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Achaeta diddeni sp. nov. (Enchytraeidae, Clitellata) from the northern German lowlands

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ABSTRACT

Achaeta diddeni sp. nov. is described from different grassland sites in the northern German lowlands. The new species belongs to a group of small *Achaeta* species without bottle-shaped glands and with spermathecae restricted to V. Having two pairs of postseptal pharyngeal glands in V and VI and the dorsal blood vessel originating in VII, it is similar to *A. iberica* Graefe, 1989 and *A. pannonica* Graefe, 1989. With the latter it shares the displacement of all sexual organs (except the spermathecae) one segment forward. It differs from *A. pannonica* in the number of lens-shaped epidermal glands being as in *A. iberica,* and in the number of preclitellar nephridia having two pairs from 6/7 to 7/8 instead of three. The species was found in slightly acid to neutral floodplain soils of the rivers Ems (Lower Saxony) and Elbe (Brandenburg) as well as at soil monitoring sites on the Isle of Föhr (Schleswig-Holstein).

Keywords: Enchytraeidae, Achaeta, species description

INTRODUCTION

The species described here was found in the course of soil biomonitoring activities using earthworms and enchytraeids as indicators of soil quality (GRAEFE & BEYLICH, 2002; JÄNSCH et al., 2005). It belongs to the small and heterogeneous group of *Achaeta* species that share the displacement of all sexual organs (except the spermathecae) one segment forward (GRAEFE, 1989). Within this group the new species is closely related to *A. panonnica* Graefe, 1989 by the presence of postseptal pharyngeal glands, the lateral position of spermathecal openings and the absence of bottle-shaped glands.

MATERIALS AND METHODS

Living and preserved specimens were examined with interference contrast light microscopy. Whole mounts were prepared following the procedure described in BEYLICH (2005). Specimens were fixed in hot Bouin's fluid (70°C), stained with boraxcarmine, passed through an ethanol-xylol dehydration series and mounted in Canada balsam between slide and coverslip. Drawings from whole-mounted specimens were made with the help of a drawing tube. Type material is deposited at the "Zoologisches Museum der Universität Hamburg" (ZMH), Germany.

Abbreviations used in the Figures: am: spermathecal ampulla. br: brain. cc: chloragocytes covering intestine. do: developing oocytes. dv: dorsal blood vessel. hc: hyaline cells of clitellum. hp: head pore. lg: lens-shaped epidermal glands. mc: male copulatory organ. ne: nephridium. oa: oesophageal appendage. oo: mature oocyte. ov: ovary. pb: post-pharyngeal bulb. pg: pharyngeal gland. po: ectal pore of spermatheca. pp: pharyngeal pad. ps: postseptal pharyngeal gland. sc: sperm chamber of spermatheca. sf: sperm funnel. sv: seminal vesicle. te: testis. vn: ventral nerve cord.

Achaeta diddeni sp. nov.

(Figures 1-4, Table 1)

Holotype: ZMH OL 13195, stained and whole-mounted specimen. Type locality: Germany, Lower Saxony, floodplain soil at the Lower Ems near Herbrum (Transekt 18 of “Ökologisches Gutachten zum Ausbau der Bundeswasserstraße Ems”, 1993), grassland, transition of Ranunculo-Alopecuretum and Lolio-Cynosuretum. Date of soil sampling 29 June 1993, animals extracted from soil by U. Graefe in July 1993.

Paratypes: ZMH OL 13196, two specimens, stained and whole-mounted, from type locality. Collection data as in holotype. ZMH OL 13197, five specimens, stained and whole-mounted, from Isle of Föhr, Schleswig-Holstein, Germany, Soil Monitoring Site BDF 38 Witsum/Föhr, grassland, pasture, Lolio-Cynosuretum. Date of soil sampling 10 Oct 2005, soil sampling and extraction by U. Graefe in October 2005.

Further material examined: Some hundred living specimens from type locality and other sites in Schleswig-Holstein and Brandenburg.

Etymology: The species is named for my late friend and colleague Wim Didden from the Department of Soil Quality, Wageningen University.

Description: Living specimens ca. 4 mm, preserved ca. 3 mm long. Segment number 22-24. Septa well developed from 4/5 to 7/8, septum reduced at 8/9 (Fig. 1). Bottle-shaped glands absent. Lens-shaped epidermal glands inconspicuous, 6 per segment in three pairs dorsally, laterally and ventrally, dorsal and lateral glands between same ring muscles, ventral glands somewhat behind. Brain rounded posteriorly. Four post-pharyngeal bulbs, outer pair apparently inside efferent ducts of pharyngeal glands. Three pairs of

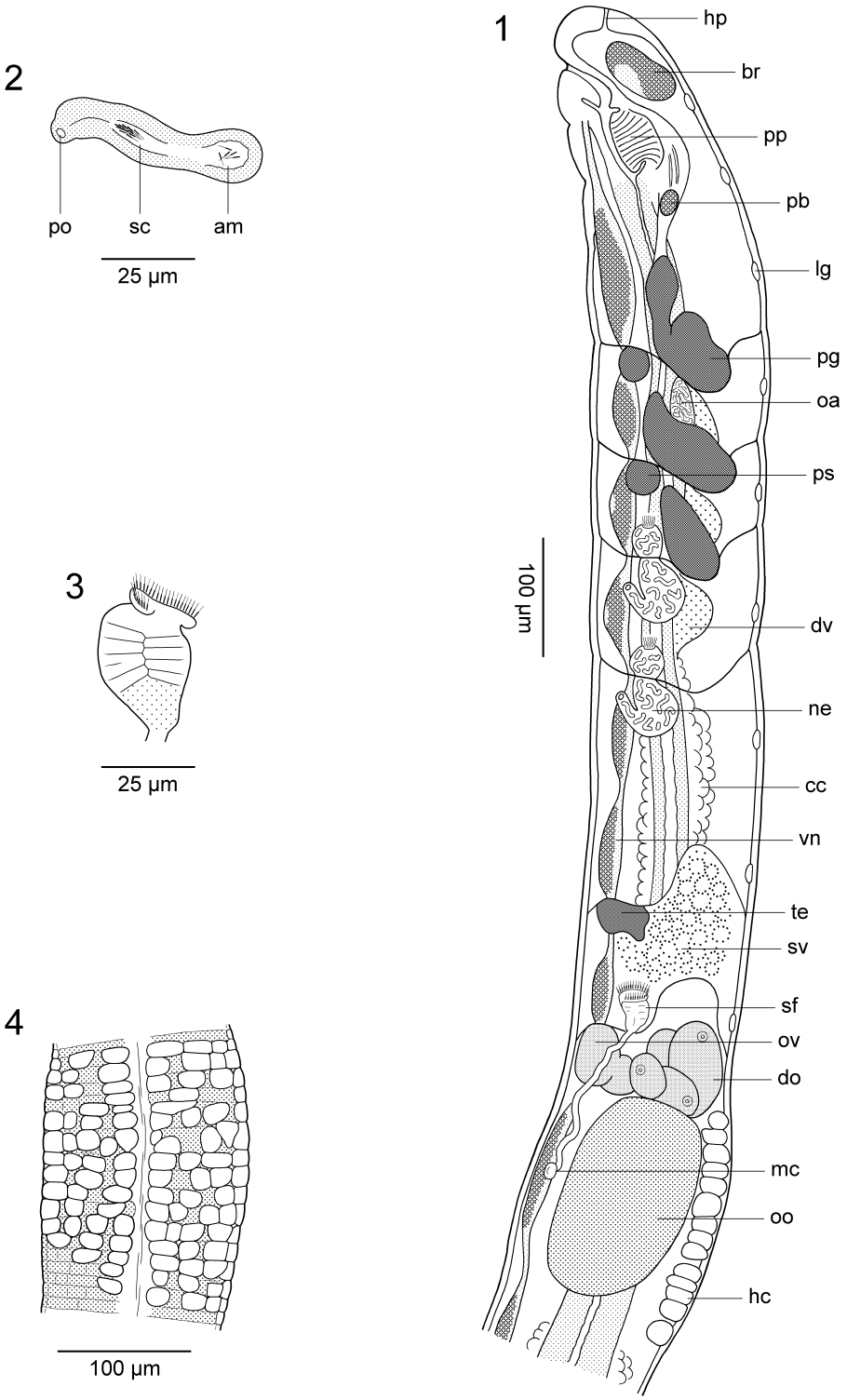

Figure 1-4: *Achaeta diddeni* sp. nov. 1. Anterior 11 segments, lateral view. Spermatheca not shown. 2. Spermatheca. 3. Sperm funnel. 4. Clitellum, dorsal view. All figures are from stained whole mounts.

pharyngeal glands in IV, V and VI, all united dorsally and with ventral lobes. Two pairs of postseptal pharyngeal glands at 4/5 and 5/6. Oesophageal appendage in V small, inconspicuous, without mid-dorsal canal leading to pharyngeal pad. Oesophagus expending gradually into intestine, forming no loop. Dorsal blood vessel originating in VII, with pulsating expansions in VII, VI and V. Two pairs of preclitellar nephridia at 6/7 and 7/8, constricted at septum, anteseptale with coils of canal. Coelomocytes roundish. Testis in X, ovary in XI, both unpaired, connected at septum between body wall and ventral nerve cord. Seminal vesicle in X loosely filled with developing sperm. Spermatozoa very short. Sperm funnel (Fig. 3) small pear-shaped, 38 µm long, 25 µm wide, collar as wide as funnel body. Vas deferens short, not coiled into spiral. Male pore in XI, surrounded by cells forming inconspicuous male copulatory organ. Accessory penial glands absent. Distance between male pores about three times as wide as ventral nerve cord ganglion (ca. 60 µm). One mature egg. Clitellum (Fig. 4) extending from XI to 1/3XII, absent mid-ventrally and mid-dorsally, dorsal interruption 10-20 µm wide, ventral gap as wide as distance between male pores. Glandular cells arranged in 16-18 transverse rows. Irregularly formed longitudinal rows of hyalocytes on dorsal side of clitellum. Latero-ventrally only granulocytes. Spermatheca (Fig. 2) short, confined to V, consisting of ectal duct, ectal sperm chamber, ental duct and ental ampulla. Most sperm concentrating ectally in sperm chamber. Spermathecal opening at lateral line, no glandular thickening at ectal orifice.

Occurrence: Known from 8 localities in northern Germany. Lower Saxony: Lower Ems. Schleswig-Holstein: Soil Monitoring Sites BDF 03 Hedehusum/Föhr, BDF 38 Witsum/ Föhr, BDF 34 Kiel. Brandenburg: Biosphere Reserve Elbtalaue (BEYLICH & GRAEFE, 2007). Grassland: pasture, reed, urban lawn. Freely draining floodplain soil, upland soil, moisture condition (sensu GRAEFE & SCHMELZ, 1999) fresh to damp, pH ($CaCl_2$) 4.2-6.5. Associated community (sensu BEYLICH & GRAEFE, 2002) Fridericio-Lumbricetum.

REMARKS

Up to now 4 *Achaeta* species are known to have sexual organs shifted one segment forward: *A. abulba* Graefe, 1989, *A. bibulba* Graefe, 1989, *A. pannonica* Graefe, 1989, and *A. diddeni* sp. nov. The first two species differ from the last two by having dorsal bottle-shaped glands (setal follicles), no postseptal pharyngeal glands, ventral spermathecal openings, one pair of preclitellar nephridia, and a mid-dorsal canal leading from the oesophageal appendage in V to the pharyngeal pad. The rejection of the term "setal follicles" for bottle-shaped glands is argued in GRAEFE (2002).

A. diddeni and *A. pannonica* belong both to a group of small species without bottle-shaped glands and with spermathecae restricted to V. Other species of this group are *A. brevivasa* Graefe, 1980, *A. iberica* Graefe, 1989, *A. afolliculata* Sesma & Dózsa-Farkas, 1993, *A. etrusca* Rota, 1995, *A. petseri* Dózsa-Farkas, 1998, and *A. antefolliculata* Dózsa-Farkas & Boros, 2005. The most important "hard" characters that distinguish some of these species, including the larger *A. camerani* (Cognetti, 1899), are shown in Table 1.

Comments on species not included in Table 1

***A. afolliculata*:** seems to have no postseptal pharyngeal glands. SESMA & DÓZSA-FARKAS (1993) describe "one pair of secondary glands in segment VI on the ducts of primary glands", but the drawing shows the glands being in IV. These structures, however, are no postseptal glands as figured in GRAEFE (1980).

***A. etrusca*:** very similar to *A. iberica*. The distinguishing features reported by ROTA (1995) are rather "soft" characters.

***A. petseri*:** first described in DÓZSA-FARKAS et al. (1998). Schmelz (SCHMELZ et al. 2005) reinvestigated the type material. He concludes "regarding the slightness of differences between *A. petseri* and *A. pannonica*, it seems possible that the former is a junior synonym of the latter".

***A. antefolliculata*:** differs from all other species by the presence of enlarged lens-shaped epidermal glands protruding into the body cavity, laterally in 5 pairs from II to VI (DÓZSA-FARKAS & BOROS 2005).

Table 1. Comparison of 5 *Achaeta* species. All species lack bottle-shaped glands. Further common characters: spermathecae restricted to V, spermathecal openings lateral, coelomocytes roundish.

	Lens-shaped epidermal glands per segment	Pairs of postseptal pharyngeal glands	Origin of dorsal blood vessel in segment	Pairs of preclitellar nephridia	Male pores in segment
A. brevivasa	6	1	VII	2	XII
A. camerani	6	2	VIII	2	XII
A. diddeni sp. nov.	6	2	VII	2	XI
A. iberica	6	2	VII	3	XII
A. pannonica	8-12	2	VII	3	XI

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