

Morphology and development of *Philometra cylindracea* (Ward and Magath, 1916) (Nematoda: Philometridae)

KÁLMÁN MOLNÁR* and C. H. FERNANDO

Department of Biology, University of Waterloo, Waterloo, Ontario, Canada N2L3G1

ABSTRACT

A description of the male and a redescription of the female of *Philometra cylindracea*, a parasite of yellow perch (*Perca flavescens*), are presented.

Philometra cylindracea has a one-year developmental cycle starting as infective larvae in June and becoming mature, larvigerous worms at the end of next June. *Cyclops vernalis* was found to be a suitable intermediate host under experimental conditions.

This nematode was described from *Perca flavescens* (Mitchill) as *Ichthyonema cylindraceum* by Ward and Magath in 1916. The very short original description was based on a single gravid female. A number of authors (Bangham, 1944, 1955; Fischthal, 1947; Hare, 1943; Van Cleave and Mueller, 1934) referred to its occurrence in various members of the Percidae and Centrarchidae without giving detailed descriptions. Rasheed (1963) regarded it as belonging to the genus *Philometra*. However, Ivashkin *et al.* (1971) did not include it in his monograph on the Camallanata, probably for lack of an adequate description.

The purpose of the present investigation was to find males of this parasite, to give a detailed description of the female and to examine the developmental cycle.

MATERIALS AND METHODS

From May 1973 to May 1974, 374 specimens of yellow perch (*Perca flavescens*) were collected from Laurel Creek, Ontario, Canada. The fish were taken to the laboratory alive and were killed and examined immediately afterwards. *Philometra* was collected for study from fish, placed in isotonic saline, fixed and preserved in alcohol, and later cleared in lactophenol. Gravid females were studied alive and the larvae obtained from them used for experimental infections which were carried out in the laboratory at 20°C. The first stage larvae were placed (throughout three consecutive days) in an aquarium of 4000 ml volume, containing thousands of specimens of *Cyclops vernalis* (Fischer). The infection of *Cyclops* was followed under the microscope. Ten days after the first infection all the *Cyclops* were placed in another aquarium containing two-year-old yellow perch. The experiment lasted 4 months. During this period four fish were killed and examined monthly except during the first four weeks, when two specimens were examined every week. Additionally a number of fish from Laurel Creek were also examined, depending on availability.

*Present address: Veterinary Medical Research Institute, Hungarian Academy of Sciences, 1580 Budapest, P.O. Box 18, Hungary

RESULTS

12, 2% (45 specimens) of the examined fish from the creek and all experimentally infected fish harboured various developmental stages of *Philometra*, depending on the season. The intensity of natural infection was 1-4, and of the experimental infection 8-16, parasites per fish. Males were not found in natural infections until their location within the host had been identified in the experimental infections.

Description

(based on 15 males and 4 adult females. Measurements in mm unless stated):

Male Transparent, minute, 2.7 (2.5-2.8) long. Their cylindrical body tapers slightly anteriorly. The greatest width is close to the posterior end, 0.035 (0.031-0.041); in the mid-region it measures 0.033 (0.029-0.037) and at the nerve ring 0.025 (0.021-0.031). The cuticle is smooth and thin. The head is rounded (Fig. 1c). Head papillae were not observed. The caudal end is blunt, with two lateral papillae connected by a narrow inconspicuous membrane. There are two relatively short spicules directed by a gubernaculum (Fig. 1d). The spicules are subequal. The mouth is three-lobed. The oesophagus is a 0.615 (0.572-0.680) long, muscular tube, with a well-developed oesophageal gland alongside. The intestine is narrow, its diameter being uniformly 0.009 (0.007-0.011) throughout. The right spicule measures 0.060 (0.049-0.071), the left 0.061 (0.049-0.075). The gubernaculum is a bent chitinous plate with a spear-like posterior end. The length of the gubernaculum is 0.038 (0.034-0.043).

Female The fully developed females are red and 97 (91-102) long. The body is cylindrical in shape, tapering slightly towards the anterior and posterior ends. Its greatest width is 0.9 (0.8-1.0). The cuticle is smooth and thin. The body cavity is totally filled out by the uterus which is full of larvae. The head is rounded, with four inconspicuous papillae and three lips (Fig. 1a). The caudal end is also rounded, showing laterally two small papillae (Fig. 1b). The oesophagus measures 2.3 (2.0-2.9). It is muscular and forms a bulb near the mouth. The oesophageal gland is very prominent with a clearly visible nucleus in its centre. The intestine is somewhat larger in diameter than the posterior portion of the oesophagus and ends blindly near the tip of the tail. The vulva is atrophied. There are two long, thin ovaries running in opposite directions and connected by a common uterine duct. The anterior ovary is bent backwards near the nerve ring region, the posterior one is bent forwards at the terminal end of the intestine. In the living female, the uterus is packed with vigorously moving larvae, which measure 0.36 (0.31-0.39) in length. They have rounded anterior ends and sharply attenuated tails.

Diagnosis: *Philometra cylindracea* (Ward and Magath, 1916) syn. *Ichthyonema cylindraceum* Ward and Magath, 1916

Host: *Perca flavescens* (Mitchill)

Habitat: Males and young females under the serosa of air bladder, developing females in the body cavity

Locality: Laurel Creek, Waterloo, Ontario, Canada

Material: Males deposited in the Helminthological Collection of the Hungarian National Museum. Other specimens in the senior author's collection

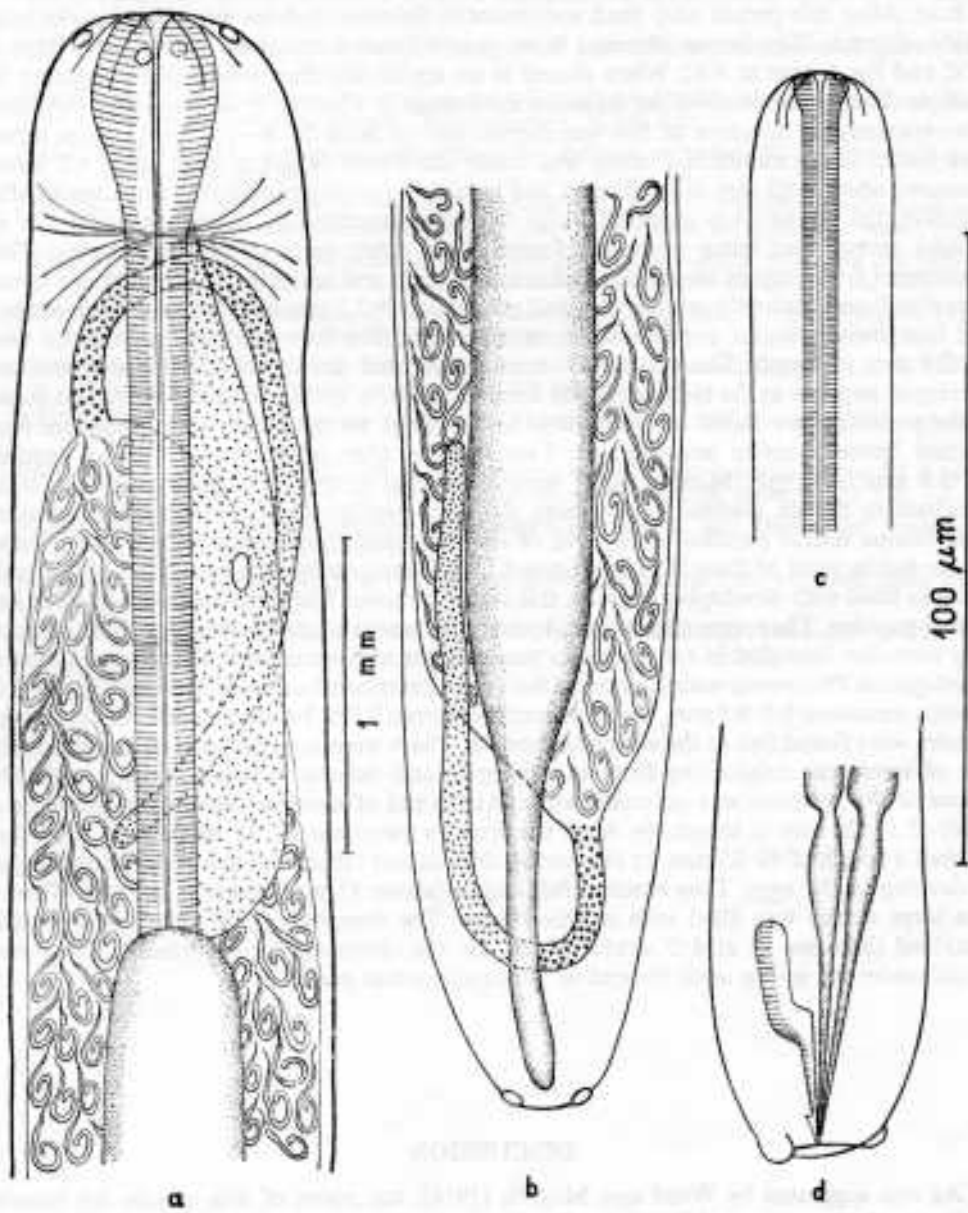


FIG. 1. a). Anterior end of female. b). Posterior end of female. c). Anterior end of male. d). Posterior end of male.

Developmental cycle

Mature females harbouring developed larvae were found from the middle until the end of June. After this period only dead specimens or their cast cuticles were found in the body cavity of perch. The larvae obtained from gravid females remained viable for 2 days at 20°C and for 7 days at 4°C. When placed in an aquarium, they were rapidly ingested by *Cyclops*. The larvae reached the infective third-stage in *Cyclops* 7-10 days after infection. The experimental infection of fish was carried out on June 26. 8-16, fourth stage larvae were found in the abdominal cavity and under the serosa of fish a week later. All larvae measured about 0.65 mm in length and had a sharply pointed caudal end. Two weeks after infection, the larvae were localized under the serous membranes, above or under the air bladder serosa. But some were also found under other parts of the peritoneum. They measured 1.5-1.7 mm in length and had rounded head and tail ends. Three week old larvae were also found under the serosa; they had grown to 1.9-2.1 mm in length and some of them had four inconspicuous papillae at the anterior end. The four week old nematodes were 2.1-2.8 mm in length. The males had more or less well developed spicules and two well developed papillae at the tail end. In the females a clearly visible chitinous vulva was found in the posterior two thirds of their body. At this stage no significant size differences were noticed between males and females. Two months after infection the females reached 4.6-5.8 mm in length. Most of them were found free in the abdominal cavity but some remained in the air bladder. Apart from the head papillae the females also had two inconspicuous lateral papillae at the end of the blunt tail. Some females still had a vulva visible but in most of them it had atrophied. The uterus occupied a great part of the body and was filled with developing eggs. At this stage the males had well developed spicules and caudal papillae. They were chiefly found under the serosa of the air bladder. Furthermore, they were also identified in subperitoneal tissues of the abdominal wall. During the period of investigation *Philometra* males stayed in the above described locations. The three month old females measured 5.9-6.1 mm, the four month old ones 7.2-9.7 mm in length. All developing females were found free in the abdominal cavity. There were no significant differences in the size of specimens originating from experimental and natural infection, respectively. The colour of the parasites was yellowish white. At the end of autumn (November) the females attained 17-28 mm in length. In April the females measured 26-32 mm and in May they reached a length of 46-65 mm. In this period their colour turned reddish and embryos began to develop in the eggs. They reached full length (about 97 mm) towards the end of June. The large uterus was filled with mobile larvae. The morphology of unfertilized females remained the same as at 4-5 weeks of age, i.e. the chitinous vulva persisted. They were found under the serosa until the end of the experimental period.

DISCUSSION

As was suggested by Ward and Magath (1916), the males of this species are minute. Owing to the low rate and intensity of natural infection, the detection of males was made possible by producing an intensive infection experimentally. In the case of Cyprinids (Molnár, 1966a, 1967; Vismanis, 1967) the males can easily be found under the serosa of the posterior part of the air bladder. The present study shows that in the perch, with an air bladder structure quite different from that of Cyprinids, the males also localize in the air bladder subserosa. They can, however, be found under parts of the peritoneum.

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