FIRST RECORD OF THE NEMATODE
PSEUDOCAPILLARIA BREVISPICULA
(LINSTOW, 1873) FROM AQUARIUM FISHES

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Abstract. Pseudocapillaria brevispicula (Linstow, 1873), a common nematode parasite of cyprinid fishes in Europe, was found for the first time in aquarium fishes in Czechoslovakia. Adult nematodes including gravid females were recovered from the intestine of Puntius tetrazona Bleeker and most probably they caused the deaths of the fishes. Conspecific larvae were found in the liver of Hyphessobrycon innesi Myers. The parasites were introduced into the aquarium with live invertebrates (oligochaetes) fed to aquarium fishes. Hence, in addition to Capillaria pterophyli, P. brevispicula is another pathogenic species of capillarids parasitizing aquarium fishes in Europe.

Capillarids are often found in various aquarium fishes and they are usually considered as highly pathogenic parasites causing sometimes the deaths of the fishes. Up to the present time, only Capillaria pterophyli Heinzé, 1933 has been reported from aquarium fishes, particularly of the family Cichlidae (Pterophyllum, Symphysodon, Cichlasoma) (e.g., Heinzé 1933, Lucký 1960, Moravec 1983a, Moravec and Gut 1982), but also of the families Cyprinidae (Puntius, Torichilgys) and Belontiidae (Colisa) (Lucký 1972). The species does not occur in free-living fishes in Europe and apparently it was introduced there together with aquarium fishes imported from South America.

In May 1983, a high mortality was recorded in fishes bred in the aquarium of the Agriculture University at České Budějovice and therefore a sample of fishes was sent for examination to the Institute of Parasitology of the Czechoslovak Academy of Sciences. Adult capillarids found in the intestine of Puntius tetrazona were identified as Pseudocapillaria brevispicula (Linstow, 1873). Also larvae found in the liver of Hyphessobrycon innesi were assigned to the same species. The larvae recovered from the intestine of Pterophyllum altum were determined as Capillaria pterophyli Heinzé, 1933.

MATERIALS AND METHODS

The method of complete helminthological dissection was used for the examination of fishes in May 1983. Three specimens of Puntius tetrazona Bleeker (Cyprinidae) were found to be infected with P. brevispicula (adults and larvae in the intestine; intensity 1, 9 and 11 nematodes, respectively), two specimens of Hyphessobrycon innesi Myers (Characidae) were infected with P. brevispicula (larvae in the liver; intensity 2 and 1 nematode, respectively) and one specimen of Pterophyllum altum Pellegrin (Cichlidae) was infected with two larvae of C. pterophyli (in the intestine). All fishes came from the same aquarium of the Agriculture University at České Budějovice, where they were occasionally fed with live aquatic invertebrates collected in the surroundings of the city. The nematodes were fixed with hot 4% formalin. The specimens are deposited in the collections of the Institute of Parasitology at České Budějovice.
**Pseudocapillaria brevispicaula** (Linstow, 1873)

The following description of adults is based on specimens from *Puntius tetrazona*.

Relatively small, fine nematodes. Two rather wide lateral bacillary bands run along almost the whole body. The stichosome consists of a single row of large stichocytes with giant nuclei; 1–2 darker (granulated) stichocytes alternate with lighter ones. The nerve ring encircles the muscular oesophagus approximately at the border of its first and second thirds.

**Male** (5 specimens): Body length 3.94–5.10 mm, maximum width 0.064 mm. Lateral bacillary bands 0.021 mm wide. Oesophagus including stichosome 1.87–2.26 mm long, muscular oesophagus 0.285 mm long. Number of stichocytes 22–23. Nerve ring 0.087–0.098 mm from anterior end. Spicule well chitinized, 0.369–0.411 mm long and 0.007–0.009 mm wide; its proximal end distinctly widened, with folded and lobular margin; distal end rounded; spicule surface almost smooth. Spinal sheath non-spiny. Posterior end of body rounded, provided with two large, rounded ventrolateral papillae. Tail length 0.012–0.015 mm.

**Female** (4 specimens): Body length of gravid females 7.85–9.50 mm, maximum width 0.068 to 0.081 mm. Lateral bacillary bands 0.030 mm wide. Oesophagus including stichosome 2.89–3.20 mm long, muscular oesophagus 0.360–0.414 mm long. Number of stichocytes 22–27. Vulva situated 0.012–0.045 mm below level of oesophagus end. Mature eggs (0.072–0.084 x 0.033–0.045 mm) barrel-shaped, without protruding polar plug; egg surface with distinct net-like sculpture. Posterior end of body rounded, anus subterminal. Tail length 0.009–0.018 mm.

**Larvae of *P. brevispicaula*** from the liver of *Hypophthalmichthys innesi*

Larvae light in colour, mostly spirally coiled. Length of smallest larvae 0.390–0.477 mm, width 0.027–0.030 mm, their cuticle very finely transversely striated. Whole oesophagus length 0.320 to 0.411 mm; muscular oesophagus 0.051–0.081 mm, stichosome 0.270–0.330 mm long. Nerve ring 0.009–0.039 mm from anterior end. Stichosome consisting of 25–29 stichocytes of uniformly dark colour and granular. Intestine light in colour, very short (0.036–0.045 mm), length of rectum 0.021 mm. Anus terminal. The largest larva 1.88 mm long and 0.041 mm wide; whole oesophagus 1.21 mm long, number of stichocytes about 30, cuticle at body end slightly loosened.

**Larvae of *C. pterophylli*** from the intestine of *Pterophyllum altum*

The two larvae found were female larvae of the fourth stage. Body length 6.42–9.15 mm, maximum width 0.041–0.054 mm. Length of whole oesophagus including stichosome 3.78–4.90 mm, number of stichocytes 43–44. Vulva still covered with cuticle. Cuticle distinctly loosened at body end. These larvae differ from those of *P. brevispicaula* in larger number of stichocytes.

**DISCUSSION**

The adult nematodes from the intestine of *Puntius tetrazona* correspond in their morphology and measurements to the species *Pseudocapillaria brevispicaula* (Linstow, 1873) as described by, e.g., Moravec (1980) and Lomakín and Trofimenko (1982) (as *Capillaria brevispicaula* and *C. tomentosa*, respectively). This species can be easily differentiated from another species of capillarids parasitic in aquatic fishes, *Capillaria pterophylli*, if males are available (see Table 1). The differentiation of females is difficult and can be based only on the different number of stichocytes. However, a certain intraspecific variability should be considered in this case, and, moreover, it is sometimes very difficult to determine the number of stichocytes in fixed specimens. Since the main hosts of *P. brevispicaula* are cyprinids (Moravec 1980), it may be assumed that *C. pterophylli* found by Lucky (1972) in aquarium fishes of the family Cyprinidae (*Puntius tetrazona* and *Tongchbyx albonubes*) were probably *P. brevispicaula*. The author did not describe the morphology of the nematodes recovered, but the characteristic specific features of *C. pterophylli* reliably differentiating this species from *P. brevispicaula* (presence of spiny spicular sheath and others) were detected by Moravec and Gut only in 1982.

The capillarid larvae found in the liver of *Hypophthalmichthys innesi* (family Characidae) were assigned to the species *P. brevispicaula* only on the basis of the number of stichocytes. However, it cannot be excluded that they might belong to some other species the adults of which parasitize, e.g., fish-eating birds. Nevertheless, the mass infection

**Table 1. Principal characters differentiating *P. brevispicaula* from *C. pterophylli***

<table>
<thead>
<tr>
<th>Character</th>
<th><em>P. brevispicaula</em></th>
<th><em>C. pterophylli</em></th>
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<tbody>
<tr>
<td>Spinal sheath</td>
<td>non-spiny</td>
<td>spiny</td>
</tr>
<tr>
<td>Length of spicule</td>
<td>0.240–0.420 mm</td>
<td>0.174–0.210 mm</td>
</tr>
<tr>
<td>Smooth</td>
<td></td>
<td>with transverse grooves</td>
</tr>
<tr>
<td>Distal part of spicule</td>
<td>non-expanded</td>
<td>expanded, particularly in dorsoventral view</td>
</tr>
<tr>
<td>Proximal end of spicule</td>
<td>distinctly expanded, with wide folded lobular margin</td>
<td>expanded, with smooth margin</td>
</tr>
<tr>
<td>Number of stichocytes</td>
<td>22–41</td>
<td>40–50</td>
</tr>
<tr>
<td>Principal hosts</td>
<td>Cyprinidae</td>
<td>Cichlidae</td>
</tr>
</tbody>
</table>

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with fish capillarids in the aquarium suggests that the first case is involved. The localization of the parasite in the liver indicates that H. innesi is an intestinal host for this parasite and that it may serve only as a paratenic host. In this case it would be a blind alley in the life cycle of P. brevispica, but in nature, such paratenic hosts may represent a source of infection with P. brevispica for some predatory cyprinids. Undetected capillarid larvae encysted in muscles and liver of H. innesi have been reported by Amlacher (1972), Reichenbach-Klinke (1963) reported undetermined capillarids from the same host (H. innesi) in aquarium in Germany, but these parasites might have belonged to some other species than P. brevispica.

P. brevispica, in contrast to C. pterophylly, is a species indigenous to Europe and is widely distributed there. It parasitizes mainly cyprinids, but also some other freshwater fishes and belongs, for example, to common parasites of pond carp, tench and other fishes (Moravec 1980, 1983b).

The life cycle of P. brevispica has not yet been studied in detail. According to Moravec (1983b) the nematodes lay uncleaved eggs which further develop in water. At the temperatures of 20—22 °C a larva develops within 7 days, but it does not hatch and remains inside the egg shell. As it follows from the papers by Lomakin and Trofimenko (1982) (but their data concern capillarids from athyal hosts, Lebistes reticulatus, and another species cannot be excluded) and Moravec (1983b), an important role in the development of this parasite is played by freshwater oligochaetes; however, it is not yet clear whether the development of P. brevispica is homogenous or heterogeneous, i.e., whether the oligochaetes serve as obligate intermediate hosts or only paratenic hosts. Lomakin and Trofimenko (1982) admit even the possibility of a direct development without intermediate hosts. Nevertheless, more detailed observations of the development of P. brevispica are desirable. As it follows from the above facts, the infected aquarium fishes were infected with P. brevispica most probably while being fed with live oligochaetes (possibly Tubifex) spontaneously infected with this parasite (i.e., collected at the sites where this parasite occurs in fish). The parasites reach sexual maturity and produce eggs in the cyprinid P. tetraza, whereas in the characid H. innesi, the larvae penetrate into the liver where they remain spirally coiled and sometimes they are surrounded by a thin membranous envelope. If the development of this parasite is homogenous, the fishes in the aquarium may be reinfected by swallowing the eggs of P. brevispica along with the detritus from the bottom of the tank, similarly as in case of C. pterophylly (see Moravec 1983). This is indicated by the findings of very small larvae (about 0.4 mm long) in the liver of H. innesi. Several species of Ichthyophthirius, including intestinal forms, are known as very pathogenic fish parasites. Mass infections with capillarids may even cause the deaths of their hosts (Dubinin 1962, Reichenbach-Klinke 1962, Hoffman 1962, Moravec and Gut 1982, Moravec 1983b). Moravec (1983b) pointed out that P. brevispica may be dangerous for the fishes in intensive pond-breeding, particularly for carp fry. The reported finding of this parasite in Puntius tetraza and Hypocypris sauricus innesi shows that P. brevispica is harmful also to breedings of aquarium fishes. Like C. pterophylly in chilids, P. brevispica may be the cause of the death in aquarium cyprinids or other fishes; it is indicated by the increased mortality of the aquarium fishes in the present case.

References


Lomakin V. V., Trofimenko V. Ya., Capillarids (Nematoda: Capillaridae) of freshwater fish of the fauna of the USSR. Tr. GELAN 31: 69—87, 1982. (In Russian.)


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Validity of the Name Gyrodactylus Seravachani

Osmann, 1965 (Monogenea: Gyrodactylidae)

Osmann (Vest. Karakalpaksk., fil. AN Uzbd. SSR 4: 21—32, 1965) described a new species of the genus Gyrodactylus Nordmann, 1832 — G. seravachani — from the gills of Schizodon intermedimis McClelland from the river Khatun (Zeravshan River basin, Uzbek. SSR). In the differential diagnosis the author states that the new species most closely resembles G. sparsitans Ling Moen, 1962 from which it differs only in longer anchors and longer point of anchors.

However, further studies of G. sparsitans from Uzbek. SSR shows that it is very close to G. sparsitans from Siberia (L. V. Belov) and G. sparsitans from Japan (M. Sato). This species is characterized by elongated anchors and long point of anchors. Therefore, it is probable that G. sparsitans is a synonym of G. sparsitans from Siberia and Japan.
Figs. 1–3. Adults of *Pseudocapillaria brevipica* from the intestine of *Puncius tetrazona*. Fig. 1. Stichosome of female with alternating dark and light stichocytes. Fig. 2. Vulva region of gravid female. Fig. 3. Proximal end of spicule. (Scales: Figs. 1, 2 — 0.05 mm, Fig. 3 — 0.02 mm.)

Figs. 1–2. Smallest larva of *Pseudocapillaria brevipica* from the liver of *Hyphessobrycon innesi*. Fig. 1. General view. Fig. 2. Head end of larva. (Scales: Fig. 1 — 0.00 mm, Fig. 2 — 0.02 mm.)