A new species of the genus Calodorylaimus (Nematoda, Dorylaimida) from highly mineralised rivers of the Elton Lake basin, Russia

Новый вид рода Calodorylaimus (Nematoda, Dorylaimida) из высокоокисленных рек бассейна озера Эльтон, Россия

V.G. Gagarin & V.A. Gusakov

В.Г. Гагарин, В.А. Гусаков

A new species of free-living nematode (Calodorylaimus salinus sp. nov.), found in sediment of the highly mineralized rivers of the Elton lake basin (Russia), is described and illustrated. This species is close to C. mongolicus Andrássy, 1988, but differs from the latter in having a wider labial region, a stouter tail in females and a greater number of separate precloacal supplements in males. A dichotomic key for identification of valid species of the genus Calodorylaimus Andrássy, 1986 is given. Calodorylaimus densus Andrássy, 1988 is assigned to the genus Laimydorus Siddiqi, 1966.


Key words: freshwater free-living nematodes, morphology, highly mineralised rivers, Dorylaimida, Dorylaimidae, Calodorylaimus, new species

Ключевые слова: пресноводные свободноживущие нематоды, морфология, высокоокисленные реки, Dorylaimida, Dorylaimidae, Calodorylaimus, новый вид

INTRODUCTION

Continental water bodies with a high level of water mineralisation are widespread in arid regions. Their hydrofauna is being intensively studied. Unlike lentic water bodies, meso- and hyperhaline rivers are much less numerous. Therefore their inhabitants have not been sufficiently investigated yet (Zinchenko et al., 2011; Gusakov & Gagarin, 2012). Lake Elton, one of the largest European hyperhaline lakes, is situated in the northern part of Near–Caspian Lowland in Volgograd Province, Russia. The lake has seven small tributaries with length of about 3–40 km with a water salinity of 7–32 gl⁻¹. In summer 2009, the community of bottom meiofauna (meiobenthos) was explored in rivers of the Elton basin for the first time (Gusakov & Gagarin, 2012). Some species from different taxonomic groups were new for the fauna of Russia or the Volgograd region, and unknown species of free-living nematode from the genus Calodorylaimus Andrássy, 1986 were found. In the present paper, description and illustrations of a new nematode species and a key for identification of all valid species of Calodorylaimus are given.

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MATERIAL AND METHODS

A detailed description of the research region and the rivers is given in a separate paper by Gusakov & Gagarin (2012). The nematode material was collected in August 18–21, 2009 by means of a microbenthometer S-1 with corer diameter 34 mm (about 9 cm²). Each sample included three sediment columns and was fixed in 4% formalin. In the laboratory, the samples were filtered through a sieve with a mesh size 82 × 82 μm. The sieving residues were examined using a Bogorov counting chamber under a stereomicroscope. Identification and measurements of the found nematodes were completed with glycerine mounts using a light microscope MBA-1A.

Calodorylaimus salinus sp. nov. was discovered in middle part of two rivers: Bol’shaya Smorogda (the habitat characteristics are given below in the holotype description) and Lantsug (49°13.557’N, 46°37.125’E, black silty sand with biofilm and hydrogen sulphide smell, depth 0.2 m, water mineralisation 6.8 gl⁻¹).

TAXONOMIC PART

Order DORYLAIMIDA Pearse, 1942
Family DORYLAIMIDAE de Man, 1876
Subfamily LAIMYDORINAE Andrásy, 1969
Calodorylaimus Andrásy, 1969
Calodorylaimus salinus sp. nov.
(Figs 1–6; Table 1: measurements)

Holotype. Male: Russia, Volgograd Prov., El’ton Lake basin, Bol’shaya Smorogda River (49°07.328’N, 46°49.450’E), black sandy silt with hydrogen sulphide smell, depth 0.3 m, mineralization of water 10.3 gram/liter; 21 Aug. 2009; leg. V.A. Gusakov. Slide 100/20 deposited in the nematode collection of the Institute of Ecology and Evolution, Center of Parasitology, Russian Academy of Sciences, Moscow.
Paratypes. Two males, 6 females; same locality as for holotype. Two slides deposited in the same collection as holotype.

Description. Male. Body comparatively long and slender. Cuticle smooth, with 40–44 longitudinal ridges, without cuticular pores. Cuticle 4.5–5.0 μm thick at midbody. Labial region offset from adjacent body. Labial papillae small, hardly visible. Amphidial fovea cup-like, wide, occupying 52% of the corresponding body diameter and situate at the base of lips. Odontostyle straight and slender, 2.0–2.1 times as long as the labial region diameter. Its aperture constituting 30–33% its length. Odontostyle width at its base more than cuticle thickness at the corresponding of body level. Odontophore rod-like, 0.5–0.6 times as long as the odontostyle length. Guiding ring double, thick. Pharynx muscular, expanding gradually along whole length. Pharyngeal gland nuclei indistinct. Nerve ring situated at 32–40% of the total pharynx length. Cardia conoid, muscular, surrounded with intestinal tissue. Testes paired, opposed. Spicules robust, bent ventrally, 1.4–1.5 times as long as the cloacal body diameter. Lateral guiding pieces spindle-shaped, 14–15 μm long. Precloacal ventro-median supplements in the shape of small papillae. One adcloacal supplement and a series of 26–27 contiguous supplements, disposed in two groups at 6–7 supplements in each group. Between both groups 12–13 single supplements. The series of ventro-median supplements 121–141 μm long. Prerectum long, well developed, 10.5–11.9 cloacal body diameters long. Intestine–prerectum junction located at 247–335 μm from the anterior most supplement. Tail comparatively short, its terminus rounded. Its length less than cloacal body diameter. Caudal papillae in 4–5 pairs.

Female. General appearance similar to that of males. Structure of cuticle and anterior body end as in males. Odontostyle 2.0–2.1 times as long as labial region width. Guiding ring double. Pharynx muscular, expanding gradually along its length. Pharyngeal gland nuclei indistinct. Cardia large, elongate-conical. Prerectum 2.5–3.2 times as long as the anal body diameter. Rectum...
Figs 1–6. *Calodorylaimus salinus* sp. nov.: 1, habitus male; 2, habitus female; 3, head male; 4, vulva area; 5, posterior body end of male; 6, female tail. Scale bars: 400 μm (1, 2), 70 μm (3–5), 25 μm (6).
1.1–1.2 times as long as the anal body diameter. Reproductive system didelphic, amphidelphic. Both ovaries situated at the left of intestine, reflexed and comparatively long. Vulva preaequatorial, in the shape of transverse slit. Vulva lips not sclerotized and not protruding outside the body counter. Oocytes numerous, first in two rows, then in a single row. Vagina with muscular walls, extending inwards to half of the corresponding body diameter. Pars proximalis vaginae 43–47 μm long, pars refrigens vaginae consisting of round, drop-like sclerotizations, pars distalis vaginae short. Uterus spacious, with spindle-shaped spermatozoa. Tail comparatively long, gradually narrowing. Its terminus hook-like bent dorsally.

Comparison. Calodorylaimus salinus sp. nov. is close to C. mongolicus Andrassy, 1988 in body size but differs from the latter in having a wider labial region (20–21 μm vs 17 μm), a thicker tail in females (c’ = 4.4–4.7 vs c’ = 5.5) and a greater number of single supplements (12–13 vs 7–8) (Tsalo-likhin, 1985; Andrassy, 1988).

Table 1. Morphometrics of Calodorylaimus salinus sp. nov. All absolute lengths are in μm.

<table>
<thead>
<tr>
<th>Character</th>
<th>Holotype male</th>
<th>Paratypes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 males</td>
<td>6 females</td>
</tr>
<tr>
<td></td>
<td>range mean</td>
<td>range mean</td>
</tr>
<tr>
<td>L</td>
<td>3952</td>
<td>3877</td>
</tr>
<tr>
<td>a</td>
<td>41</td>
<td>34–42</td>
</tr>
<tr>
<td>b</td>
<td>5.7</td>
<td>4.7–5.6</td>
</tr>
<tr>
<td>c</td>
<td>124</td>
<td>15.9–19.6</td>
</tr>
<tr>
<td>c’</td>
<td>0.6</td>
<td>4.1–4.7</td>
</tr>
<tr>
<td>V, %</td>
<td>–</td>
<td>40.8–45.8</td>
</tr>
<tr>
<td>Labial region width</td>
<td>20</td>
<td>20–21</td>
</tr>
<tr>
<td>Odontostyle length</td>
<td>41</td>
<td>41–43</td>
</tr>
<tr>
<td>Pharynx length</td>
<td>698</td>
<td>635–776</td>
</tr>
<tr>
<td>Distance from pharynx end to vulva</td>
<td>–</td>
<td>747–983</td>
</tr>
<tr>
<td>Distance from pharynx end to cloaca</td>
<td>3222</td>
<td>2806, 3229</td>
</tr>
<tr>
<td>Tail length</td>
<td>32</td>
<td>198–220</td>
</tr>
<tr>
<td>Prerectum length</td>
<td>581</td>
<td>262–284</td>
</tr>
<tr>
<td>Spicules length</td>
<td>72</td>
<td>–</td>
</tr>
<tr>
<td>Number of supplements</td>
<td>27</td>
<td>–</td>
</tr>
<tr>
<td>Supplement row length</td>
<td>131</td>
<td>–</td>
</tr>
</tbody>
</table>

Etymology. The species name is originate- ed from salinus (Lat.) – saline, as it belongs to a species from saline water bodies.

Table 2. Morphometrics of valid species of the genus *Calodorylaimus* Andrassy, 1969. All absolute lengths (except \( L \)) are in μm.

<table>
<thead>
<tr>
<th>Species</th>
<th>Males</th>
<th>Females</th>
<th>Distance from vulva to anus/tail length</th>
<th>Prerectum length/anal body diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( L, \text{mm} ) ( a ) ( b ) ( c ) Labial region width</td>
<td>( \text{Odontostyle-length} )</td>
<td>Spicules length</td>
<td>Number of supplements</td>
</tr>
<tr>
<td>octo</td>
<td>2.2–2.6</td>
<td>30–36</td>
<td>5.0–5.6</td>
<td>100–130</td>
</tr>
<tr>
<td>chassanicus</td>
<td>2.1–2.9</td>
<td>26–50</td>
<td>3.9–4.1</td>
<td>74–76</td>
</tr>
<tr>
<td>gravidus</td>
<td>1.3</td>
<td>28</td>
<td>4.3</td>
<td>80</td>
</tr>
<tr>
<td>insignis</td>
<td>1.4–1.5</td>
<td>29–38</td>
<td>3.9–4.1</td>
<td>78–92</td>
</tr>
<tr>
<td>macrostylus</td>
<td>1.8–1.9</td>
<td>34–35</td>
<td>3.8–4.0</td>
<td>93–94</td>
</tr>
<tr>
<td>mangalorensis</td>
<td>2.1–2.3</td>
<td>42–46</td>
<td>4.0–4.4</td>
<td>92–105</td>
</tr>
<tr>
<td>mongolicus</td>
<td>3.3–3.6</td>
<td>31–36</td>
<td>4.4–5.1</td>
<td>71–110</td>
</tr>
<tr>
<td>parhomalopapillatus</td>
<td>3.6</td>
<td>43</td>
<td>3.5</td>
<td>91</td>
</tr>
<tr>
<td>sachalinus</td>
<td>2.2</td>
<td>30–33</td>
<td>4.5–4.7</td>
<td>96–98</td>
</tr>
<tr>
<td>salinus</td>
<td>3.6–4.0</td>
<td>39–43</td>
<td>5.0–5.7</td>
<td>114–124</td>
</tr>
<tr>
<td>wasimi</td>
<td>1.4</td>
<td>31–33</td>
<td>4.0–4.7</td>
<td>67–68</td>
</tr>
</tbody>
</table>
Key to valid species of the genus *Calodorylaimus*

1. Cuticle with longitudinal ridges .............. 2
   - Cuticle without longitudinal ridges ........... 5
2. Cuticle with 30 longitudinal ridges; males
   $L = 2.1–2.9$ mm .............................. *C. chassanicus*
   - Cuticle with 40–44 longitudinal ridges; males
   $L = 3$ mm or more .............................. 3
3. Females $V = 31%, c = 12.7$.
   - Females $V > 40%, c > 15$ ................. 4
4. Labial region 17 μm wide; females $c' = 4.1–4.7$ .............................. *C. salinus*
   - Labial region 20–21 μm wide; females $c' > 5.5$ .............................. 6
5. Males $L = 2$ mm or less .......................... 7
   - Males $L > 2$ mm .............................. 11
6. Labial region 8.0–8.5 μm wide .......................... 8
   - Labial region 10 μm and more .......................... 9
7. Odontostyle 19 μm long, spicules 46 μm long
   ............................................. *C. gravidus*
   - Odontostyle 20–23 μm long, spicules 36–38
   μm long ...................................... *C. weasimi*
8. Females prerectum 7.3–7.7 times as long as the anal body diameter; odontostyle 36 μm long .............................. *C. macrostylus*
   - Females prerectum 6 or less times as long as the anal body diameter; odontostyle less than 28 μm long .............................. 9
9. Females distance from vulva to anus 2.3–2.5 times as long as tail length; $c = 14–20$ .............................. *C. indicus*
   - Females distance from vulva to anus 5 times or more as long as the tail length; $c = 6.0$ or less .............................. 10
10. Females prerectum 2.7–3.9 times as long as the anal body diameter; spicules 36 μm long .............................. *C. insignis*
   - Females prerectum 2.4–2.6 times as long as anal body diameter; spicules 48–50 μm long .............................. *C. limnophilus*
11. Labial region 12 μm wide; odontostyle 23–24 μm long .............................. *C. sachalinus*
   - Labial region 13 μm wide or more; odontostyle 26 μm long or more .............................. 12
12. Males $b = 4.0–4.4$; odontostyle 43–46 μm long .............................. *C. mangalorensis*
   - Males $b > 4.8$ or more; odontostyle 26–35 μm long .............................. 13
13. Females $c' = 12–15$, $V = 44–46%$; odontostyle 26–29 μm long .............................. *C. andrassyi*
   - Females $c' = 20–27$, $V = 36–37%$; odontostyle 32–35 μm long .............................. *C. octo*

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