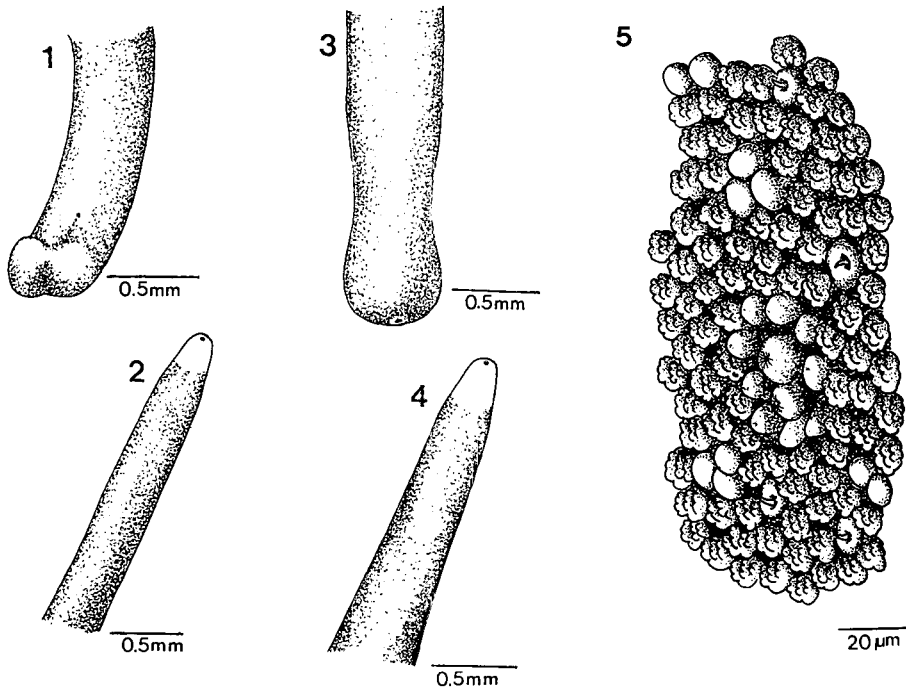


Fig. 1. *Chordodes Koreensis*, n. sp. 1, posterior part of male; 2, anterior end of male; 3, posterior part of female; 4, anterior end of female; 5, five different kinds of papillae of midventral cuticular surface.

Kyunggi-do, Oct. 28, 1991.

Description. Length of all specimens 127 mm in female, 85-179 mm in male. Diameter 1.0-1.5 mm in female, 0.7-1.1 mm in male. Male smaller than female. Body color dark brown in preserved condition. Anterior part conical and mouth present at center of it in both sexes. Posterior end of both sexes general in form as in other species of the same genus.

Papillae type 1: Composed of 2 papillae standing in close contact with each other. Largest one measuring 15-23 μm in height and 13-20 μm in diameter. Hyaline hairs vary in number and length. Hyaline hairs of 2 types present on top of papillae (Pl. 2, Fig. 1), type 1 (Pl. 2, Figs. 2, 3) composed of short hyaline hairs (less than 20 μm) and type 2 (Pl. 2, Fig. 4) composed of long hyaline hairs (less than 200 μm). These two kinds of papillae type 1 occurring together just on midventral cuticular surface. One slender process demonstrated between paired component occasionally (Pl. 2, Fig. 3).

Papillae type 2: Arranged in circle around papillae type 1, numbering 7-23; finger-like or conical in shape (Pl. 2, Figs. 5, 6) measuring 10-23 μm in height. Several short, fine hyaline hairs like granules present on upper part of it.

Papillae type 3: These papillae usually occurring paired among papillae type 5, occasionally forming cluster by 3 papillae; oval and roundish in shape; a little higher and larger than papillae type 5.

Papillae type 4: Singly scattered among papillae type 5; oval and roundish form in surface view measuring 14-20 μm in width and 6-12 μm in height. Single short spine-like hyaline process present

center of it (Pl. 2, Figs. 5, 6).

Papillae type 5: A vast number of smaller ones, lowest of all, occurring close together between groups of larger papillae; irregularly polygonal or oval in shape. Largest width 10-19 μm and 5-9 μm in height.

Discussion. This species has been known only from Japan. It is easily distinguishable from other species of *Chordodes* by the possession of two kinds of papillae type 1, one with long hyaline hairs and the other with short ones just on the midventral cuticular surface. It was reported by Inoue (1952) that *C. japonensis* has only a single kind of papillae type 1, while *C. ferganensis* carry 2 kinds of papillae type 1. And also it was reported by Kirjanova and Spiridonova (1989) that papillae type 3 in *C. japonensis* forms a cluster of 2 or 3 papillae but *C. ferganensis* has singly scattered papillae type 3, not forming a cluster of 2 or 3 papillae. But based on the observation of Korean samples using SEM, they carry 2 kinds of papillae type 1 (Pl. 2, Fig. 1) like *C. ferganensis* and also clusters of papillae type 3 (Pl. 2, Figs. 2, 3, 5, 6) like *C. japonensis*. I think Inoue, who first report *C. japonensis*, could not have found 2 kind of papillae type 1 through the light microscope. And the description by Kirjanova and Spiridonova about the papillae type 3 was based on only one specimen. Therefore they might not have drawn clear conclusions. The present study clearly shows that *C. ferganensis* is synonymous with *C. japonensis*.

ABSTRACT

This study on the genus *Chordodes* was based on the specimens collected from four areas in Korea during the period October 1988 to October 1992. As a result, a new species is described using a scanning electron microscope and conventional method, under the name of *Chordodes koreensis*. And It was identified that *C. japonensis* Inoue, 1952 is synonymous with *C. ferganensis* Kirjanova and Spiridonova, 1989. This genus is reported for the first time from Korea.

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EXPLANATION OF PLATES

Plate 1. *Chordodes koreensis*, n. sp.

Figs. 1-3: Five different kinds of papillae of male holotype.

Fig. 4: Midventral surface view of female allotype.

Figs. 5, 6: Midventral surface view of two other individuals of male paratype.

Plate 2. *Chordodes japonensis* Inoue, 1952

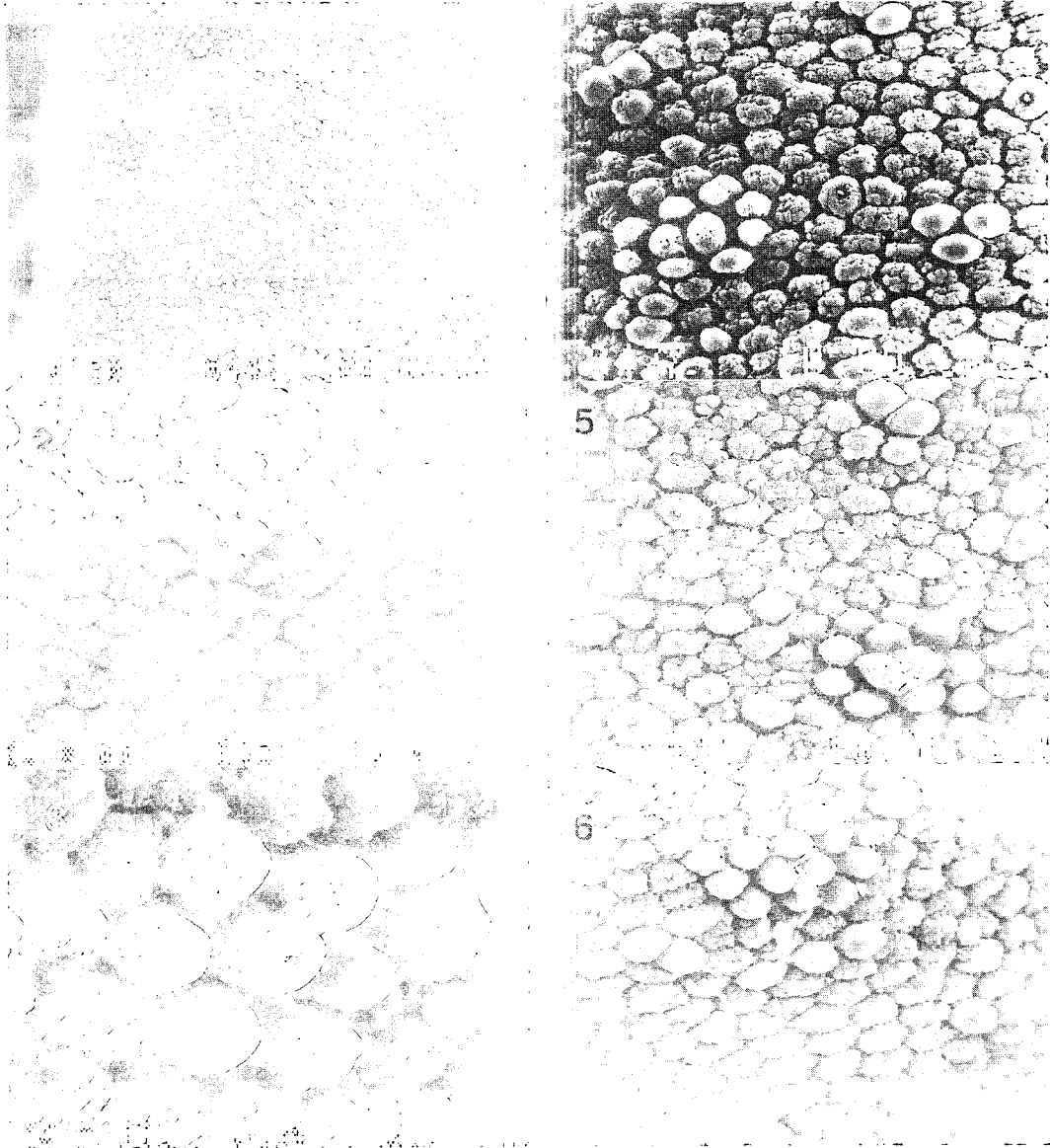
Fig. 1: Two kinds of papillae type 1 occurring together on midventral cuticular surface, female.

Figs. 2, 3: Short hyaline hairs on papillae type 1, female.

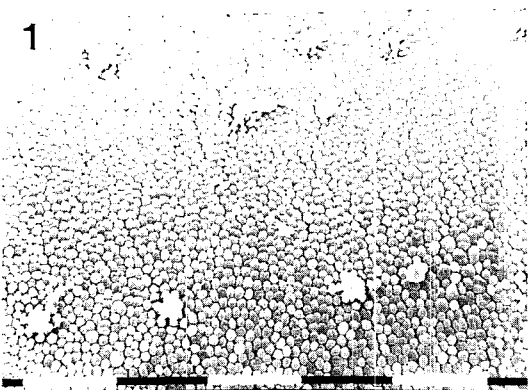
Fig. 3: Long hyaline hairs on the papillae type 1, female.

Figs. 4, 5: Smaller and slender hyaline hairs, male.

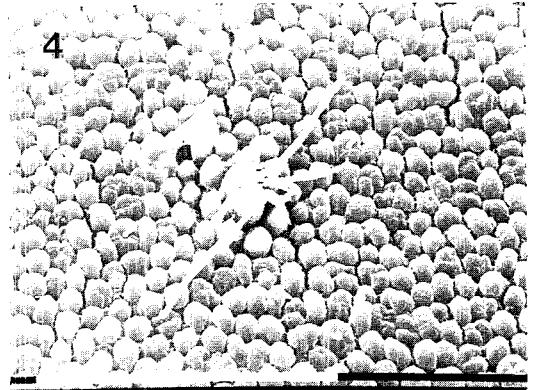
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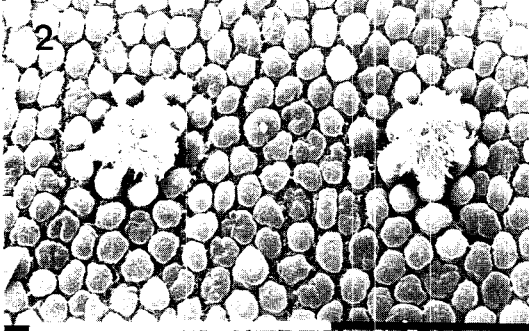
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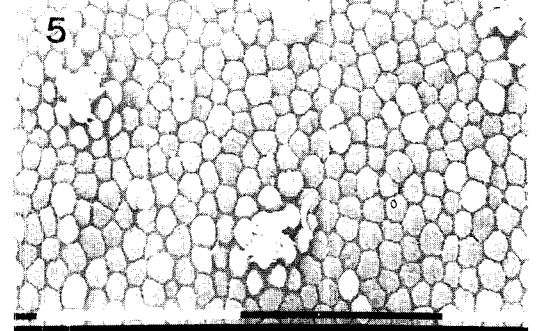
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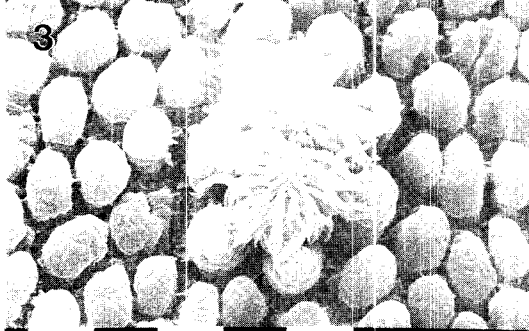
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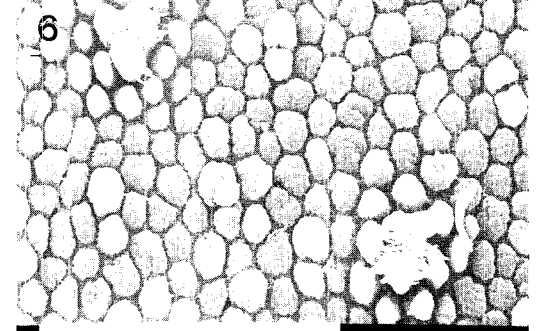
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