

First records of *Microlaimus tenuispiculum* de Man, 1922 (Nematoda: Microlaimidae) from the Black Sea

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Received 25 September 2017 | Accepted 12 October 2017 | Published online 30 October 2017.

Abstract

First detection of free-living nematodes *Microlaimus tenuispiculum* de Man, 1922 from the Black Sea is marked. Species is found off the coast of Crimea and on the NW shelf of the Black Sea (in areas of Zernov's *Phyllophora* Field and submarine Dnieper Canyon) at depths from 5 to 190 m on different types of sediment (sandy-silt, dense silt clay and silt with hydrogen sulphide). Description with illustrations of *M. tenuispiculum* is given. The Black Sea specimens differs by the shorter tail ($c = 7.3\text{--}9.1$ vs $c = 6\text{--}7.5$), shorter esophagus ($b = 6.9\text{--}8.2$ vs $b = 6\text{--}6.9$) and the presence of somatic setae.

Key words: *Microlaimus*, nematode, taxonomy, Black Sea.

Introduction

Representatives of genus *Microlaimus* de Man, 1880 are widely distributed in benthos from shallow-water to deep-sea habitats (Semprucci *et al.* 2013, Giere 2009) including maximum depth of 7800 m in the southern part of the Pacific Ocean (Gambi *et al.* 2003). At present about 80 species of genus *Microlaimus* are known (Guilini *et al.* 2017). However, for the Black Sea only three species of this genus are described: *M. globiceps* de Man, 1880, *M. kaurii* Wieser, 1954 and *M. ponticus* Sergeeva, 1976. The areas of distribution of the nematodes from the genus *Microlaimus* include sites with more variable content of oxygen, hypoxic and anoxic conditions of the Black Sea benthos at depths from 5 to 2080–2121 m (Sergeeva & Kolesnikova 2003, Kulakova 2013, Mureşan 2014).

Previously unknown species of free-living nematodes – *M. tenuispiculum* was found during benthic studies carried out in different areas of the Black Sea. *M. tenuispiculum* is characteristic species for muddy suboxic or anoxic environments and is common in the North (Steyaert *et al.* 2005) and Baltic seas (Allgén 1934a) and off the coast of England (Somerfield *et al.* 1994). In the Black Sea representatives of this species occur both in shallow-water and deep-sea habitats with abundance up to 81% in the total nematodes community structure.

The present was aimed to redescribe *M. tenuispiculum* based on a new material from the Black Sea and clarify its systematic position.

Material and Methods

The work is based on materials collected in the coastal and offshore areas of the northwestern part of the Black Sea. Offshore material was collected during two cruises: 72/2 of RV Meteor in February – March 2007 in the region of submarine Dnieper Canyon (Sergeeva *et al.* 2012) and 68th of RV "Professor Vodyanitsky" in October – November 2010 at the Zernov's *Phyllophora* Field (Sergeeva *et al.* 2013). In Dnieper Canyon the stations were chosen to span the lower boundary oxygen layer, oxic/anoxic transition zone to the upper anoxic zone, crossing the shelf and the NW Crimean slope at the depths of 120–240 m. In this area samples of bottom sediments were collected using a modified version of the Barnett multiple corer. Sediment cores were sectioned into the following horizontal layers: 0–1, 1–2, 2–3, 3–5 cm.

In the area of Zernov's *Phyllophora* Field meiobenthos samples were collected at depths 19–52 m. Sediments were taken by meiobenthic tube (18.1 cm²) from the surface (layer high 0–5 cm) of the bottom sediments monoliths lifted by "Ocean 50" grab.

In the coastal zone, sampling was made in Sevastopol Bays (May 2013): Sevastopolskaya, at depths 1.5–17 m and Kruglaya – 2–16 m (Revkova 2014), using a meiobenthic tube from the surface (layer 0–5 cm) of the bottom monoliths lifted by Petersen grab. All samples were fixed in 75 % alcohol. The sediment was carefully washed with water on sieves with mesh sizes of 1000 and 63 µm. The fraction retained on the sieves was stained in rose Bengal solution before being transferred to a Bogorov chamber and sorted in water under a binocular microscope. For taxonomical analysis, nematodes were mounted onto permanent glycerin-gelatin slides (Tsalolikhin 1980).

Figures and measurements were made with a Nikon Eclipse E200 microscope. Type specimens are deposited in the collection of the A. O. Kovalevsky Institute of Marine Biological Research RAS (Sevastopol, Russia).

Abbreviation: a – body length divided by maximum body diameter; b – body length divided by esophageal length; c' – tail length divided by cloacae body diameter; c – body length divided by tail length; L/spic. – body length divided by spicule length; c.b.d. – corresponding body diameter; V – distance of vulva from anterior end as percentage of body length, (%).

Results

Taxonomy

Order Desmodorida De Coninck, 1965

Superfamily Microlaimoidea Micoletzky, 1922

Family Microlaimidae Micoletzky, 1922

Genus *Microlaimus* de Man, 1880

Diagnosis. (Tchesunov, 2014) Cuticle annulated, in some species also showing punctations or longitudinal bars. Head slightly set off. Spicules usually short and arcuate, seldom long and slender; gubernaculum present, often bent distally but without dorso-caudal apophyses. Papilloid precloacal supplements may be present. Ovaries paired, outstretched.

Type species: *M. globiceps* de Man, 1880

Microlaimus tenuispiculum de Man, 1922

Figure 1, Table 1

Material examined: five males, three females. Glycerin-gelatin slides. Males on slides from # FIN/BS–16 to FIN/BS–20; same for females, from FIN/BS–21 to FIN/BS–23.

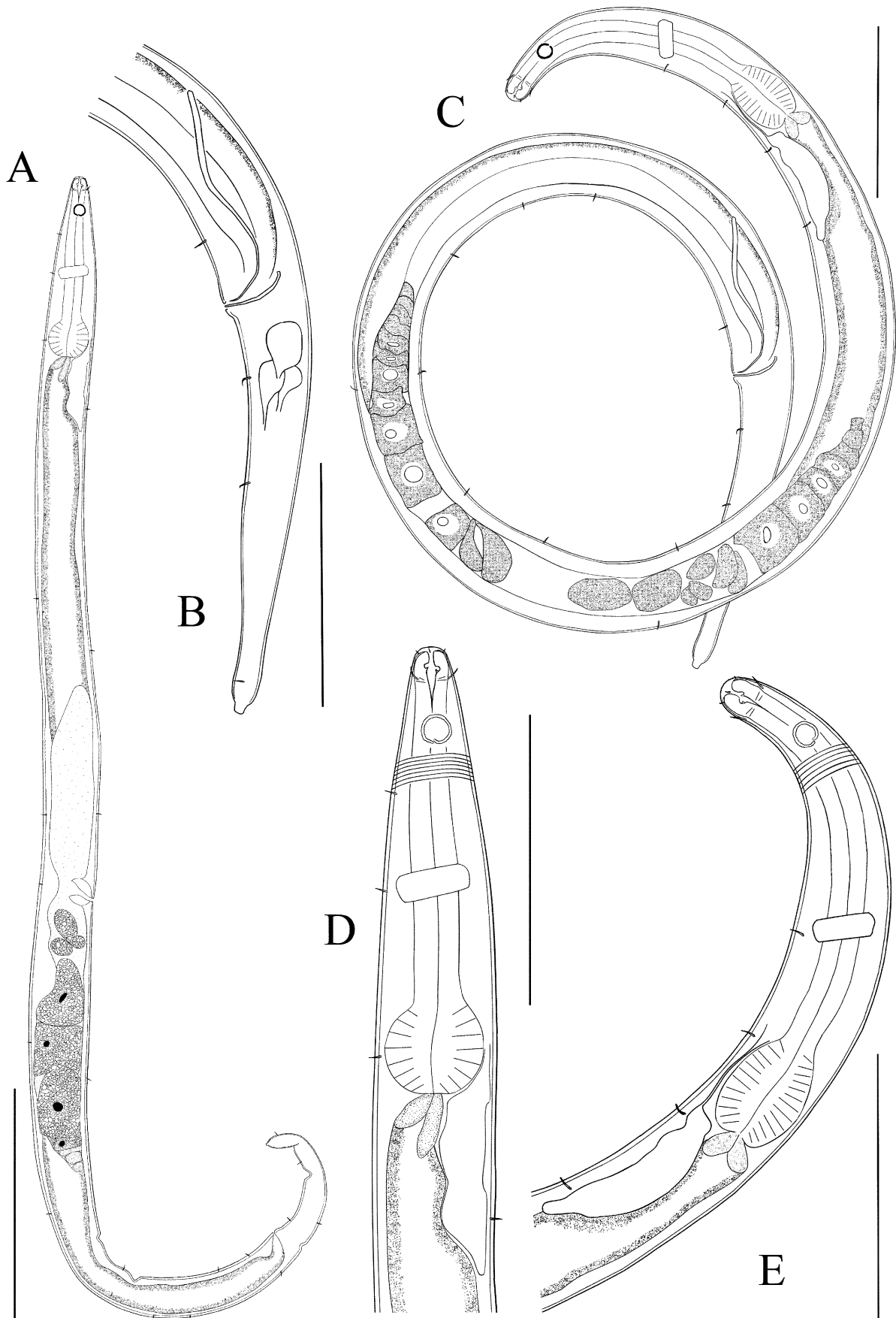


Figure 1. *Microlaimus tenuispiculum* de Man 1922 A: female, total view; B: male 1, tail; C: male 1, total view; D: female, head; E: male 1, head. Scale bars: A = 100 μ m; B, C, D, E = 50 μ m.

Type locality. Black Sea. Submarine Dnieper Canyon, specimens were found on 8 stations at depths 120–190 m (st. 256, 120 m, 44°47.54'N, 31°57.34'E; st. 258, 130 m, 44°47.41'N, 31°57.50'E; st. 259, 140 m, 44°47.36'N, 31°57.61'E; st. 260, 150 m, 44°47.29'N, 31°57.72'E; st. 261, 160 m, 44°47.15'N, 31°57.99'E; st. 262, 170 m, 44°47.04'N, 31°58.16'E; st. 324, 180 m, 44°46.72'N, 31°58.36'E; st. 326, 190 m, 44°46.67'N, 31°58.36'E). Bottom sediments are sandy silt with large quantities of bivalve, ostracod and foraminifera shells at 120–140 m depth, and silt with molluscan shell debris and bacterial aggregations at 150–190 m depth. The sediment surface is covered by various kinds of organic detritus, including the remains of macroalgae and micro-algae, as well as bacterial mats of different sizes. The maximum abundance was recorded at depth 160 m (73895 ind./m², 10.1 % of the total community), minimum – at depth 180 m (456 ind./m², 4.4 %).

Zernov's *Phyllophora* Field: specimens were found on 7 stations at depths 20–36 m (st.11, 27 m, 45°38.417'N, 30°36.35'E; st.14, 21 m, 45°58.967'N, 30°53.233'E; st.15, 34 m, 46°5.3'N, 31°5.933'E; st.16, 35 m, 45°58.917'N, 31°5.367'E; st.18, 36 m, 45°45.45'N, 31°6.883'E; st.24, 20 m, 46°4.117'N, 31°21.033'E; st.25, 20 m, 46°4.05'N, 31°35.083'E). Bottom sediments are silt with light smell of hydrogen sulphide and with dead shells at 27 (st. 11) and 21 m (st. 14) depths; dense silt clay with dead shells at 34 (st. 15) and 35 m (st. 16); silty debris shells at 36 m (st. 18); silty debris shells at 20 m (st. 24 and 25). Maximum abundance was at depth 35 m (st. 16) – 20580 ind./m² (81 % of the total community), minimum – 36 m (st. 18) – 605 ind./m² (0.5 %).

Shallow waters: Kruglaya and Sevastopolskaya Bays. In Kruglaya Bay, specimens were found on 3 stations at the exit of the Bay (depths 8–16 m). Bottom sediments are sand with dead shells. Maximum abundance was at depth 15 m (790 ind./m², 1.2 % of the total community), minimum – at depth 8 m (575 ind./m², 1%). Sevastopolskaya Bay, specimens were found along the whole of the Bay area on 12 stations at depths 5–17 m. Bottom sediments are silty-sand with hydrogen sulphide (depths 5–10 m), black silt with smell hydrogen sulphide (depths 8–17 m). Maximum abundance (17725 ind./m², 15.3 % of the total community) was recorded in the mouth of the Bay.

Table 1. Morphometric characteristics of *Microlaimus tenuispiculum* de Man 1922. All measurements in µm.

	Male 1	Males (n=4)	Females (n=3)
L	630	559–678	574–727
a	28.6	25.5–30.2	18.5–24.2
b	6.7	6.9–8.2	7.1–7.9
c	7.8	7.5–8.6	7.8–10.5
c'	4.8	4.2–4.6	4.6–4.8
V, %			46.7–50.1
Cephalic setae, length	4	4	4
Head diameter at cephalic setae	7	7–8	7–8
Buccal cavity, width	1.1	1.1–1.4	1.3
Buccal cavity, length	6	6–7	6–7
Amphidial fovea width	5	5	5
Head diam. at amphids	10	10	11
Amphid from anterior end	12	12–14	11–14.5
Terminal bulb, diameter	14	14–16	18–21
Nerve ring cbd	17	16–21	20–23
Cardia cbd	17	17–20	21–23
Maximum body diameter	20	17–24	27–32
Mid-body diameter	19	16–23	26–30
Anal body diameter	17	15–19	15
Tail, length	80	68–79	68–72
Gubernacular, length	14	12–13	
Spicule, length	49	45–51	
L/l.spic.	12.8	11.2–13.8	

Description. *Male.* Body spindle-shaped, tapering gradually to both ends. Cuticle finely annulated (width of annuli 1 μm). Head rounded. Sensillae of cephalic end arranged in 3 circles: 6 inner labial papillae indistinct and 6 short outer labial papillae 1 μm long. Four cephalic setae 4 μm long, situated 6 μm behind the anterior end. Somatic setae 3 μm long, scattered along the body. Cryptocircular amphidial fovea (45.5–50 % of corresponding body diameter), situated 12–14 μm from anterior edge. Buccal cavity narrow with one dorsal and two ventrosublateral teeth. Pharynx cylindrical, muscular with well-developed bulb, oval-shaped 14–16 μm in wide. Nerve ring is situated at the level of middle of pharynx. Secretory-excretory system present; renette cell situated posterior to cardia on ventral side of the body; secretory-excretory pore not visible. Cardia small.

Reproductive system diorchic, with opposed and outstretched testes lying to the left of intestine. Sperm cells oval-shaped, 10 \times 16 μm . Spicules medium-sized (2.6–3.4 a.b.d.), slender and S-shaped. Gubernaculum (0.7–0.8 a.b.d.), simple and thin. One precloacal seta (3 μm long), situated 12 μm from anus. Tail conical, with swollen tip. One caudal seta on the terminal part of the tail, 2.8 μm long. Three caudal glands present. Spinneret present.

Females. Similar to male in most parameters. Reproductive system didelphic, amphidelphic, with outstretched ovaries. Vulva situated slightly anterior to mid-body, not protruding outside the body contour. Vagina short, with muscular walls. Large oocyte 24 μm long and 20 μm wide. Spermatozoa of round-shape visible in uterus.

Discussion

The Black Sea specimens of *Microlaimus tenuispiculum* de Man 1922 generally fit the original description by de Man (1922) including redescriptions by Allgen (1933) and Gerlach (1950). Differences are found in the shorter tail ($c = 7.5\text{--}10.5$ vs $c = 6\text{--}7.5$), shorter oesophagus ($b = 6.7\text{--}8.2$ vs $b = 6\text{--}6.9$) and the presence of somatic setae in specimens from our study. Despite the fact that female ovaries are not reflexed, Jensen (1978) transferred *M. tenuispiculum* de Man 1922 to *Mogolaimus demani* (de Man, 1922) because of close similarity to *M. allgeni* Gerlach 1950 in the form of spicules. Lorenzen (1994) suggested to transfer *M. demani* back to *Microlaimus*. In the original and other descriptions, male gonads were not indicated, but the Black Sea specimens have two testes opposed and outstretched. Kovalyev & Tchesunov (2005) noted *M. tenuispiculum* in the list of valid *Microlaimus* species. However, Leduc (2016) omitted it from a new updated list of valid *Microlaimus* species. Superficially, the molgolaimids may strongly resemble species of Microlaimidae but differ clearly in having antiodromously reflected ovaries (Tchesunov, 2014).

Acknowledgements

This work was carried out as a part of the state project of IMBR № 0828-2014-00144. I am grateful to Prof. N. G. Sergeeva for critical reading of the manuscript and valuable suggestions. Special thanks to our colleagues L. F. Lukyanova for processing of bottom sediments samples and E. A. Ivanova for sample collecting during cruise 72/2 of the R/V “Meteor”.

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