

***Philometra robusta* sp. n.** **(Nematoda: Philometridae) from the abdominal** **cavity of the scribbled toadfish,** ***Arothron mappa* (Lesson) from the Philippines**

F. MORAVEC¹, H. MÖLLER² and T. HEEGER³

¹Institute of Parasitology, Czechoslovak Academy of Sciences, Branišovská 31, 370 05 České Budějovice, Czechoslovakia;

²Zentrum für Marine Tropenökologie, Universitätsalle GW1, D-2800 Bremen 33, Germany;

³Institut für Meereskunde an der Universität Kiel, Düsternbrooker Weg 20, D-2300 Kiel 1, Germany

Key words: *Philometra robusta*, *Arothron mappa*, Philippines, Nematoda

Abstract. A new nematode species, *Philometra robusta* sp. n., is described from the female specimens collected from the abdominal cavity of the scribbled toadfish, *Arothron mappa* (Lesson) (Tetraodontidae, Tetraodontiformes), from coastal waters of Tawi-Tawi, Philippines. It is characterized mainly by its markedly large body (body length 275–450 mm, width 8–10 mm), arrangement and number of small cephalic papillae (eight papillae in outer circle and four in inner one), structure and length (2.4–2.6 mm) of the oesophagus, short ovaries, and presence of a pair of small subventral papilla-like projections on the ventrally curved caudal extremity. *P. robusta* is the second known *Philometra* species parasitizing tetraodontiform fishes.

During a short visit by one of the authors (H. Möller) to the Philippines in the spring 1991, seven large nematode specimens referable to the family Philometridae Baylis et Daubney, 1926 were collected from the abdominal cavity of one scribbled toadfish, *Arothron mappa*. These nematodes, all representing gravid females, proved to be members of a new, hitherto undescribed species of the genus *Philometra* Costa, 1845 which we describe below.

MATERIALS AND METHODS

The nematodes were fixed in hot 4% formaldehyde in saline and stored in 4% formaldehyde. An *en face* view was prepared according to Anderson's (1958) method. Transverse sections of the nematode oesophagus were made by hand using a sharp razor blade. For examination, the nematodes were cleared in glycerine. Drawings were prepared with the aid of a Zeiss microscope drawing attachment. All measurements are given in millimetres.

***Philometra robusta* sp. n.**

Figs. 1–4

Type host: Scribbled toadfish, *Arothron mappa* (Lesson) (Tetraodontidae, Tetraodontiformes) (body size 70 cm).

Localization: Abdominal cavity.

Type locality: Tawi-Tawi Island, Sulu Archipelago, Philippines (5°12' N, 120°00' E) (16 April 1991).

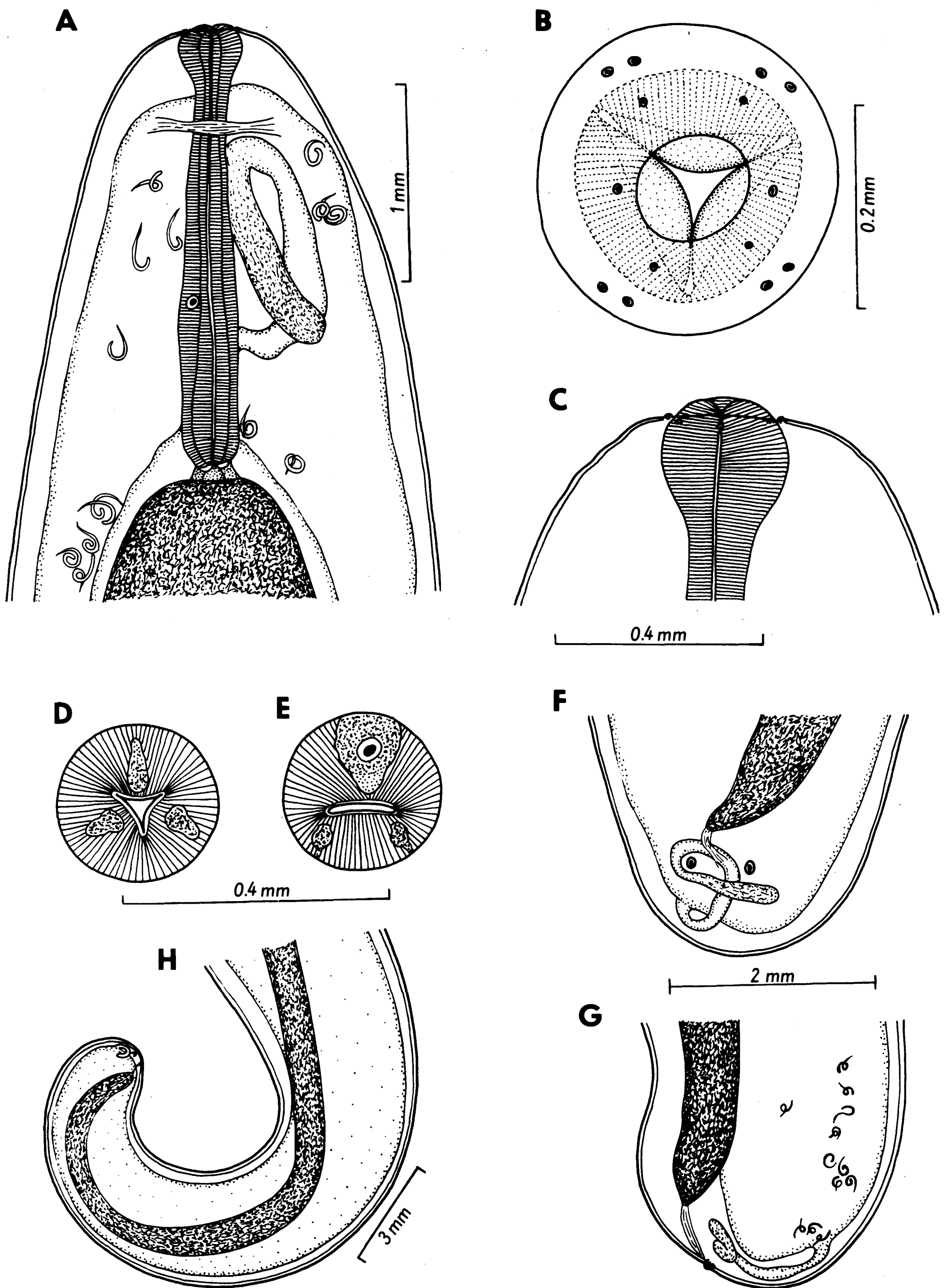


Fig. 1. *Philometra robusta* sp. n. – gravid female. A – anterior end of body; B, C – head end, apical and lateral views; D – cross section of anterior region of oesophagus; E – cross section of mid-region of oesophagus; F, G – posterior extremity, ventral and lateral views; H – posterior end of body, lateral view.

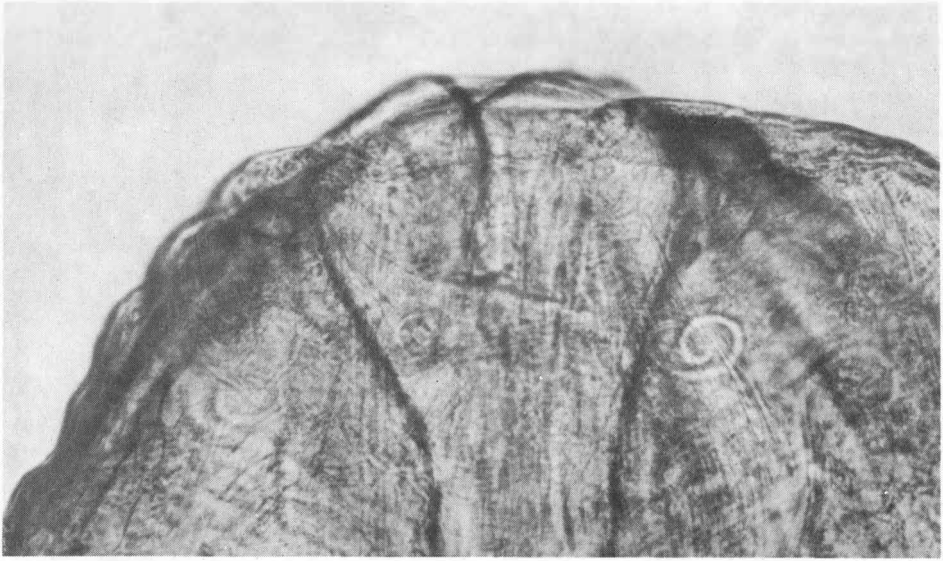


Fig. 2. Head end of gravid female of *Philometra robusta* sp. n. ($\times 140$).

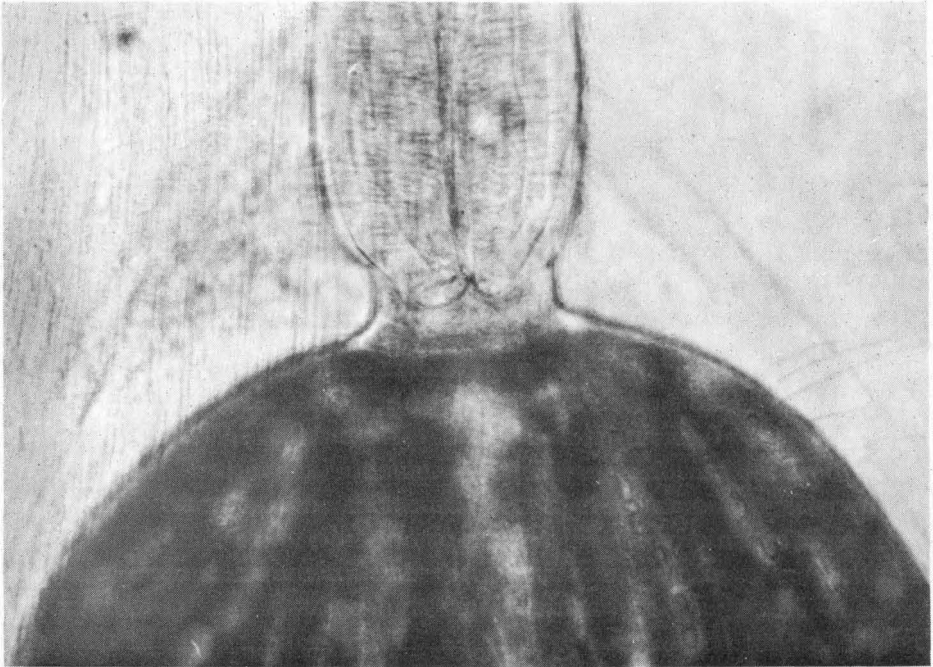


Fig. 3. Region of oesophageo-intestinal junction in gravid female of *Philometra robusta* sp. n. ($\times 140$).

Deposition of types: Holotype (♀) and 3 paratypes (♀♀) in Institute of Parasitology, Czechoslovak Academy of Sciences, České Budějovice (Cat. No. N-582); 2 paratypes (♀♀) in Zentrum für Marine Tropenökologie, Universität Bremen.

Etymology: The specific name "*robusta*" (= robust) relates to a characteristic feature of this species, i.e. the robust body of its gravid female.

Description of female (based on 6 specimens; measurements of holotype in parentheses): Body of gravid female with larvae in uteri light-brown in colour in live specimens and whitish in fixed specimens. Body very long, relatively broad for *Philometra*, tapering to both ends; cuticle smooth. Length of body of fixed specimens 275–450 (450), maximum width 8–10 (10); width of anterior end of body 2 (2), that of posterior end 2–3 (3); maximum length of largest live specimen 680 (Fig. 4). Cephalic extremity rounded; oral aperture circular, relatively large; three oesophageal lobes protruding from mouth as flat, slightly elevated surfaces. Cephalic papillae almost indistinct in lateral view, represented by eight small outer papillae arranged in four pairs and by four small inner papillae; pair of small lateral amphids present. Oesophagus muscular, inflated at anterior end to form distinct bulb 0.272–340 (0.272) long and 0.313–0.381 (0.381) wide. Greater, posterior, part of oesophagus slightly expanded medially. Dorsal oesophageal gland not well demarcated, provided with inconspicuous cell nucleus located medially; in transverse section oesophageal gland not elevated from circular outline of oesophagus.

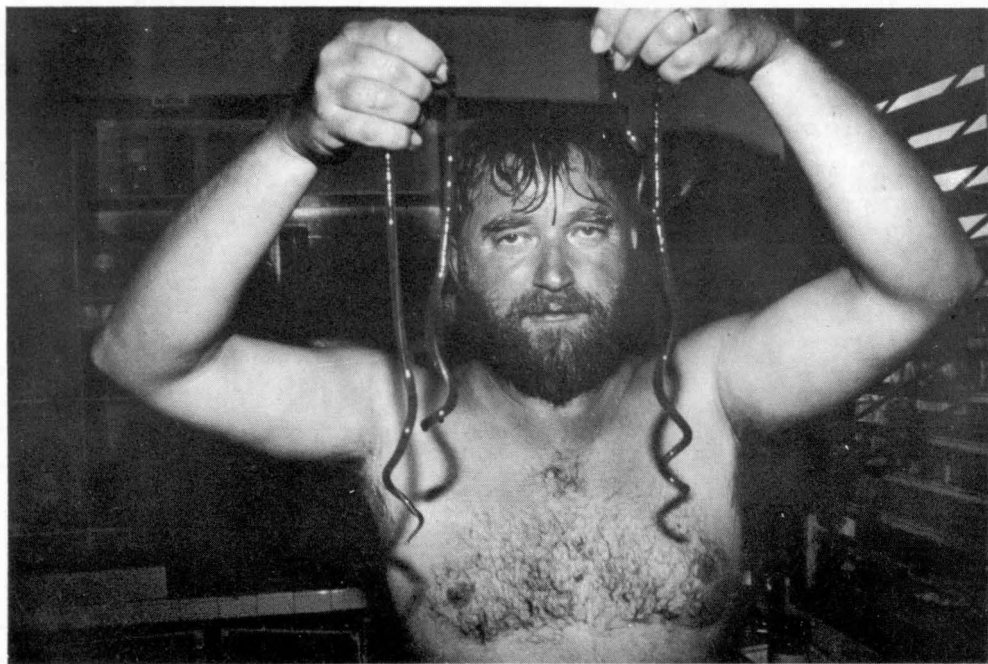


Fig. 4. Two live specimens of *Philometra robusta* sp. n. in the hands of one of present authors (H. Möller).

Lumen of oesophagus triradiate anteriorly (Fig. 1 D) and oval, dorsoventrally depressed by enlarged oesophageal gland medially (Fig. 1 E); subventral glands reduced at this level. Posterior end of oesophagus opening into small ventriculus through very short valve; size of ventriculus in holotype (0.068×0.177). Length of entire oesophagus, including anterior bulb, 2.41–2.61 (2.50), representing 0.6–0.9 (0.6) % of whole body length; maximum width of cylindrical portion of oesophagus 0.245–0.313 (0.299). Cell nucleus of oesophageal gland 1.36–1.63 (not determined in holotype) from anterior extremity. Nerve ring encircling oesophagus 0.449–0.571 (0.503) from anterior extremity of body. Intestine white in colour, straight, displaced laterally by uterus and extending posteriorly almost to posterior extremity; width of intestine close to its anterior end 0.95–1.29 (1.16); posterior end of intestine atrophied, forming short ligament attached ventrally to body wall close to posterior extremity. Posterior end of body somewhat narrowed, curved ventrally, with rounded tip; pair of small inconspicuous, subventral papilla-like projections present close to site of intestinal ligament attachment. Ovaries short, with broad, rounded ends, situated close to anterior and posterior extremities of body; anterior ovary reaching to level of nerve ring; posterior ovary at level of intestinal ligament. Uterus occupying major part of body, filled with numerous, mostly coiled, larvae; length of larvae 0.330–0.420, maximum width 0.015–0.018.

Male: unknown.

DISCUSSION

The family Philometridae includes a large number of species that are parasites of both freshwater and marine fishes. Because males are unknown for many species and even genera, the classification of philometrids is principally based on female morphology (Rasheed 1963, Moravec 1986). According to the key to genera of the Philometridae provided by Moravec and Shahaarom-Harrison (1989), nematodes of the present material belong to the genus *Philometra* Costa, 1845 *sensu stricto*.

In addition to morphological features, the body size of gravid females and the site of gravid females in the host fish are important for the identification of philometrid nematodes (Moravec 1978). Of the many species of *Philometra*, gravid females of only the following six species are 200 mm or more in length and are thus comparable with those of *P. robusta* sp. n.: *P. amazonica* Travassos, 1960, *P. balistii* (Rasheed, 1963), *P. cephalus* Ramachandran, 1975, *P. globiceps* (Rudolphi, 1819), *P. lateolabracis* Yamaguti, 1935 and *P. managatuwo* Yamaguti, 1941. Gravid females of other species of the genus are much shorter. However, in contrast to the above six named species, the females of *P. robusta* are conspicuously broader, with the body width ranging from 8–10 mm; in all other known *Philometra* species the width of female body is at most 2.5 mm, but usually only about 1 mm. This also includes an undescribed *Philometra* species from the muscles of “tunas” in the Indian Ocean, the gravid females of which are up to 843 mm long, but their

diameter is about 1.5 mm (personal communication of Dr. Ahmed Hafiz, Republic of the Maldives).

The above six named *Philometra* species can also be differentiated from *P. robusta* by the following features of the female:

P. amazonica from the abdominal cavity of the freshwater fish *Callophysus macropterus* from Brazil: the body length reaches 950 mm; the oesophagus measures only 1.2–1.4 mm (vs. 2.4–2.6 mm); the intestine is dark (vs. white); and there are no caudal papillae.

P. balistii from the eye of the marine fish *Balistes* sp. from Sri Lanka: the body is at most 210 mm; the head is provided with four protruding lobes, each bearing two fleshy papillae; and the tail possesses two broad lobes projecting from the sides, each having two papillae (the structure of the head and caudal extremities of *P. robusta* is different).

P. cephalus from the gonads of the striped mullet, *Mugil cephalus*, from India: the body is at most 250 mm long, 0.9–1.1 mm wide and dark-brown to pink; the oesophagus measures only 0.7–1.2 mm (vs. 2.4–2.6 mm); the intestine is dark-brown (vs. white); and the cuticle is allegedly embossed (vs. smooth), which makes the generic identification of this form questionable.

P. globiceps from the abdominal cavity of several species of marine fishes in the Mediterranean and Black Seas: the body, which may attain a length of up to 200 mm, is 0.9 mm wide and blood-red in colour; the intestine is dark-brown (vs. white); the ovaries are elongate (vs. short); the uterus does not reach posteriorly the region of the intestinal ligament; the larvae are 0.56 mm (vs. 0.33–0.42 mm) long; and there are no caudal papillae.

P. lateolabracis from the gonads of various marine perciform fishes, occurring mainly in the tropical regions of the Pacific, Indian and Atlantic Oceans: the length of female body is usually less than 200 mm (but Sakaguchi et al. (1987) give the maximum length as 290 mm) and its width 0.7–1.0 (vs. 2.75–4.50 mm and 8–10 mm); the body is dark-red in live specimens and dark-brown in fixed ones; the intestine is dark-coloured (vs. white); the ovaries are very long and thin, the posterior ovary not reaching posteriorly region of the intestinal ligament (vs. ovaries short and wide, the posterior ovary situated at the level of intestinal ligament); and the oesophagus is only 1.0–1.4 mm long (vs. 2.4–2.6 mm), its anterior bulb being rather indistinct (vs. well developed).

P. managatuwo from the ovary of the marine fish *Stromatoides argenteus* from Japan: although the body length is 460 mm, its width is only 1.3 mm; the body is dark-red in colour; the oesophagus is 0.9–1.1 mm (vs. 2.4–2.6 mm) long; the posterior ovary loops back at a length of about 1.5 mm from the caudal extremity (vs. posterior ovary very short, situated near caudal extremity); and caudal papillae absent (vs. present).

As far as the authors are aware, the only *Philometra* species reported from fishes of the order Tetraodontiformes is *P. pellucida* (Jägerskiöld, 1893) found in testes of *Tetraodon stellatus*, *T. hispidum* and some other species of marine fishes in Australia

and Japan (see Ivashkin et al. 1971). In contrast to *P. robusta*, the female body in this species is dark-red in colour (vs. light-brown) and its maximum length is only 135 mm (vs. 275–450 mm) with a width of 2 mm at most (vs. 8–10 mm); the oesophagus is markedly shorter (0.9–1.6 mm, as compared to 2.4–2.6 mm); the ovaries are more slender; and the disposition of caudal papilla-like projections is different.

Deardorff and Stanton (1983) have reported an unidentified *Philometra* species from the abdominal cavity of another tetraodontiform fish, the sharp-nosed puffer fish, *Canthigaster jactator*, from Hawaii, causing considerable abdominal distention in the hosts. The authors gave only the measurements of gravid females which ranged from 110–310 mm long by 2.5–7.0 mm wide and had an oesophagus 1.5–1.7 mm long. The size of body (especially its width), host group, site, and geographical position of these nematodes indicate a possible affinity with *P. robusta*.

A characteristic feature of *P. robusta* is the ventrally curved caudal extremity of the females which was found in all specimens of the present material. This has not hitherto been described for any *Philometra* species.

Some philometrid nematodes are known to cause serious diseases in fishes, but only few reports discuss a conspicuously distended abdomen of the fish host. Hoshina and Soguri (1952) observed an enlarged body cavity induced by *Philometra opsalichthydis* Yamaguti, 1935 (a species considered by Rasheed (1963) to be a synonym of *P. parasiluri* (Yamaguti, 1935)) in the pond smelt, *Hypomesus olidus*, in Japan. In addition, minnows, *Phoxinus phoxinus*, with a considerably inflated abdomen due to a heavy infection with *Philometra abdominalis* Nybelin, 1928 were observed in the Rokytka Brook in Czechoslovakia several years ago (Moravec, unpublished); infested fishes were incapable of swimming well and it was possible to collect them by hand. Deardorff and Stanton (1983) mentioned that specimens of the Hawaiian puffer fish, *Canthigaster jactator*, heavily infected with *Philometra* sp. are permanently distended and, therefore, the effects of this parasite on the morbidity and mortality of the puffer fish populations may be significant. If the fish was not wedged into a crevice in the reef, it rapidly ascended to the surface where erratic movements and lack of shelter could attract predatory fishes. The authors also mentioned that Johnson (1982) briefly reported finding infected specimens of *C. jactator* and an unidentified species of sharp-nosed puffer in the waters of the Magic Island Channel, Hawaii, stating that internal parasites caused the puffers “to swell dramatically”: the agent was probably the same nematode species as that reported by Deardorff and Stanton (1983).

The effects of *P. robusta* on its fish host seem to be similar to those described by Deardorff and Stanton (1983) for *Philometra* sp. in *Canthigaster jactator*. In this case the puffer fish harbouring *P. robusta* was also collected by hand, swimming upside down at the water surface.

Acknowledgement. We are grateful to the German Research Council (DFG) for supporting this study.

REFERENCES

- ANDERSON R. C. 1958: Méthode pour l'examen des nématodes en vue apicale. *Ann. Parasitol. Hum. Comp.* 33: 171–172.
- DEARDORFF T. L., STANTON F. G. 1983: Nematode-induced abdominal distention in the Hawaiian puffer fish, *Canthigaster jactator* (Jenkins). *Pacif. Sci.* 37: 45–47.
- HOSHINA T., SOGURI M. 1952: On a nematode parasite, *Philometra opsalichthydis* Yamaguti, 1935, parasitic to the body cavity of *Hypomesus olidus* (Pallas). *Jpn. J. Ichthyol.* 2: 76–80. (In Japanese.)
- IVASHKIN V. M., SOBOLEV A. A., KHROMOVA L. A. 1971: Camallanata of animals and man and the diseases caused by them. *Osnovy nematodologii*, Vol. 22. Publ. House Nauka, Moscow, 436 pp. (In Russian.)
- JOHNSON S. 1982: Life in a boat channel. *Sea Frontiers* 28: 179–183.
- MORAVEC F. 1978: Redescription of the nematode *Philometra obturans* (Prenant, 1886) with a key to the philometrid nematodes parasitic in European freshwater fishes. *Folia Parasitol.* 25: 115–124.
- MORAVEC F. 1986: Taxonomic problems in nematodes of the family Philometridae. Vth Int. Helminthol. Symposium "Helminths, Helminthoses, Environment", The High Tatras, Štrbské Pleso, Oct. 22–24, 1986, Abstracts of Reports, p. 9.
- MORAVEC F., SHAHAROM-HARRISON F. 1989: *Paraphilometroides nemipteri* gen. et sp. n. (Nematoda: Philometridae) from the marine fish *Nemipterus peronii* (Valenciennes) from Malaysia. *Folia Parasitol.* 36: 345–350.
- RASHEED S. 1963: A revision of the genus *Philometra* Costa, 1845. *J. Helminthol.* 37: 89–130.
- SAKAGUCHI S., YAMAGATA Y., SAKO H. 1987: Reidentification of *Philometra* parasitic on the Red Sea bream. *Bull. Natl. Res. Inst. Aquaculture*, No. 12, 69–72. (In Japanese with English summary.)

Received 3 February 1992

Accepted 30 March 1992