Redescription of *Ethmolaimus multipapillatus* Paramonov, 1926 (Nematoda: Chromadorida: Ethmolaimidae)

Переописание *Ethmolaimus multipapillatus* Paramonov, 1926 (Nematoda: Chromadorida: Ethmolaimidae)

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The neotype of *Ethmolaimus multipapillatus* Paramonov, 1926 is designated from Inder Lake, Kazakhstan. Taxonomy, zoogeography and biology of the genus *Ethmolaimus* are discussed. A key to species of the genera *Ethmolaimus, Paraethmolaimus* and *Trichethmolaimus* is given.

Выделен и описан неотип *Ethmolaimus multipapillatus* Paramonov, 1926 из озёра Индер в Казахстане. Обсуждается таксономия, зоогеография и экология рода *Ethmolaimus*. Приведен ключ для определения видов родов *Ethmolaimus, Paraethmolaimus* и *Trichethmolaimus*.

Key words: free-living nematodes, brackish waters, zoogeography, Kazakhstan

Ключевые слова: свободноживущие нематоды, солоноватые воды, зоогеография, Казахстан

INTRODUCTION

Species *Ethmolaimus multipapillatus* was described by A.A. Paramonov (1926) from brackish waters near the Kinburn Spit (Black Sea, Dnieper-Bug Liman). Even though this species was recorded by this author as frequently occurring and abundant, it was described by one male specimen and two female specimens only (Paramonov, 1926, 1929). *Ethmolaimus multipapillatus* was discovered for the second time in the Black Sea near the Varna coast where three females and one male were collected (Gerlach, 1951). No other reliable records of the species have been reported since it description done 85 years ago, except for a number of publications where *E. multipapillatus* was either just mentioned (e.g. Platt, 1982, 1985) and no morphometric data were given (Jensen, 1994; Platt, 1985) or no reference to males was made (Decraemer & Coomans, 1978), or species identification was doubtful (*Ethmolaimus* cf. *multipapillatus* Paramonow, 1929 (sic!) in Gerlach, 1957). Therefore, of great interest is the material from brackish lakes of north-western Kazakhstan: Chelkar (50°28´N 51°40´E), Alzhan (50°16´N 50°41´E) and Inder (48°28´N 51°50´E), where a large number of males, females and larvae of *E. multipapillatus* were found.

The morphological characters and morphometric data for the western Kazakhstan specimens conform completely to the original description of the species (Table 1 and 2). Unfortunately, the type material collected by A.A. Paramonov has not been preserved. The neotype is designated here with the purpose of clarifying the taxonomic status of *Ethmolaimus multipapillatus* in accordance with conditions of Art. 75.3 of the International Code of Zoological Nomencalture (International Commission on Zoological Nomenclature, 1999) as discussed in detail below.

Ethmolaimus multipapillatus Paramonov, 1926
(Figs 1–8)

Neotype of *E. multipapillatus*: male; Kazakhstan, Inder Lake, 24 May 2010, coll. L.Ya. Borkin; slide No A-7175 (Zoological Institute, St. Petersburg, Russia). Additional material: 33 males, 61 females, 18 juveniles from Inder Lake, Alzan Lake and Chelkar Lake, same date and collector.

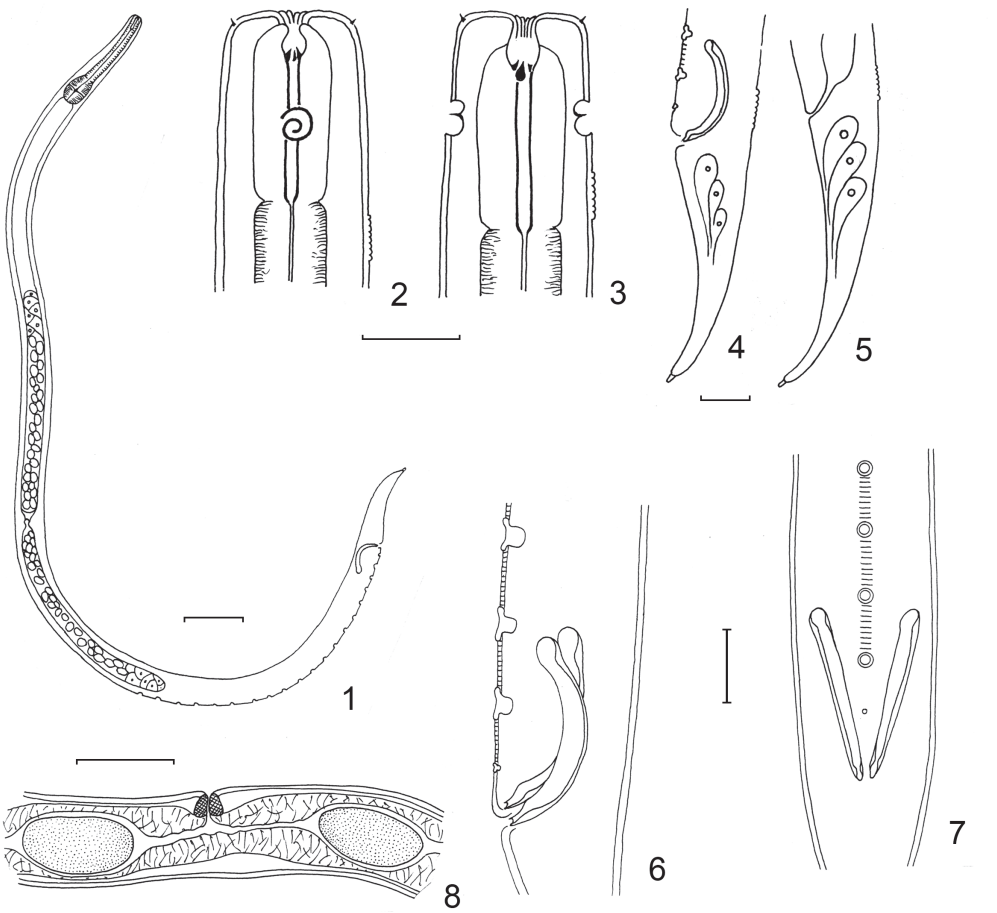
Together with *E. multipapillatus* the following species were found: a male and a female of *Penzancia flevensis* (Stekhoven, 1935), a larva of *Tripyla tenuis* Brzecki, 1964, and a larva of *Alaimus* sp.

Description of neotype. L=1026 μm, a=38, b=8.6, c=15.8, spic. 35 μm, suppl. 22. Cuticle finely annulated, punctuation fine. Cephalic diameter 13 μm. Cephalic setae about 1 μm long. Buccal cavity consists of two parts: anterior part cup-shaped with weakly sclerotized walls, and long cylindrical part 19 μm with well sclerotized walls; at junction between the two parts curved teeth inserts: one dorsal tooth and two subventral teeth, dorsal tooth being slightly more sclerotized then subventral ones. Amphid 4 μm in diameter, centre of amphid situated in 13 μm behind front end. Oesophagus 120 μm long, bulbus 29 × 19 μm, NR=54%. Cardia small. Renetta fairly outstretched ("tubular" sensu Paramonov, 1929) and situated in 30 μm behind bulbus and opening through a pore behind nerve ring. Testes: T_1 =245 μm, T_2=136 μm; spermia diameter about 7 μm. Spicules broad and sickle-shaped, 35 μm along axis (along the arc) and 27 μm along chorda (from tip to tip). Supplements 22, length of supplements row 270 μm. Tail 65 μm long; caudal glands well developed. Measurements of others specimens see in Tables 1 and 2.

Comments to the redescription of *Ethmolaimus multipapillatus*

Literature data on distribution of *Ethmolaimus multipapillatus* are of interest in terms of both zoogeography and autecology. It should be remembered that a number of identifications are insufficiently reliable, as has been mentioned above. Thus, a species similar to *E. multipapillatus* was identified by one female found in mangrove thickets of the Brazilian coast (Gerlach, 1957). However, species identification of this genus is based primarily upon male genital structure, and therefore, the absence of males in the material reduces reliability of this identification. The same is true for the discovery of 49 females and 16 larvae (not a single male!) of *E. multipapillatus* in mangrove thickets of the Lizard Island, which is a part of the Great Barrier Reef in Northern Australia (Decraemer & Coomans, 1978). The authors have provided neither morphometry nor drawings. Few males and females (without morphometric data, but with good microphotographs) have been reported in the work based on material from the hypersaline lake (270‰) in Africa on the Namibia coast in the region of Lüderitz Town (Platt, 1985), and also from waters with similar salinity in the estuary of the Murray River in Australia and in the region of Malaga in Spain (Jensen, 1994). Salinity of the Kinburn lakes, where *E. multipapillatus* was found for the fist time, is 9–12‰; salinity of Western Kazakhstan lakes varies depending on the season and can reach 318‰.

Revisions of the genus *Ethmolaimus* de Man, 1880 including an analysis of species composition were carried out repeatedly, beginning with the work of Micoletzky (1921). Hirschmann (1952) reduced all the species that had been described by that time, except for *E. multipapillatus,* to synonyms of the type species *Ethmolaimus pratensis* de Man, 1880. Later, validity of the majority of the synonymised species was restored (Gerlach & Riemann, 1973; Tsalolikhin, 1985). At present, the genus is considered to include 12–14 valid species (Andrassy, 2005; Decraemer & Smoll, 2006), of which four species have been described based on females only, that casts some doubt upon their validity.



Figs 1–8. *Ethmolaimus multipapillatus*. **1**, entire body of male; **2**, head lateral view, **3**, head dorsal view; **4**, tail of male; **5**, tail of femail; **6**, posterior end of male lateral view; **7**, posterior end of male ventral view; **8**, vulvar section and mature eggs. Scale bars: 60 μm (1), 15 μm (2–7), 40 μm (8).

Ethmolaimus bothnicus Jensen, 1994 and *Ethmolaimus hailuotoensis* Turpeenniemi, 1995 can be considered to belong to brackish water ("semi-marine„) species, and *E. hirsutus* (Gerlach, 1956) Jensen, 1994, to marine species. Before the revision of Jensen (1994) the latter species was placed in a separate genus *Trichethmolaimus* Platt, 1982 (syn. *Spiliphera hirsuta* Gerlach, 1956) (Platt, 1982), a conclusion that is quite justified and should be supported at present. The others are freshwater species. *Ethmolaimus multipapillatus,* occurring in both brackish and hypersaline waters should be placed in a distinct taxon. There are few examples of nematodes with such a wide range of salinity tolerance, this is, primarily, *Chromadorita leuckarti* (de Man, 1876), a species occurring in both brackish and saline (20‰ and higher), and freshwater lakes and even in rivers (Tsalolikhin, 1985).

It is worth mentioning that the great majority of species of the order Chromadorida are marine nematodes, and only a relatively small portion of those occur in fresh waters. This demonstrates a tendency in the

Table 1. Morphometric charaters of males of *Ethmolaimus multipapillatus*

Characters	Inder, Alzan and Chelkar lakes, Kazakhstan (n=15)	Black Sea, Kinburn Peninsula (n=1) (Paramonov, 1926, 1929)	Black Sea, Varna Town (n=2) (Gerlach, 1951)
L, μm	839–1053 (943±18)	907	1230–1233
a	27.1–39.5 (31.9±1)	28	19.8–27.4
b	7.3–9.5 (8.2±0.2)	8	6.8–9.4
c	11.9–17.1 (13.9±0.4)	13.5	11.2–19.3
c´	2.6–3.3 (3±0.1)	3	2.1
Oesophagus, μm	104–124 (115±2)	113	130–181
Tail, μm	59–77 (68±1)	67	64–110
Gonads, μm	T_1 = 137–250 (204±17) T_2 = 79–193 (132±13)	?	$T_1 \approx T_2 \approx 250$
Supplements, n	19–28 (22±1)	22–24 (n=?)	24
SR, μm*	204–290 (253±7)	–	–
SR/L,%	23–30 (26±0.6)	–	–
Sp, μm	Along axis: 30–36 (33±1) Along chord: 23–29 (27±0.5)	Along chord: 32	Along chord: 32
Sp/SR,%	Along axis: 10–16 (13±1) Along chord: 9–14 (11±1)	–	–
Cephalic diameter, μm	10–15 (14±0.3)	13	16
Stoma (cylindrical part), μm	16–19 (17±0.5)	15–20 (n=?)	16
Stoma/oesophagus, %	12–18 (15±0.5)	12	12
Amphid diameter, μm	4–5	4	6

*SR – length of supplement row.

Table. 2. Morphometric characters of females of *Ethmolaimus multipapillatus*

Characters	Inder, Alzan and Chelkar lakes, Kazakhstan (n=6)	Black Sea, Kinburn Peninsula (n=2) (Paramonov, 1926, 1929)	Black Sea, Varna Town (n=4) (Gerlach, 1951)
L, μm	935–993 (961±10)	837–902	830–990 (919)
a	23.1–31.6 (27.8±1.3)	22–25	17–19.6 (17.9)
b	8.4–8.8 (8.6±0.1)	7.5–8	7.4–8 (7.6)
c	10.3–11.1 (10.5±0.1)	11.2–11.7	8.2–11.3 (10.1)
c′	4.2–5 (4.4±0.1)	2.8–3.3	2.6–3.3 (3.1)
Oesophagus, μm	106–114 (112±2)	108–115	112–128 (120)
Tail, μm	89–93 (91±1)	75–77	84–95 (88)
Gonads, μm	Q_1=182–210 (200±9) Q_2=182–193 (186±7)	?	$Q_1 \approx Q_2 \approx 200$
V%	49–52 (51±0.5)	51	47–50
Cephalic diameter, μm	13–14	14–15	19
Stoma (cylindrical part), μm	15–19 (17±0.5)	17–20	16
Stoma/oesophagus, %	14–17 (15±0.5)	16	13
Amphid diameter, μm	3–4	4	5

order for adaptation to a new habitat (Tsalolikhin, 1989). Paramonov's (1929) point of view of freshwater origin of *E. multipapillatus* is not sufficiently convincing. In the context of the question of the origin of the genus *Ethmolaimus* in general and species *E. multipapillatus* in particular, Paramonov (1929: 122) wrote with regard to such morphological character as head setae, "...in *Eth. multipapillatus* head setae disappeared, but this can hardly be regarded as proof of the impact of saline waters <...> head setae are by no means a "marine" character, and no pattern at all can be formulated here ...".

I suppose *E. multipapillatus* appears to be originally marine, and it then settled in

coastal regions of Gondwana and gradually adapted to high salinity in water bodies that had separated from the sea. This is the only explanation that can be applicable for the presumed wide distribution of the species that is observed at present.

Tchesunov (1983, 1983a) noted the resemblance between the nematode fauna of the Dnieper-Bug Liman (where the Kinburn Spit, a type locality of *E. multipapillatus* is located), and that of the Caspian Sea. However, the genus *Ethmolaimus* is absent in the list of the Caspian nematodes (Tchesunov, 1983). Reliable data on nematode communities of saline lakes of the Caspian Depression and the Caspian Sea are extremely scanty; these are the data given in the present work and in the description of *Oncholaimus bajulus* Paramonov, 1937 from saline Lake Takhtaral in the drainage of the Emba River (Paramonov, 1937). It is noteworthy that another species of the same genus, *Oncholaimus hyrcanus* Tchesunov, 1979 that is not closely related to the species from Takhtaral (Tchesunov, 1976, 1979, 1983a) inhabits the Caspian Sea.

Based on the limited data on the range of *E. multipapillatus* it can be assumed that the Black Sea and Kazakhstan populations could have comprised a single (macro) population inhabiting the Ponto-Caspian basin. I suppose that, taking into account the absence of available specimens from the Black Sea basin, the designation of the neotype as it is done above from a Kazakhstan lake does not contradict Art 75.3.6 of the Code because the neotype came *as nearly as practicable* from the original type locality.

Key to species of genus *Ethmolaimus*, *Paraethmolaimus* and *Trichethmolaimus*

1(4). Head with lip region set-off.
2(3). Supplements 20–28 .... ***Paraethmolaimus dahli*** (Gerlach, 1953) [coastal brackish waters of South America (Jensen, 1994)]
3(2). Supplements 15–17 ..... ***Paraethmolaimus appendixocaudatus*** Jensen, 1994 [brackish waters in Australia (Jensen, 1994)]
4(1). Head with lip region not set-off.
5(6). Cephalic setae very short, not more than 2 μm; supplements not less than 18 ..... ***Ethmolaimus multipapillatus*** Paramonov, 1926
6(5). Cephalic setae well developed; supplements not more than 17.
7(8). Amphids are situated below the level of stoma ..... ***Ethmolaimus hailuotoensis*** Turpeenniemi, 1995 [Baltic Sea, Bothnian Gulf, salinity 5‰, depth 12–22 m, sand, mud (Turpeenniemi, (1995)]
8(7). Amphids situated on level of stoma or at boundary of stoma and oesophagus.
9(10). Excretory duct of renetta opening at level of stoma .... ***Ethmolaimus derisorius*** Shoshin, 1998 [Lake Baikal, depth 3–4 m, weakly muddy fine sand (Shoshin, 1998)]
10(9). Excretory duct of renetta opening in region of nerve ring.
11(14). Somatic setae are numerous, 20–50 to 200 μm in length.
12(13). Somatic setae up to 200 μm; supplements not more than 10 ..... ***Trichethmolaimus hirsutus*** (Gerlach, 1956) [North Sea, Kiel Bay and Clyde Sea (northwestern Scotland), salinity up to 35‰ (Jensen, 1994)]
13(12). Somatic setae 20–50 μm; supplements 12–14.
14(15). Cephalic setae 15 μm; spicules 32–34 μm ..... ***Ethmolaimus pilosus*** Shoshin, 1998 [Lake Baikal, depth 3–4 m, weakly muddy fine sand (Shoshin, 1998)]
15(14). Cephalic setae 25 μm; spicules 28 μm .... ***Ethmolaimus lanatus*** Shoshin, 1998 [Lake Baikal, depth 3–4 m, weakly muddy fine sand (Shoshin, 1998)]
16(11). Somatic setae short, very short or absent.
17(18). Only dorsal tooth developed ... ***Ethmolaimus zullinii*** Eyualem & Coomans, 1996 [Africa, Ethiopia: Lake Tana, depth 0.5 m, mud (Eyualem & Coomans, 1996)]
18(17). All three teeth developed, the dorsal being as a rule larger, sometimes much larger than subventral ones.
19(20). Spicules slender and sickle-shaped, 25–27 μm along chord .... ***Ethmolaimus bothnicus*** Jensen, 1994 [Baltic Sea, Bothnian Bay (Jensen, 1994)]
20(19). Spicules not slender (massive), arcuate.
21(24). Oesophageal bulb is weakly developed.
22(23). Amphid situated in upper part of stoma . ..... ***Ethmolaimus intermedius*** Jensen, 1994

[Austria: Attersee, Finsterlatersee (Jensen, 1994)]

23(22). Amphid situated at base of stoma ..... ***Ethmolaimus parapratensis*** Alekseev & Naumova, 1979 [Russia, Far East, Lake Khasan (Alekseev et al., 1979)]

24(21). Oesophageal bulb strong.

25(26). Amphid diameter about 1/3 of head width ..... ***Ethmolaimus foreli*** (Hofmaenner, 1913) [lakes of Switzerland (Hofmänner & Menzel, 1913)]

26(25). Amphid diameter about ½ of head width.

27(28). Dorsal tooth much larger than subventral ones ..... ***Ethmolaimus revaliensis*** (Schneider, 1906) [freshwater lakes of Europe (Gerlach & Riemann, 1973); freshwater lakes of Mongolia (Tsalolikhin, 1985); Lake Baikal (Shoshin, 1998)]

28(27). All teeth approximately similar ..... ***Ethmolaimus pratensis*** de Man, 1880 (syn.: *E. tatricus* Daday,1897; *E. lemani* Hofmaenner, 1913; *E. alpinus* Micoletzky, 1914; *E. americanus* Cobb,1914; *E. gracilicaudatus* Cobb,1915; *E. maduei* Micoletzky, 1922; *E. caudatus* Alekseev et Dimina, 1979) [widespread in moist soils, mosses and fresh (more rarely) brackish waters of Europe, Asia and North America (Hirschmann, 1952; Gerlach & Riemann, 1973)]

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