

***Parachordodes megareolatus*, a New Species of Horsehair Worm (Nematomorpha: Gordioida: Gordea) from Korea**

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ABSTRACT

One new species of horsehair worms (Nematomorpha) from Korea, *Parachordodes megareolatus*, is described. The specimen is reported from the human urinary system. The significance of this and other reports from the urinary system is discussed. The characteristics of the new species are clusters of a small type of cuticular structures, the areoles, which are associated with a second type of areoles, the large megareoles. Another character unique for the genus *Parachordodes* is the fusion of rows of cuticular bristles on the ventral side anterior of the cloacal opening.

Key words: *Parachordodes megareolatus* n. sp., horsehair worm, Nematomorpha, Korea

INTRODUCTION

To date, seven species of horsehair worms (Nematomorpha) have been described from Korea: *Gordius lineatus* Baek and Noh, 1992; *G. pallidus* Linstow, 1906; *G. robustus* Leidy, 1851; *G. semilunaris* Linstow, 1906; *Parachordodes coreanus* Linstow, 1906; *Chordodes japonensis* Inoue, 1952 and *C. koreensis* Baek, 1993 (Linstow, 1906; Baek and Noh, 1992; Baek, 1993).

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Here we report a new species of the genus *Parachordodes* from Korea.

Nematomorphs are parasites of arthropods, from which mature animals emerge to reproduce in free water. The microscopic larvae infect aquatic hosts which act as paratenic hosts. Final hosts, mostly terrestrial arthropods, become infected when they ingest infected paratenic hosts (Schmidt-Rhaesa, 2001). This life cycle probably accounts to the majority of species, but may not be the only one.

There are a number of records from nematomorphs in association with humans. They have either been found in the intestinal system, in the urinary system (for summaries see Cappucci, 1982; Coombs and Crompton, 1991) or, rarely, in other regions such as a tumor in an orbit (Singh and Rao, 1966) and the external auditory canal (Faust and Ramos, 1960). All these cases are probably not due to "real" parasitization of humans by nematomorphs, but account to accidental associations (Schmidt-Rhaesa, 2001).

MATERIALS AND METHODS

The male specimen of *Parachordodes megareolatus* described below was found in a bed pan of a 77 year-old female patient in a hospital after urinating. The process of emergence was not directly observed, but the bed pan observed to be dry and clean prior to urinating and contained the worm immediately after. The patient was in hospital with degenerative arthritis and irritable bowel syndrome. The hospital is a county hospital in Sanchong-gun, Gyeongnam province, Korea.

The specimen was preserved in 70% ethanol, dried in an increasing ethanol series, critically point dried (with a Bal-Tec CPD 030) and sputtered with gold (Bal-Tec SCD 005). Observation took place with a Hitachi SEM-S-450 under 15 kV. Additionally, pictures were taken with a dissecting microscope and from cuticle preparations by light microscopy.

SYSTEMATIC ACCOUNTS

****Parachordodes megareolatus*, new species**

Holotype: 1 male passed from a patient during urinating in a county hospital in Sanchong-gun, Gyeongnam province, Korea. Type specimen will be deposited in the Museum für Naturkunde, Berlin, Germany, accession nr. ZMB Entozoa 7376.

The body is 13.5 cm long and 0.5 mm in diameter. The colour is medium brown, with dark brown spots, which can be seen already with low magnifications (Fig. 1C). The anterior end is slightly tapered, the anterior cap is white, followed by a dark brown collar that merges without clear boundary into the main body colour (Fig. 1B).

The posterior end is bifurcated (Fig. 1A). The oval cloacal opening on the ventral side is surrounded by several spines (Fig. 1A). The ones on the inner side are very short, while the outer ones are slightly longer. Anteriolateral of the cloacal opening are rows of comparatively long (up to 30 μ m)

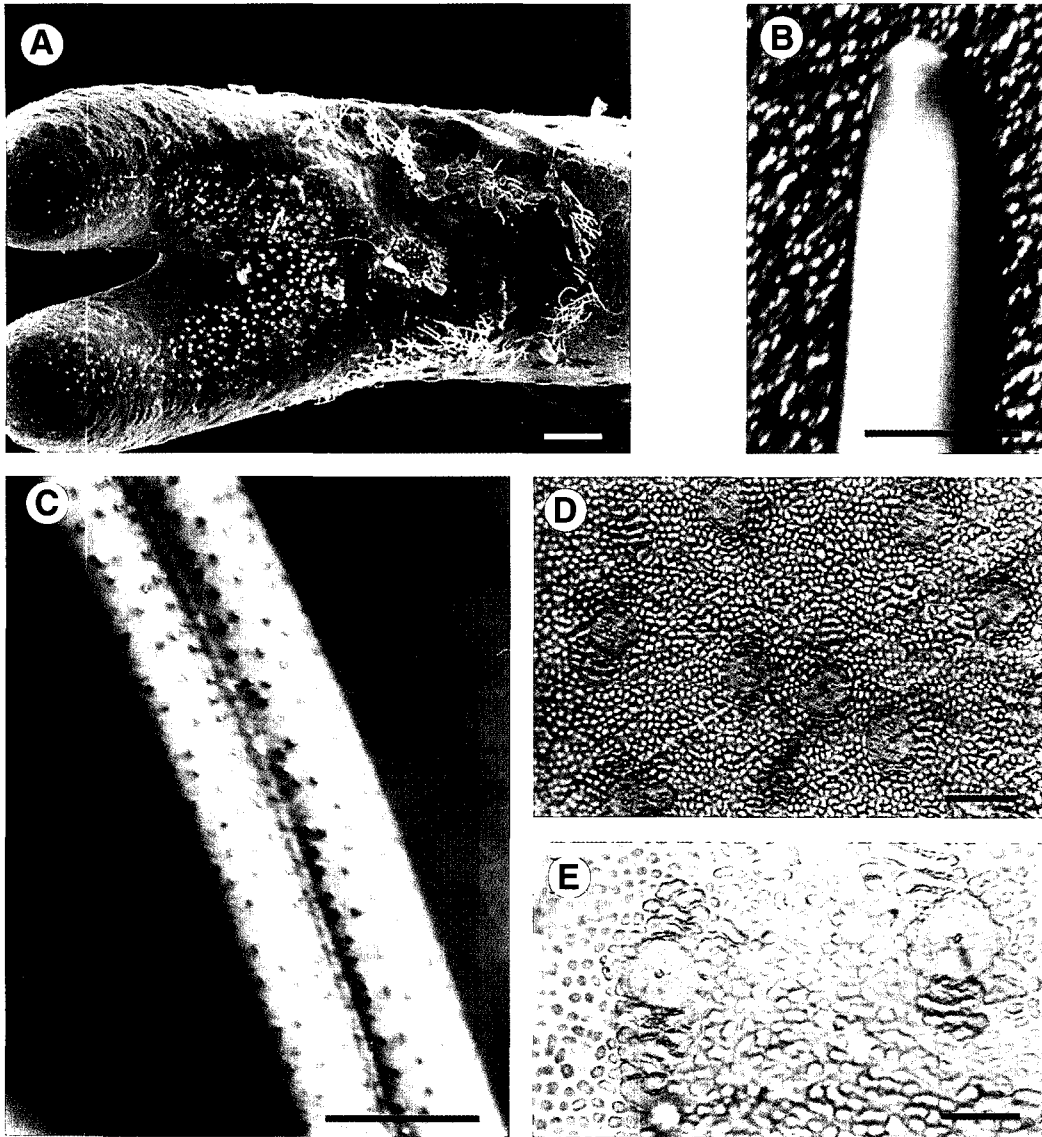


Fig. 1. A, Ventral view of posterior end with tail lobes, cloacal opening, anterolateral bristles and posterior spines; B, Anterior end with white tip and dark collar; C, Ventral side in midbody showing megareoles as dark spots and dark linear midline created by clustered areoles of type 1; D, E, Megareoles and clustered areoles of type 1 in low and higher magnification. A with SEM, B, C with dissecting microscope, D, E with light microscope. Scale bars = 10 μm (D), 20 μm (E), 50 μm (A), 0.5 mm (B, C).

and unbranched bristles (Fig. 1A). Posteriorly, they extend about 50 μm behind the cloacal opening. Anteriorly, they meet in the ventral midline. Posterior of the cloacal opening are numerous solid cuticular spines which extend onto the ventral side of the tail lobes (Fig. 1A). Towards the end of the lobes, they become more delicate.

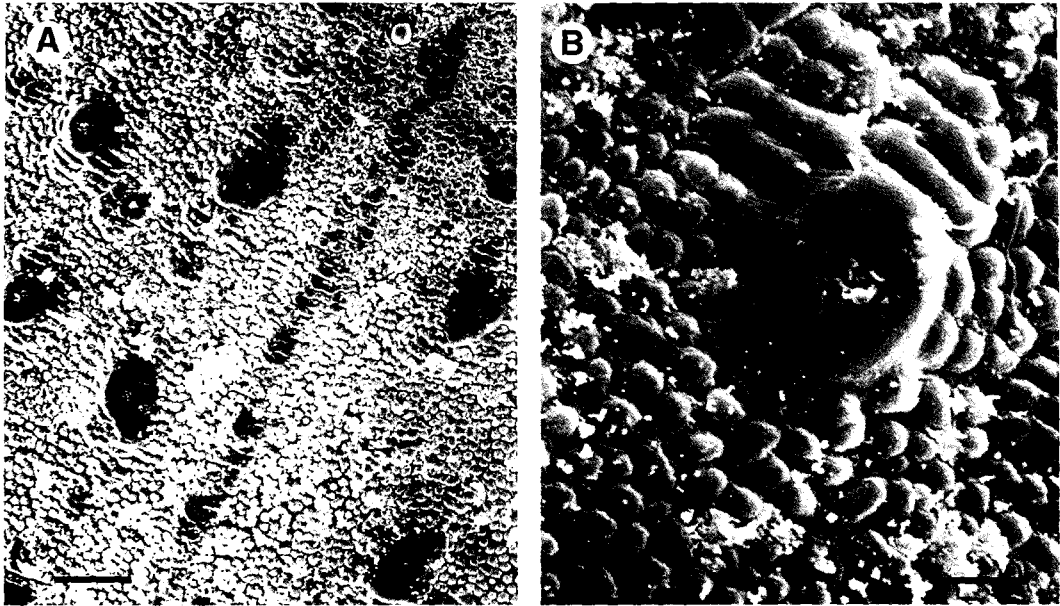


Fig. 2. A, Areoles in the ventral midline showing linear arrangement of clustered areoles of type 1; B, Megareole with associated areoles of type 1. Both with SEM. Scale bars = 5 μm (B), 20 μm (A).

The cuticle contains two kinds of areoles in different arrangement patterns. The cuticle is densely covered with rounded small areoles of the first type (Figs. 1D, E, 2A). They are either smooth or have a very small process on top (Fig. 2B). Areoles of the second type are the megareoles, which are characteristic for the genus *Parachordodes* (see Schmidt-Rhaesa, 2002). These are large and elevated areoles which appear darker in colour compared to the first type of areoles (Figs. 1C-E, 2A, B). Megareoles may appear composed of several subunits. In the center of each megareole is a pore (Fig. 2B). Areoles of the first type can be arranged into larger clusters. In these cases, they approach each other and can fuse to some degree (Fig. 2B). These clusters are associated with the megareoles and form conspicuous larger regions within the homogeneous type 1 areoles (Fig. 2B). The clusters of type 1 areoles can also exist without association to megareoles (Fig. 2A). In the ventral midline, they form a very conspicuous line of elevated areoles (Figs. 1C, 2A).

DISCUSSION

The new specimen clearly belongs to the genus *Parachordodes* Camerano, 1897. Although the characteristics for this genus are not always clearly formulated, Schmidt-Rhaesa (2002) mentioned the possession of megareoles (large elevated areoles with an apical pore) as the main character of the genus. The characteristic structures of *Parachordodes megareolatus* are the clusters of areoles of type 1 and their association with the megareoles, forming even larger structures. An association of smaller areoles with megareoles has been described for *P. propareolatus* Heinze, 1935 from

Turkestan (Heinze, 1935), Kirgisia, Uzbekistan and Tadzhikistan (Spiridonov, 1989) and for *P. magnus* Spiridonov, 1989 from Kazakhstan (Spiridonov, 1989), but in neither case, the smaller areoles form clusters similar to *P. megareolatus*. The form of the male posterior end resembles other *Parachordodes* species, with the exception that usually the anterolateral bristles are arranged in two clearly separated rows or fields (Schmidt-Rhaesa, 2002), while in *P. megareolatus*, n. sp. they join ventrally.

There has been some debate whether the reported cases of association of horsehair worms with humans are indications of a true parasitism or rather accidental cases (pseudoparasitism). The cases of occurrence of nematomorphs in the intestinal system can be suspected to be caused by accidental uptake of nematomorphs with water under restricted hygienic conditions. Three cases have been reported, where horsehair worms were found in the urogenital system and expelled by urinating. Carvalho (1942) reported *Paragordius esavianus* from a child in Rio de Janeiro, Brazil. Yeh and Jordan (1957) reported *Pseudogordius tanganyikae* from the urine of a five-year old child in Tanzania and Burger (1972) reported *Paragordius esavianus* from a 23-year old woman in Texas, USA. In Carvalho's and Burger's case, expelling the worm was accompanied by slight discomfort (Burger, 1972) or severe pains (Carvalho, 1942). In all three cases there were symptoms such as vague pains in the lower abdomen and in the cases from Tanzania and Texas, these symptoms vanished after expellation of the worms. There is no plausible explanation of how nematomorphs could reach the human urogenital system. Two alternative explanations could account to the occurrence of nematomorphs in urinating containers: first, infected arthropods which are accidentally in the same room as the patient, may use the urine as the only available liquid to release their parasite. Second, Herter and Nesse (1989) have pointed out that night pots are often used for disposal of captured and killed insects such as cockroaches. As cockroaches are regular hosts of nematomorphs, the worms can emerge in these cases into the pot. However, at least in Burger's (1972) and our case, worms were found immediately after urinating which seems to rule out that the nematomorphs originated from insects rather than from humans.

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한국산 철선충류 (유선형동물문: 연가시강: 연가시목)의 1신종,
진주철선충

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요 약

한국의 한 환자의 비뇨기계로부터 배출된 철선충이 신종으로 확인됨에 따라 진주철선충 (신칭) (*Parachordodes megareolatus*, n. sp.)으로 기재하였다. 이 신종의 형태적 특성은 표피에 작은 혹 (areole)이 돋아있고 이들이 큰구멍혹 (megareole)들과 연계되어 있는 것이다. 표피에 분포된 큰구멍혹이 이 신종이 갖고 있는 특성중의 하나이다. 일면, 본 충의 속 (genus)이 갖고 있는 특성중의 하나는 수컷 복면의 총배설강 (cloaca)이 개구되는 전면에 강모 (bristle)가 나 있고 그 배열이 모두 융합되어 있다는 것이다.