A new species of diatom-feeding *Asperotobrilus* (Nematoda: Triplonchida: Tobrilidae) from Lake Baikal

Новый вид диатомоядного *Asperotobrilus* (Nematoda: Triplonchida: Tobrilidae) из озера Байкал

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A new species, ***Asperotobrilus holophagus* sp. nov.** is described, which is a specialised diatom-feeder. A simple funnel-shaped stoma, a high vestibulum, and reduction of lips are typical of diatom-feeding tobrilids. A key to species of the genus *Asperotobrilus* is given.

Приводится описание нового вида ***Asperotobrilus holophagus* sp. nov.**, специализирующегося на поедании диатомей. Для этого вида, как и для всех диатомоядных тобрилид, характерны простая воронковидная стома, образование высокого вестибулюма и редукция губ. Дается определительная таблица видов рода *Asperotobrilus*.

Key words: freshwater free-living nematodes, morphology, Triplonchida, Tobrilidae, *Asperotobrilus*, new species, Baikal

Ключевые слова: пресноводные свободноживущие нематоды, морфология, Triplonchida, Tobrilidae, *Asperotobrilus*, новый вид, Байкал

INTRODUCTION

Nutrition of free-living nematodes is still insufficiently studied. The probable feeding objects may be inferred from the morphology of the stoma and anterior body end. Having applied this approach, Wieser (1953) distinguished four general types of nematode nutrition; this system was later modified by Jensen (1987). However, the feeding of tobrilids is difficult to characterise on the sole basis of the stoma structure. According to Jensen's system, they can be classified either as predators (presence of onchia in the voluminous stoma) or as deposit-feeders (a voluminous stoma, allowing food to be swallowed without destroying it by the onchia, which are hidden deep in recesses). The feeding objects of tobrilids can seldom be determined with confidence from the contents of their intestine.

In such a giant and stable water body as Lake Baikal, the evolution of tobrilids has led them to occupy the ecological niches uncommon of most continental water bodies. This phenomenon is reflected in a variety of adaptations to different nutrition types. For example, a diverse group of large predatory tobrilids feeding on oligochaetes occurs in Lake Baikal (their food object can be easily determined by the presence of numerous chaetae in their intestine) (Tsalolikhin, 1980). Diatoms constitute another favourite food object of some tobrilids in Lake Baikal. Diatoms are occasionally found in the digestive systems of tobrilids outside Lake Baikal as well, for example, in *Brevitobrilus stefanskii* (Tsalolikhin, 2001), but the stoma of the species is of an ordinary structure. Most of diatom-feeding tobrilids of Lake Baikal have a specifically modified stoma (discussed below), by which they

may be recognised even if there are no diatoms in their intestine. Different tobrilid taxa of Lake Baikal have acquired this nutrition type independently. Diatom-feeding tobrilids have been found in the genera *Asperotobrilus*, *Tobrilus* and *Eutobrilus*.

In this paper, a diatom-feeding species of *Asperotobrilus* is described. The diatom-feeding tobrilids from other taxa as well as the transformations of their head end and stoma will be described in detail in a separate publication.

TAXONOMIC ACCOUNT

The diagnosis of the genus *Asperotobrilus* is given in earlier publications (Shoshin, 1991, 1998).

Asperotobrilus holophagus sp. nov.
(Figs 1–7)

Measurements: Table.

Holotype. Male, **Russia**, Lake Baikal, Krestovskiy Cape, depth 20 m, fine grey sand, 25.10.00 (leg. Shoshin); slide A-6740, deposited at the Zoological Institute, St. Petersburg, Russia.

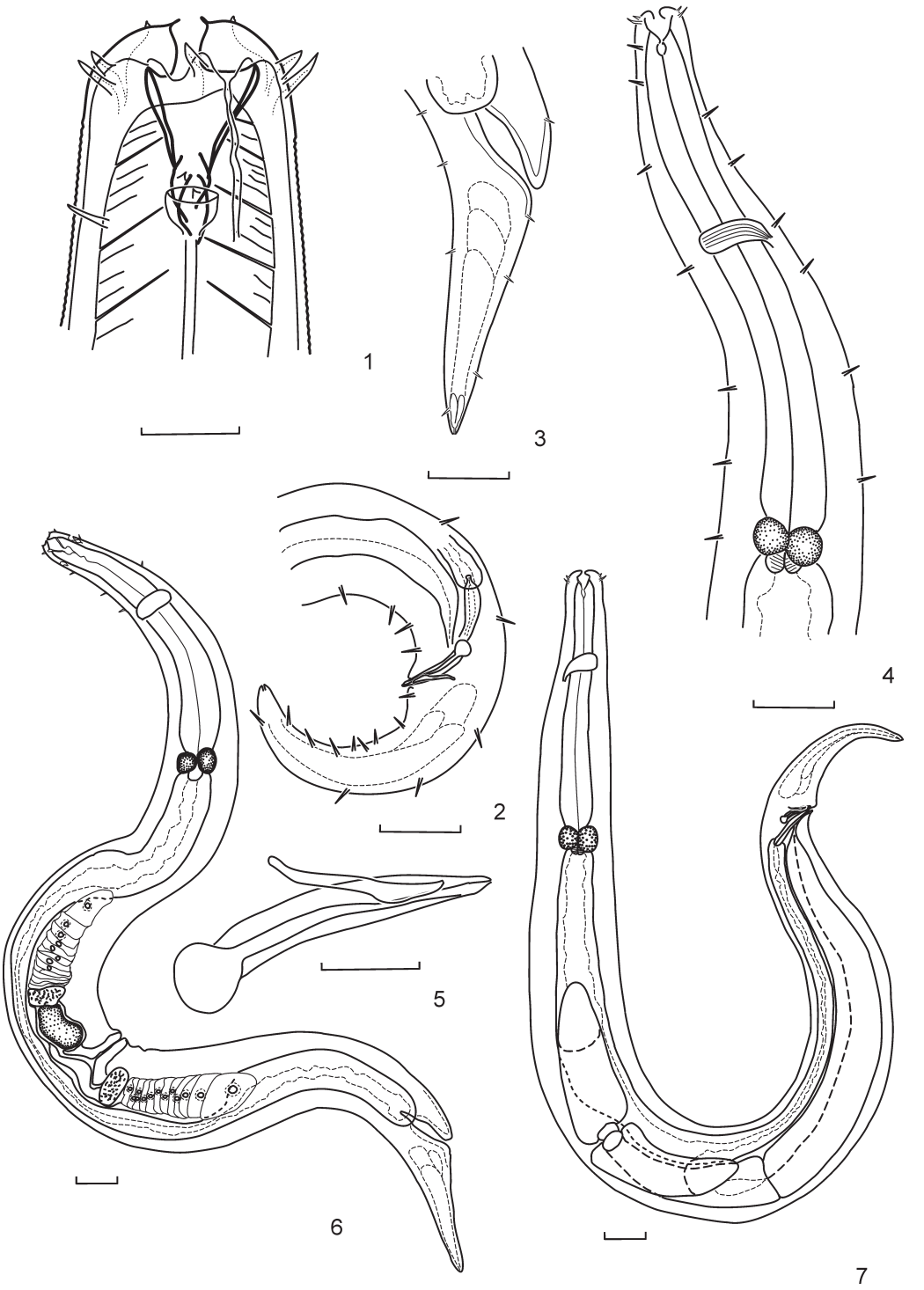
Paratypes. Two males and one female from same locality as holotype, and three young females: **Russia**, Lake Baikal, Peschanaya Bay, depth 5.0 m, fine sand, 11.08.86 (leg. Shoshin), all slides deposited at the Zoological Institute, St. Petersburg, Russia.

Description. *Male*. Relatively small tobrilid, body spindle-shaped, thick. Body after fixation C-shaped or irregularly shaped, maximum body width in the middle, tapering distinctly to anterior and posterior ends. Cuticle 2.2–2.4 μm thick, two-layered under light microscope, outer layer 1.4–1.6 μm thick, inner layer 0.8 μm thick. Cuticle finely transversely striated, striae more prominent near anterior end, 1.0 μm apart, at midbody 0.8 μm apart. Somatic setae numerous, hard, 7.5–8.0 μm long in precloacal region and 5.5–6.5 μm long on rest of body. Subcuticular metanemes indistinct. Numerous crystalloids associated with somatic musculature and between body wall and internal organs**,** absent at anterior end and cylindrical tail portion. Crystalloids rod-like, 2.4–2.8 × 0.8 μm. Anterior body end rounded, not offset. Labial papillae small, indistinct. Cephalic setae in two slightly separated circles; setae of anterior circle shorter than those of posterior circle. Cephalic setae of anterior circle 15% of head width, papilloid; those of posterior circle resembling common body setae. Cheilostome high, surrounded with plump cheeks, true lips reduced, buccal cavity with thick-walled, funnel-shaped, followed by two largely overlapping pockets. Pockets rounded, poorly distinguished from buccal cavity; each pockets armed with small onchium, distance between two onchia 3.0–3.5 μm, total width of pocket lumen 6.0 μm. Amphid large, its aperture more or less oval, situated at middle level of stoma pockets. Oesophagus (pharynx by some authors) relatively short, strongly muscular, slightly expanded anteriorly and posteriorly. Cardial glands 3 in number, globular, 14 × 18 μm. Intestine polycytous with irregular cells 8.0–12.0 μm in diameter, enlarging posteriorly (13.5 × 20.0 μm in size). Intestine about 50% of body width, compressed by reproductive system. Some diatoms discernible in intestinal lumen. Testes are two, ventral to intestine, with main portions of both testes on left side of intestine. Spermia closely packed in vesiculae seminales; they are oblong, rod-like, 5.7–6.3 μm long and 1.0–1.2 μm wide. Male sexual duct very thick, about 50% of body width. Vas deferens separated from ejaculatory duct by hard constriction. Supplementary organs absent. Spicules slender, slightly curved with rounded proximal capitulum. Tail thick, conical with pointed terminus.

Female. Similar to male except for slightly shorter somatic setae (4.5–4.7 μm), sexual characters, size of amphids, and numerous crystalloids between body wall and internal organs. Crystalloids of at least two forms: larger rod-like ones 10.5–11.8 × 0.9–1.3 μm and small rod-like ones 5.3–6.3 × 0.6–0.7 μm, absent at anterior end and cylindri-

Table. Absolute and relative measurements of *Asperotobrilus holophagus* **sp. nov.** All absolute lengths are in μm.

	Male		Female paratypes	
	Krestovskiy Cape		Krestovskiy Cape	Peschanaya Bay
	holotype	paratypes (n=2)	(n=1, adult)	(n=3, young)
Total length	1114	1040, 1098	998	1116–1160 (1142)
Body length/body width	16.6	15.5, 18.0	12.0	18.7–20.9 (20.0)
Body length/oesophagus length	4.8	4.6, 4.9	3.9	4.6–5.0 (4.8)
Body length/tail length	8.7	9.0	8.5	8.5–9.3 (8.9)
Tail length/anal body width	3.7	2.7, 3.2	2.6	3.7–4.2 (3.9)
Cephalic setae length (anterior circle/ posterior circle)	4.0/6.5	4.0/6.5	4.0/6.5	3.0–3.5/4.8–5.0
Head end width	26	23, 26	26	20
Stoma width	10	13	15	10–11
Total stoma length (vestibulum/ buccal cavity/pockets)	30 (6.5/13/10)	30 (6.5/13/10)	32 (6.5/15/10)	24–26 (4.0–4.5/10–11/8–12)
Amphidial aperture width	6.5	6.5	?	4.5–4.7
Distance between anterior end of body and nerve ring (% oesophagus length)	41.7%	41.4%, ?	31%	39.6–44.7 (42.6)%
Oesophageal length	230	224, 224	256	230–240 (235)
Maximum body width	67	61, 67	83	55–62 (57)
Distance between anterior end of body and vulva (% body length)	–	–	56.1%	51.7–57.0 (53.6)%
Distance between anterior end of body and testis joint (% body length)	43.0%	39.3%, 43.2%		
Length of anterior genital branch of female	–	–	160	?
Length of posterior genital branch of female	–	–	144	?
Length of anterior testis	118	80, 112	–	–
Length of posterior testis	80	106, 112	–	–
Distance from vulva to anus	–	–	320	335–435 (395)
Male sexual duct length	506	477, 544	–	–
Ejaculatory duct length (% male sexual duct length)	362 (71.5%)	349, 352 (64.7%, 73.2%)	–	–
Spicules length/width	37/6	38/8	–	–
Gubernaculum length	20	20	–	–
Rectal length	49	51, 52	42	33–36 (35)
Tail length	128	115, 122	118	125–135 (128)



Figs 1–7. ***Asperotobrilus holophagus*** **sp. nov**.: **1,** head end of male; **2,** tail of male; **3,** tail of female; **4,** oesophagus of male; **5,** spicules and gubernaculum; **6,** total view of female; **7**, total view of male. Scale bars: 10 μm (1, 5), 35 μm(2–4, 6, 7).

cal tail part. Female reproductive system didelphic, amphidelphic. Ovaries ventral to intestine, reflexed, with main portions on left side of intestine. Cells in germinal zone in multiple rows, oocytes first in tandem and then in continuously enlarged single row. Oviduct indistinct. Spermatheca filled with sperm. Uterus 37.0–64.0 μm long when one egg present, twisted when eggs absent. Egg oval, 44.0 × 36.0 μm. Vagina perpendicular to body axis, vagina length about 50% of body width at its level. Vulva transversal, slit-like, just anterior to mid-body, lips slightly protuberant.

Comparison. Differs from type species *A. asper* Shoshin, 1992 by conical stoma, high cheilostome and reduction of lips.

Etymology. From *holo-* and *phagos* (Greek: whole, entire and eating) because of its mode of feeding.

CONCLUSION

Key to species of the genus *Asperotobrilus*

1(6) Buccal cavity narrow, nearly cylindrical.
2(5) Somatic setae extremely long and hard, longer than 7 μm (usually 10–20 μm).
3(4) True supplementary organs absent, ventral precloacal setae indistinguishable from somatic setae ..... ***A. asper*** Shoshin, 1991
4(3) Supplementary organs in form of shortened setae ..... ***A. aculeatus*** Shoshin, 1998
5(2) Somatic setae weak, not longer than 4–5 μm ... . ***A. investis*** Shoshin, 1998
6(1) Buccal cavity wide, funnel-shaped .... ***A. holophagus*****, sp. nov.**

The following transformations of the stoma are characteristic of diatom-feeding tobrilids of Lake Baikal:

– the buccal cavity is funnel-shaped, whereas the stoma of other species of the genera *Asperotobrilus*, *Tobrilus* and *Eutobrilus* is wineglass- or goblet-shaped;

– the onchia and recesses of the stoma are considerably reduced in most species;

– the vestibulum is significantly modified: the true lips are reduced, so that the oral fissure is closed not by the lips but by the inner walls of vestibulum, formed by soft tissues.

Owing to the above transformations, the stoma of diatom-feeding tobrilids becomes similar to that of Monhysterida, among which diatom-feeding species are quite common.

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