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Chordodes parabipilus (Nematomorpha: Gordiida), a new species of horsehair worms from Georgia

Abstract We describe a new species of freshwater horsehair worms (Nematomorpha, Gordiida) from Georgia, *Chordodes parabipilus*. One female of this species was collected in Tsitsamuri. The cuticle contains five types of areoles. The presence of both short and long apical filaments on the crowned areoles indicates a close relationship to *Chordodes bipilus* from Iran. The difference between both species is the absence of one type of areoles, the bulging areoles, in *Chordodes parabipilus*.

Keywords Nematomorpha, Gordiida, *Chordodes*, new species, hairworm, cuticle

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Introduction

Species of freshwater horsehair worms (Nematomorpha: Gordiida) are characterized mainly by different cuticular patterns. Traditionally, species have been investigated by light microscopy of a piece of cuticle. Scanning Electron Microscopy provides far better resolution of the cuticular structures and has become the standard method in nematomorph taxonomy.

Few gordiid species are known from Georgia. These are: *Gordius villoti* ROSA, 1882 (CAMERANO 1896), *Gordius georgiensis* KIRJANOVA, 1955 (KIRJANOVA 1955), *Chordodes oscillatus* KIRJANOVA, 1953 (KIRJANOVA 1953), *Spinochordodes baeri* (CAMERANO, 1896) (KIRJANOVA 1950) as well as *Gordius* sp. (GORGADZE & KINTSURASHVILI 2002) and *Spinochordodes* sp. (GORGADZE et al. 2008). We report here a new species, *Chordodes parabipilus*.

The genus *Chordodes* includes mainly tropical and subtropical species. Recently, the terminology of cuticular structures was unified and an overview of the genus and key for all recognized species was developed (Schmidt-Rhaesa et al. 2008). Based on this revision we recognize *Chordodes parabipilus* as a new species.

Material and methods

The single female specimen was preserved in 70% ethanol. Specimens were investigated under a dissecting scope (Leica MZ 9.5) concerning general characters and colour. Measurement of the length was taken with outstretched worms using a ruler, diameter was measured under the dissecting scope using a digital ruler. The cuticle from a 1 mm long piece of worm from the midbody region was prepared and examined with a Scanning Electron Microscope (SEM). The piece was dehydrated in an increasing ethanol series, critically point dried, coated with gold in a sputter coater and examined with a LEO SEM 1524 under 10 kV. Digital images were taken. All terminology for cuticular structures follows Schmidt-Rhaesa et al. (2008).

Results

Chordodes parabipilus new species

Type locality Georgia, village Tsitsamuri, ~ 20 km from Tbilisi. Found alive in a private swimming pool.

Material investigated One female specimen (collected by Temur Gvalia on September 30, 2002, deposited in the Zoological Museum of the University Hamburg under accession number ZMH V13269).

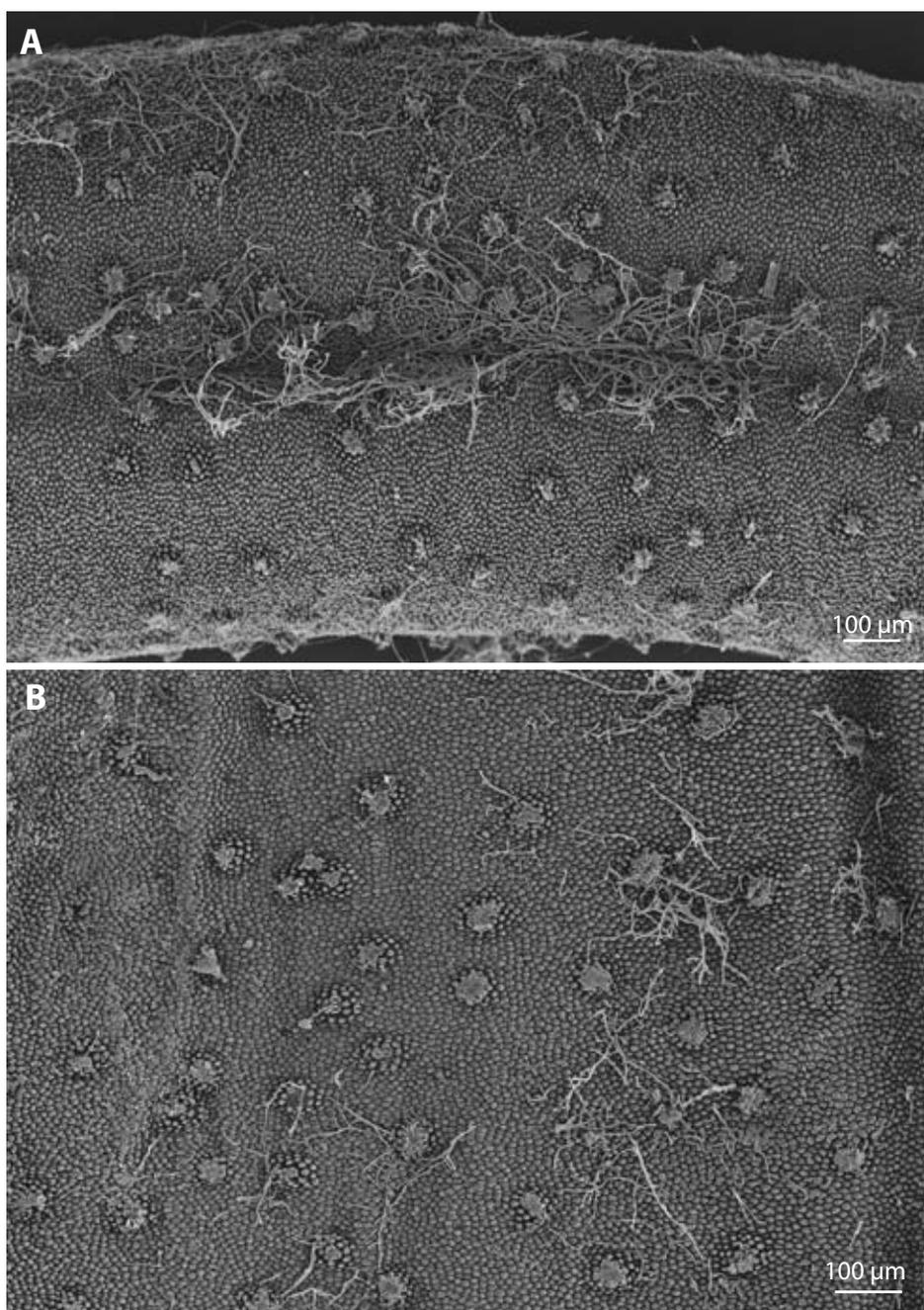


Fig. 1. *Chordodes parabipilus*, new species. A, B. Overview on the cuticular surface showing the clusters of crowned and circumcluster areoles dispersed among simple areoles and the presence of very long filaments of the crowned areoles in different locations on the surface of the animal.

Description The female is 290 mm long and has a diameter in midbody region of 1.2 mm. The anterior end is tapering. The anteriormost tip is white and blends into the uniform brown body colour; a dark collar is absent.

The cuticle contains five types of areoles (= elevated cuticular structures). Most abundant are simple areoles (Fig. 1A, B, 2A, B), which cover the entire body, other areolar types are dispersed between the simple areoles. Simple areoles are moderately elevated and have a smooth surface, on top of each simple areole is a small tuft of very short bristles (Fig. 2B). Among the simple areoles are some tubercle areoles and thorn areoles (Fig. 2A, B). Tubercle areoles carry a finger-like process on top, thorn areoles have a strong thorn on top of a broader basis. Characteristic for the genus *Chordodes* are crowned areoles, which carry a crown of apical filaments on an elevated "stem". Crowned areoles occur in pairs and are surrounded by so-called circumcluster areoles, which resemble the simple areoles, but are higher and carry slightly longer bristles on top (Fig. 2E–H). Several crowned areoles carry extremely long apical filaments, these may form dense tangles (Fig. 2C, D). Crowned areoles with long filaments are present in several regions on the cuticle and are not restricted to the ventral and/or dorsal midlines as in many other *Chordodes* species (Fig. 1A, B). Many of the crowned areoles have only shorter apical filaments (see e.g. Fig. 2F). As the filaments appear to break from their basis easily due to their fragility (see e.g. Fig. 2E), it appears possible that some of the crowned areoles with short filaments did originally carry longer filaments, too. The crowned areoles are clustered in pairs (Fig. 2F–H). Each has a more or less flat top with smooth surface (Fig. 2F–H). The two paired areoles border each other along one straight edge, which is 10–15 µm long (Fig. 2F–H). The filaments branch from the flat top in a semicircular way from the remaining border of the crowned areoles. Two kinds of filaments are present: long and thick ones as well as short and thin ones (Fig. 2E–H). The short filaments are about 20 µm long and have a diameter around 0.7 µm. The long filaments have a diameter of around 2 µm, their length is difficult to measure, but can clearly exceed 100 µm.

Discussion

The specimen described here resembles *Chordodes bipilus* KIRJANOVA, 1957, but differs quite clearly in one character. *Chordodes bipilus* was described on the basis of two females from Iran. Although size parameters appear not to be very important for species determination, *C. bipilus* is with 230–235 mm length and 1.2–1.5 mm diameter within the same size range as *C. parabipilus*. The cuticle of *C. bipilus* contains six types of areoles (KIRJANOVA 1957). Simple areoles (type 1 in KIRJANOVA 1957) correspond in shape and in the presence of fine bristles on top. Tubercle areoles (type 2 in KIRJANOVA 1957) and thorn areoles (type 3 in KIRJANOVA 1957) are also present. The main differ-

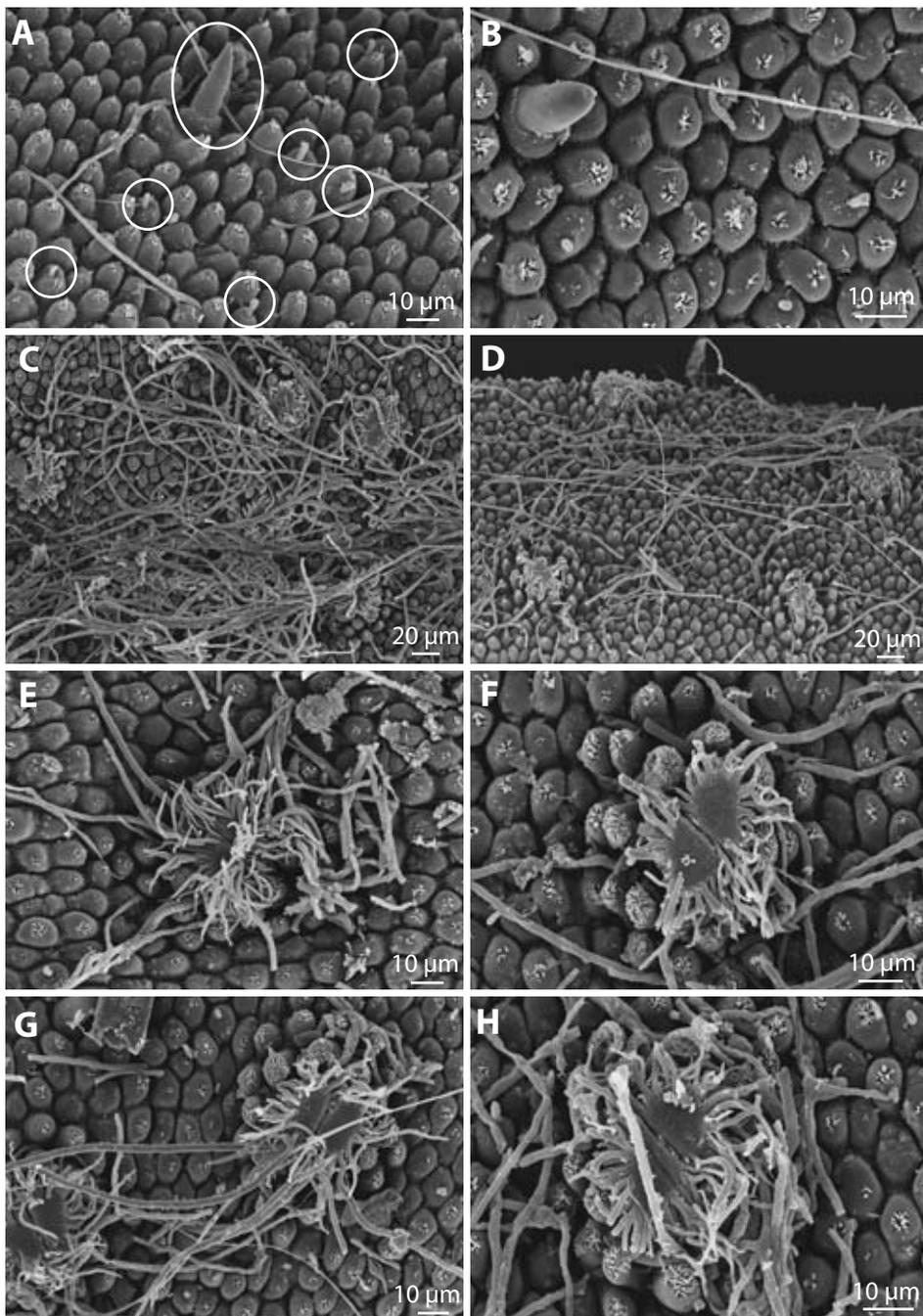


Fig. 2. *Chordodes parabipilus*, new species, details of cuticular structures. A, B. showing simple areoles, tubercle areoles (circles in A) and thorn areoles (oval in A). C, D. Very long apical filaments from crowned areoles can form dense tangles. E-H. Four Different pairs of crowned areoles surrounded by circumcluster areoles, illustrating the presence of two types of apical filaments and the flat surface of the crowned areoles.

ence is that bulging areoles (type 4 in KIRJANOVA 1957) could not be found in *C. parabipilus*, despite explicitly looking for them (see Fig. 1B). These were clearly figured and described by KIRJANOVA (/1957) for *C. bipilus*.

Pairs of crowned areoles (type 5 in KIRJANOVA 1957), surrounded by circumcluster areoles (type 6 in KIRJANOVA 1957) are present in *C. bipilus*, but may show some difference compared to *C. parabipilus*. The flat surface of each crowned areole is not clearly described or figured for *C. bipilus*. Crowned areoles with long apical filaments appear to be restricted to the ventral midline in *C. bipilus*, while they appear to have a broader distribution in *C. parabipilus*. This, however, is unusual among *Chordodes* species, because in species known to date long filaments only occur along the ventral and probably also the dorsal midline (SCHMIDT-RHAESA et al. 2008). Characteristic for *C. bipilus* is the presence of two kinds of filaments originating on the same crowned areole (KIRJANOVA 1957). This has not been described from other *Chordodes* species, but is clearly also present in *C. parabipilus*. Therefore, both species seem to be closely related, but the presence or absence of bulging areoles makes them separate species.

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