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The first record and description of females of the genus *Acunemella* Andrassy, 2002 (Nematoda, Nordiidae) from the South Shetland Islands

Abstract. There is a single record of the rare terrestrial nematode genus *Acunemella* Andrassy, 2002 (Nematoda, Nordiidae) in the type locality on Chiloé Island (South Chile). The type species of the genus, *Acunemella torta* Andrassy, 2002, was described on the basis of only two male specimens. In this article, mature females of the genus *Acunemella* are described for the first time based on morphology and morphometrics of specimens from Deception Island (South Shetland Islands). The current article is the first report of this genus from the Antarctic region. Females from Deception Island are characterized by a didelphic-amphidelphic genital system, with both branches almost equally developed, a distinct muscular sphincter between oviduct and uterus, a curling outer surface of the uterus, *pars refringens vaginae* moderately sclerotized, with two relatively large ($4-6 \times 12-13 \mu\text{m}$) rounded triangular pieces, a vulval region with well-developed cuticular folds. Morphologically, females are similar to originally described males but differ by longer bodies, more distinctly offset lip regions and the shape of sperm cells in uterus. Verifying the taxonomic status of the population described in this article requires the analysis of additional materials.

Keywords: Antarctica, Deception Island, morphology, nematodes, taxonomy

1 Introduction

The first biological studies were started by Ukrainian scientists in the area of the Akademik Vernadsky station (Marina Point, Galindez Island, Argentine Islands) during the third year-long Ukrainian Antarctic Expedition in 1998–1999. Since then, another 25 expeditions have been conducted in which biological research, particularly nematological, was carried out under the State targeted scientific and technical research programs in the Antarctic. During Ukrainian Antarctic expeditions

(2006–2007, 2007–2008, and 2009–2010), samples of nesting material and mosses from the Argentine Islands were collected and analyzed. Complete checklists of invertebrates inhabiting terrestrial moss and bird nest communities were published, including 28 nematode species (Dykyu et al., 2012; Trokhymets et al., 2014).

During the Ukrainian Antarctic Expedition (2003–2004) in March 2004, a few moss samples were collected on Deception Island (South Shetland Islands). The processing of these samples revealed the presence of two mature females and two

juvenile specimens, very similar to *Acunemella torta* Andrassy, 2002 according to most morphologic features.

In the most current study focused on the nematode fauna of the Maritime Antarctic, the data on 44 species belonging to 21 genera is presented (Elshishka et al., 2023). Only 12 were previously reported from Deception Island, but *Acunemella* was not detected among them (Spaull, 1973; Maslen, 1979; Andrassy, 1998a; Russell et al., 2014). *Eudorylaimus spaulli* Loof, 1975 is the only species from Deception Island which belongs to the order Dorylaimida, the same as *Acunemella*.

Genus *Acunemella* with the single species *A. torta* was described by I. Andrassy from Chiloé Island near the west coast of Chile, in the Pacific Ocean. Soil samples containing *Acunemella* specimens were collected in the rhizosphere of fern plants. The species was described based on only two males and one immature female (Andrassy, 2002). As the type population contained only male specimens, some important diagnostic features (such as the female genital system) have not been determined. In Dorylaimida, characters of genital systems of both sexes are important diagnostic features used to determine species within the separate genera. The morphology of the females is described here in detail as *Acunemella* sp.

2 Materials and methods

Nematodes were extracted by a decantation and sieving method with final separation on extraction sieves, fixed in a hot 4% TAF (Courtney et al., 1955), processed to pure glycerin as described by Seinhorst (1959), and mounted on slides using the paraffin-ring method. Identification, measurements, and microphotographs were made using an Olympus BX 51 microscope with Nomarski differential interference contrast, equipped with a digital camera Olympus DP 72, and the computer program Quick PHOTO MICRO 2.3. The morphometric study of each specimen included classical diagnostic features of the Dorylaimida (de Man body ratios); all the abbreviations used are as defined in Jairajpuri and Ahmad (1992). The location

of pharyngeal gland nuclei is expressed according to Loof and Coomans (1970) and Andrassy (1998b).

Material examined: two females and two juveniles from a single location, in good state of preservation, collected on March 10, 2004 on the shore of Whaler's Bay, Deception Island, South Shetland Islands.

3 Results and discussion

Acunemella sp. (Figure)

L = 1652–1831 μ m; a = 33.1–36.6; b = 3.9–4.1; c = 39.3–40.7; c' = 1.6–1.9; V = 43.5–45.1%; odontostyle length = 47–52 μ m (L – overall body length; a – body length / greatest body diameter; b – body length / distance from anterior to esophago-intestinal valve; c – body length / tail length; c' – tail length / tail diameter at anus; V – % distance of vulva from anterior).

Description. Females. Habitus strongly curved ventrad, especially in the posterior body region, forming the shape of a closed spiral after warm relaxation. Body cylindrical, slender, with a maximum diameter at the vulva level (50 μ m), gradually tapering towards the posterior end but strongly towards the anterior end. Anterior end of the body extremally narrow, 8 μ m wide, only 17.4–19.5% of the body diameter at the level of esophageal base. Cuticle smooth, 1.5–2.0 μ m thick at mid-body, and 3.5–4.0 μ m on tail. Lip region rounded, offset from the rest of the body by a shallow depression, twice as broad as high. Lips not separate, with weakly protruding labial and cephalic papillae. Amphid with slit-like aperture, about two-thirds as wide as lip region diameter, amphidal fovea relatively large, funnel-shaped. Cheilostom nearly cylindrical, lacking any differentiation. Odontostyle extremally long and thin, with conspicuous lumen and very small aperture; 5.9–6.5 times as lip region diameter, and 2.8% of body length. Guiding ring simple, situated at 11–12 μ m from anterior end. Odontophore linear, almost as long as odontostyle. Pharynx 424–444 μ m long, consisting of two different parts: an anterior slender narrow part and wide muscular

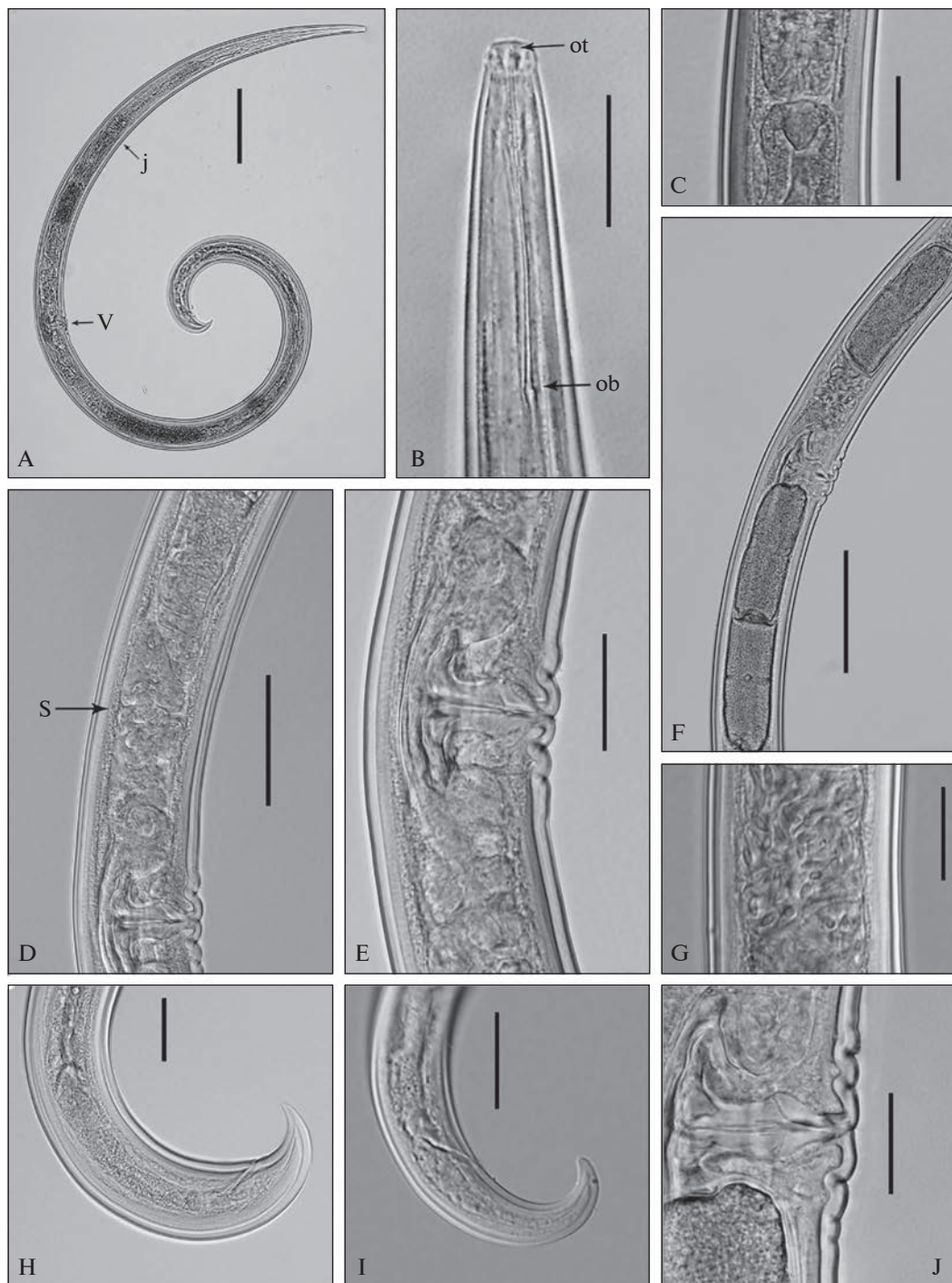


Figure. Light micrographs of *Acunemella* sp. A: Entire female; B: Anterior region in lateral, median view; C: Pharyngo-intestinal junction; D: Anterior genital branch; E: Vagina; F: Part of genital system with eggs; G: Sperm cells in uterus; H: Female tail region; I: Juvenile tail region; J: Vulval region. Abbreviations: V – vulva; j – pharyngo-intestinal junction; ob – odontostyle base; ot – odontostyle tip; S – oviduct-uterus sphincter. (Scale bars: A = 120 μ m; B, G, J = 20 μ m; C, E, H, I = 30 μ m; D = 50 μ m; F = 80 μ m)

basal expansion (168–185 μm), occupying 39.6–41.7% of total pharynx length; gland nuclei, according to Loof and Coomans (1970), located as follows ($n = 2$): $\text{DO} = 68.7\text{--}70.3\%$, $\text{DN} = 70.0\text{--}71.7\%$, $\text{S}_1\text{N}_1 = 80.4\text{--}81.8\%$, $\text{S}_1\text{N}_2 = 83.6\text{--}84.4\%$, $\text{S}_2\text{N} = 93.5\text{--}95.0\%$ (DO – orifice of dorsal gland; DN – dorsal gland nucleus at center of nucleolus; S_1N_1 – anterior nucleus of the first pair of ventrosublateral glands; S_1N_2 – posterior nucleus of the first pair of ventrosublateral glands; S_2N – nuclei of the second pair of ventrosublateral glands) or according to Andr ssy (1998b): $\text{D} = 70.0\text{--}71.7\%$, $\text{AS}_1 = 34.6\text{--}35.8\%$, $\text{AS}_2 = 45.0\text{--}45.1\%$, $\text{PS} = 78.2\text{--}82.5\%$ (D – dorsal nucleus; AS_1 – anterior subventral nucleus, first; AS_2 – anterior subventral nucleus, second; PS – posterior subventral nuclei). Pharyngo-intestinal valve conoid, 14–17 μm long. A dorsal cell mass is perceptible in one female specimen at the level of anterior end of intestine.

Genital system didelphic-amphidelphic, with both branches almost equally developed, anterior 207–268 μm or 13–15% of body length, and posterior 322–379 μm or 20–21% of body length. Ovaries large, anterior 91–110 μm , posterior 221–250 μm long, reflexed, almost reaching the oviduct-uterus junction. Oocytes arranged first in two or more rows, then in a single row. Oviduct consisting of slender part consisting of prismatic cells and moderately developed *pars dilatata* with distinct lumen. A distinct narrowing with muscular sphincter separates oviduct and uterus. Uterus 43–81 μm long, tubular, with curling outer surface. Abundant ovoid sperm cells observed in both distal and proximal uterine sections. Uterine eggs relatively large, $89\text{--}96 \times 30\text{--}31 \mu\text{m}$ ($n = 3$), ca 1.9–2.0 times long as corresponding body diameter. Egg shell thin and smooth. Vagina extending inwards 35 μm , more than half (70%) of body diameter; *pars proximalis* 14–15 μm wide, with sigmoid walls, *pars refringens* moderately sclerotized, with two adjacent rounded triangular pieces, measuring $4\text{--}6 \times 12\text{--}13 \mu\text{m}$; *pars distalis* weakly expressed. Vulva preequatorial, transverse slit. On the ventral body side anteriorly and posteriorly to vulva 2–3 well-developed cuticular folds are present (Figure E, J).

Prerectum 85–91 μm long, rectum 23–24 μm , slightly shorter than anal body diameter (24–27 μm). Tail 42–45 μm long, convex conoid, ventrally curved, with finely rounded tip. Terminal hyaline portion of the tail distinctly expressed, 9–13.5 μm long. Caudal pores not visible.

Juveniles. $L = 807\text{--}884 \mu\text{m}$; $a = 38.4\text{--}42.1$; $b = 3.0\text{--}3.1$; $c = 21.2\text{--}28.5$; $c' = 2.1\text{--}2.7$; lip region diameter – 6–7 μm ; odontostyle length – 24–26 μm ; tail length – 31–38 μm .

Juveniles were similar to adults apart from lacking a fully developed reproductive system, shorter body length, relatively longer ($c' = 2.1\text{--}2.7$ vs 1.6–1.9) and more cylindrical tail.

The genus *Acunemella* can be distinguished from the other genera of the family Nordiidae by some unique characters: very narrow lip region, extremely long and thin odontostyle, and dorsal pharyngeal gland very posterior in position. The presence of all these characters in specimens from the studied population proves they belong to the genus *Acunemella*. Comparative analysis shows that females of *Acunemella* sp. from Deception Island are very similar to males from the type population of *A. torta* from Chilo  Island, but have some morphological differences. They differ by a longer body (1.65–1.83 vs 1.48–1.57 mm), more distinctly offset lip region, and shape of sperm cells (ovoid in female uterus vs fusiform in male testis). The habitat where *Acunemella* sp. was collected also differs from the type one (mosses vs soil around fern roots).

The received data significantly contribute to the morphological characteristic of the genus *Acunemella* and verify that it belongs to the family Nordiidae. The new geographical record of this genus indicates the participation of South American faunistic elements in the formation of Antarctic nematode fauna. Verifying the taxonomic status of the population described in this article requires the analysis of additional materials.

Author contributions. Study design: A.S.; investigation: A.S., S.S.; writing original draft: A.S., S.S.; illustration preparation: S.S.; manuscript editing: S.S.

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Conflict of Interest. The authors declare that they have no conflict of interest.

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Перша знахідка і опис самок роду *Acunemella* Andrásy, 2002 (Nematoda, Nordiidae) з Південних Шетландських островів

Реферат. Рідкісні наземні нематоди роду *Acunemella* Andrásy, 2002 (Nematoda, Nordiidae) досі були відомі лише з типового локалітету на острові Чилое (південь Чилі). Єдиний вид роду, *Acunemella torta* Andrásy, 2002, описаний на основі лише двох екземплярів самців. В даній роботі, на основі таксономічно значимих морфологічних ознак та морфометричних параметрів екземплярів, зібраних на острові Десеппшен (Південні Шетландські острови), вперше описані статевозрілі самки роду *Acunemella*. Це перша знахідка роду в Антарктиці. Самки з острова Десеппшен характеризуються дидельфно-амфідельфною статеву системою, хвилястою зовнішньою поверхнею матки, помірно склеротизованими *pars refringens* вагіни з відносно великими (4–6 × 12–13 мкм) округло-трикутними тільцями та добре розвинутими кутикулярними складками в ділянці вульви. Морфологічно, самки подібні до самців з типової популяції *A. torta*, проте відрізняються довшим тілом, більш чітко відділеною губною областю і формою спермій у матках. Верифікація таксономічного статусу нематод, зібраних на острові Десеппшен, потребує досліджень додаткового матеріалу.

Ключові слова: Антарктика, морфологія, нематоди, остров Десеппшен, таксономія