MORPHOLOGY OF THE NEMATODE CAPILLARIA PTEROPHYLLI HEINZE, 1933, A PATHOGENIC PARASITE OF SOME AQUARIUM FISHES

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Abstract. *Capillaria pterophylli* Heinze, 1933 is redescribed from the type specimens of the Berlin Museum and additional materials from the hosts *Symphysodon aquifrons* and *Symphysodon* sp. (new host records) bred in aquaria in Prague. It is indicated by presence of a spiny spicular sheath and also by structure of the spicule and the posterior end of body in male that this species belongs to the genus *Capillaria* according to a new conception of Moravec (1982).

In 1978 and 1980, samples of capillarid nematodes found in the intestines of *Symphysodon* sp. and *Symphysodon* sp., cultured in two different aquaria in Prague, were sent for identification to the Institute of Parasitology, Czechoslovak Academy of Sciences. Although this material was mostly composed of fragmented specimens, their morphological structure, particularly the presence of a spiny spicular sheath in male, suggested that they might belong to a new, hitherto undescribed species of capillarids. However, reexamination of the type specimens of *Capillaria pterophylli* Heinze, 1933, an intestinal parasite of aquarium fishes of the genus *Pterophyllum*, revealed that the original description of this species was inaccurate or erroneous in some respects and that the morphology of the nematodes from *Symphysodon* sp. was identical with that of *C. pterophylli*. Also their hosts (*Symphysodon* and *Pterophyllum*) are closely related, both originating from the same geographical region (the Amazon River basin), so there may be no doubt about their conspecificity.

MATERIALS

The type specimens of *C. pterophylli* were borrowed from Zoologisches Museum der Humboldt-Universität, Berlin (GIDB). This material consisted of "type" (♂ + ♀) mounted as a slide (Kat. Nr. 6055) and originating from the host *Pterophyllum zimbei* Ahl (nowadays these specimens are almost destroyed due to drying up of glycerine-jelly), additional two specimens (♀ + incomplete ♂) from the same host in alcohol (Kat. Nr. 6055) and two specimens (♂ + juvenile) also conserved in alcohol from the host *P. scalare* (Lichtenstein) (Kat. Nr. 6055). Original material consisted of a body fragment of gravid female and one complete and one incomplete young females from *Symphysodon* sp. and one complete gravid female and numerous male and female fragments from *Symphysodon aquifrons* Pellegrin. After examination the specimens from *S. aquifrons* were mounted in glycerine-jelly, while those from *Symphysodon* sp. are maintained in 4% formalin; all the specimens are deposited in the collection of the Institute of Parasitology, Czechoslovak Academy of Sciences, Prague.

*Capillaria pterophylli* Heinze, 1933

The following description is based on own materials from *Symphysodon* sp.; measurements (own data) of the type specimens (paratypes) from *Pterophyllum* sp. are given in brackets.

Description: Relatively small nematode, anterior end of body narrow, rounded, with indistinct mouth papillae; a very small stylet appearing to be present. Cuticle of head end with very fine, dense
transverse striations, staining some 0.006 mm from anterior extremity. Two fairly wide, well visible lateral baccalary bands present, extending practically along whole body length, their maximum width in mid-body being some 0.030—0.045 mm; surface of baccalary bands appearing to be composed of numerous round formations containing a small central, highly refractive papilla. Stichosome consisting of single row of large stichocytes subdivided into numerous transverse annuli and provided with conspicuously large cell nuclei; striped appearance of stichosome caused by alternation of stichocytes dark (granulate) and light in colour. Nerve ring encircling muscular oesophagus approximately at border of its first and second thirds. Two well-developed, wing-like cells present just posterior to oesophagus and intestine.

Male: Length of almost complete male (anterior end absent) 3.30 (length of paratype with posterior end 8.84) mm, maximum width 0.062—0.069 (0.068) mm. Maximum width of lateral baccalary bands 0.039 (0.036) mm. Length of whole oesophagus established in paratype only (4.42) mm, length of stichosome 2.24 (4.18) mm. Stichocytes 49 (49) in number. Spicule well sclerotised, 0.175—0.210 (about 0.2 mm long, with distal end rounded and proximal end mostly somewhat expanded, funnel-shaped; except for proximal and distal ends, spicular surface provided with numerous irregular transverse grooves. Distal third of spicule distinctly expanded, especially when dorsoventrally viewed; width of spicule at its anterior half 0.012 (0.012) mm, at its posterior half in lateral view 0.015 mm, in dorsoventral view 0.018 mm. Spicular sheath densely covered with spines, length of flat, triangular spines being some 0.003 mm. Posterior end of body rounded, provided with two large hemispherical subventral lobes, each containing apparently one small submarginal papilla. Cloacal opening situated at level of anterior rim of these lobes; pair of very small, inconspicuous papillae present near anterior rim of cloacal aperture. Length of tail 0.015—0.027 (—) mm.

Female: Body length of complete gravid female 9.25 (15.55) mm, maximum width 0.068 (0.065) mm; length of young female lacking eggs 5.69 mm, its maximum width 0.064 mm. Maximum width of lateral baccalary bands in gravid females 0.039 (0.045) mm. Length of entire oesophagus 3.64—7.75 (3.20—5.67) mm, of which muscular oesophagus being 0.237—0.408 (0.219—0.249) mm; distance of nerve ring from anterior extremity 0.087—0.096 (0.089) mm. Length ratio of oesophagus and body 1:2.4 (1:2.7); (in young female without eggs only 1:1.6). Posterior end of body rounded, anal pore subterminal; length of tail 0.099—0.105 (0.099) mm. Rectum relatively short. Vulva located 0.095—0.111 (0.098) mm below level of oesophagus end, i.e., 3.34—4.76 (5.89) mm from anterior extremity. Vulpiae lips not elevated or only anterior lip slightly elevated. Uterus containing numerous eggs arranged largely in one row. Fully developed eggs barrel-shaped, sometimes narrowed equato- rially with polar plugs almost non-protruding. Wall of eggs two-layered; inner layer thin, hyaline, highly refractive; outer layer very thin, slightly thicker near egg-poles only, with very fine net-like sculpture on its surface. Polar plugs of less developed eggs distinctly protruding; height of polar plug 0.003 mm, its width 0.007 mm. Content of mature eggs in uterus uncoloured. Length of eggs 0.048 to 0.057 (0.054—0.057) mm, width 0.024—0.027 (0.027—0.030) mm; thickness of egg-wall 0.0016 mm.

**DISCUSSION**

In 1933 Heinze described a new capitellid species, *Capillaria pterophyli* from the aquarium fishes *Pterophysium scalar* and *P. einbeck* from Germany; according to the original description this species is characterized by a nonspiny spicular sheath in the male. Therefore, *C. pterophylli* has been listed in the monographs of Skraiva et al. (1954, 1957) within the genus *Capillaria* in the erroneous concept of these authors (i.e. amongst the species possessing a nonspiny spicular sheath). Despite the fact that both species of the fish hosts (considered by many ichthyologists as only subspecies or different forms of the same species) are of the South American origin, the description of *Capillaria pterophylli* indicated a considerable similarity of these nematodes to the Palaeoartic species *Pseudocapillaria brevispica* (Lintost, 1873), a frequent parasite of various freshwater fishes in Europe; this might lead to considerations that *C. pterophylli* was in fact *P. brevispica* and that aquarium fishes possibly acquired infection while being fed with live invertebrates (e.g., tubificids), which may harbour the invasive larvae of the parasite. In the following years there were several additional records of *C. pterophylli* from aquarium fishes from GDR and Czechoslovakia (Reichenbach-Klinker 1952, Lucký 1960, 1972), but only Lucký (1960) deals with the morphology of this nematode; unfortunately, the latter author had only female specimens at his disposal. It has been revealed by reexamination of the holotype of *C. pterophylli* that the
spicular sheath of this specimen is spiny; the spines are, however, feebly visible, because the spicular sheath is withdrawn inside the nematode’s body and the specimen is considerably damaged. Also in all other features the type specimens of C. pterophagi coenide with the nematodes from Symphysodon spp. Consequently, C. pterophagi is a distinct species, differing markedly from P. brevipinula by the presence of the spiny spicular sheath. The morphology of this species, particularly the structure of the male tail and the spicule, shows its affinities with the species of fish capillarids C. eumastax Freitas et Lent, 1935, C. ctenata Van Cleave et Mueller, 1932, C. gracilis (Bellingham, 1844), C. kubachi Ingles et Coles, 1963, C. margolin Moravec et McDonald, 1981 and C. wickinsi Ogden, 1962; all the named species are characterized by presence of a spiny spicular sheath and, therefore, were often listed in the genus Thomine Dujardin, 1845. However, Moravec (1981) indicated that Thomine was a synonym of Capillaria Zeder, 1800, which is characterized by presence of the spiny spicular sheath (see Baras et al. 1981); the species possessing a nonspiny spicular sheath, having often been assigned erroneously to the genus Capillaria, are evidently members of other genera. According to a recently proposed arrangement of the genera within the nematode family Capillaridae (Moravec 1982), this morphological group of species including C. pterophagi is tentatively assigned to the genus Capillaria. The hitherto records suggest that the main hosts of C. pterophagi are fishes of the family Cichlidae (Pterophyllum, Symphysodon) originating from South America. However, Lucký (1972) reports this species as well from other aquarium fishes of different families, originating from other geographical regions — Puntius tetrazona Bleeker (Cyprinidae; Sumatra), Boramecia Lin-Shu-Yen (Cyprinidae; China) and Colisa laticeps Buchanan—Hamilton (Belontiidae; India). Reichenbach—Klinke (1952) mentions the finding of unidentified intestinal capillarids from Hypoplectrus brasiliensis Myers (Characidae; South America). The infected aquarium fishes usually did not come from a direct import and this suggests the life-cycle of this parasite can be passed under the aquarium conditions. This Reichenbach—Klinke (1952) found a large number of these nematodes in the intestines of angelfish, Pterophyllum scalare; he observed that highly infected fishes had been pinched and they had not taken any food; similar symptoms were observed in the infected discus, Symphysodon spp. which frequently even died. Various species of intestinal capillarids penetrate usually deeply into the intestinal mucosa of the host fishes and may cause inflammation of their intestines.

Acknowledgments. The authors are grateful to Dr. G. Hartwich, Zoologisches Museum der Humboldt--Universität, Berlin, DDR, for the loan of the type specimens of C. pterophagi and to Dr. J. Leu, D.Sc., Institute of Parasitology, Czechoslovak Academy of Sciences, Prague, for providing capillarid specimens from Symphysodon sp.

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Received 12 January 1981.

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**EFFECT OF WATER SALINITY ON PARASITIC CRUSTACEANS OF FISHES**

The composition and the degree of infestation with fish parasites to a considerable extent depend on the water salinity which is felt keenly by ectoparasitic organisms as well as by the endoparasites, particularly by their free-living larval stages.

Crustaceans as ectoparasites of fishes are highly sensitive to the salinity of water. Therefore some crustaceans live only in the sea, while others in fresh water. Such division into marine and fresh-water crustaceans occurs in the Caspian Sea basin too. However, in crustaceans it is not expressed to such an extent as in other groups of ichthyoparasites. Thus Dogel and Herbst (1932), in their studies on parasites of fishes of the Caspian Sea, Publ. House Acad. Sci. USSR, Moscow—Leningrad, 149 pp., 1939, in Russian) analyzed the dependence of parasite fauna of the fishes from the Caspian Sea on the salinity of water considered only the copepod Thermista gastero- tera, a typical parasite of Gasterosteidae in a typical marine parasite. The parasite was brought to the Caspian Sea apparently from the North at that geological time when this sea was connected with the northern basins. Here it turned to parasitizing other fishes: Chthonurus burssoloides, Poros flavulatus, Atherina Athenaeum pontica natio caspia, Gobiidae and Synnymphus nigromosus caspia.

During the last 25 years, T. K. Maksakov and his disciples carried out investigations on fish parasites at the south-western coast of the Caspian Sea (here water salinity reached 13 %) and at the basins of rivers falling into it. As a result of this work the following species of parasitic crustaceans were found on fishes: Euryphlebia eimlichii, Nordmann, 1832, E. brevis, Markwitshich, 1932, Thatistoma gasterotera (Pagen- stecher, 1863), Caligus lacustris Steenstrup et Zötkin, 1861, Lamprakeleia pulex Nordmann, 1832, L. compacta Markwitshich, 1930, Lernaeas cypriophora Linnei, 1758, L. cypriophora Bumistero.
**Figs. 1–2.** *Capillaria pterophylly Heini*, 1953 from *Symphysis acusifasciata*. Fig. 1. Anterior end of female with distinct stichosome region (scale = 0.8 mm). Fig. 2. Posterior end of male (ventral view) (scale = 0.65 mm).

**Figs. 1–3.** Eggs of *Capillaria pterophylly Heini*, 1933 from *Symphysis acusifasciata* (all scales = 0.62 mm). Fig. 1. Fully developed mature egg. Fig. 2. Fully developed mature egg (focused on its surface). Fig. 3. Not fully developed young egg (note protruding polar plugs).