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Authors: Rosa-Molinar, Edward, and Williams, C. S.

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Larval Nematodes (Philometridae) in Granulomas in Ovaries of Black-tip Sharks, *Carcharhinus limbatus* (Valenciennes)

Edward Rosa-Molinar,[1] **C. S. Williams,** Transmission Electron Microscopy Laboratory, Carver Research Laboratories, Tuskegee Institute, Tuskegee Institute, Alabama 36088, USA; **and J. R. Lichtenfels,** Parasite Classification and Distribution Unit, Animal Parasitology Institute, Beltsville Agricultural Research Center, Beltsville, Maryland 20705, USA

Larvae of philometrid nematodes are found occasionally in the gonads of some teleosts (Raju, 1960, J. Mar. Biol. Assoc. India 2: 95–102; Simmons, 1969, U.S. Fish. Bull. Spec. Rep. 580: 1–17) and more rarely in elasmobranchs, but none of the previously reported cases involved the ovaries of sharks. Presented here is a description of larval nematodes of the family Philometridae in granulomas in the ovaries of two black-tip sharks.

During a 2-yr study (1978–1980), 156 black-tip sharks (52–178 cm TL) were taken from the north central Gulf of Mexico between Cape San Blas, Florida and the mouth of the Mississippi River. During routine gross examination of these sharks, two females which had been collected 6.4 km south of Dauphin Island, during long-line operations in Mobile Bay, were found to contain ovarian granulomas. At necropsy, ovarian tissue was preserved in buffered 10% formalin, dehydrated in a series of ethanols, embedded in paraffin, sectioned at 5–10 μm and stained with Harris' hematoxylin and eosin. Representative sectioned specimens of larval nematodes have been deposited in the U.S. National Parasite Collection, Beltsville, Maryland as USNM Helm. Coll. No. 77011 and 77012. We will refer to USNM Helm. Coll. No. 77011 as Case 1 and to USNM Helm. Coll. No. 77012 as Case 2.

Histologic sections revealed large numbers of larval nematodes within granulomas located in the right ovaries of Case 1 and Case 2 sharks. The granulomas were between the germinal site of the ovary and the epigonal tissue. The granuloma in Case 1 measured 113 × 53 × 53 μm, and Case 2 measured 169 × 160 × 160 μm. The Case 1 granuloma was well vascularized and appeared to be non-encapsulated. However, the Case 2 granuloma appeared to be encapsulated. The larvae were about 15–24 μm in diameter, more than 250–300 μm long, and were spotted with "elliptical cells." A tooth-like structure was visible at the anterior (Fig. 1), and a long whip-like tail was present at the posterior (Fig. 2). The surface of the cuticle was sculptured with a consistent pattern of cross-striation throughout the length of the larva.

The larvae were similar to those described from sharks by Steiner (1921, Zentralbl. Bakteriol. 1 Abt. Orig. A. Med. Mikrobiol. Infektionskr. Parasitol. 86: 591–595), Johnston and Mawson (1943, Trans. R. Soc. S. Aust. 67: 187–190) and de Ruyck and Chabaud (1960, Vie Milieu 3: 386–389). They were identified as members of the family Philometridae but could not be classified further because necessary adult characters were, of course, lacking. However, only a single genus, *Phlyctainophora* (Steiner, 1921) has been reported in sharks. The life cycles of members of this genus are unknown, but the life cycle of other Philometridae involve development in an arthropod intermediate host (Platzer and Adams, 1967, Can. J. Zool. 45: 31–43; Uhazy, 1977, Can. J. Zool. 55: 265–273; Uhazy, 1977, Can. J. Zool. 55: 1430–1441).

Two species of the genus *Phlyctainophora* have been reported in sharks (Steiner, 1921, op. cit.; Mudry and Dailey, 1969, Proc. Helminthol. Soc. Wash. 36: 280–284). Both of these studies described nematodes located in mandibular tissue of the host sharks. Previously, larvae believed to be *Phlyctainophora* have been reported from Pacific sharks in two cases (Johnston and Mawson, 1943, op. cit.; de Ruyck and Chabaud, 1960, op. cit.). However, these larvae were not found in gonadal tissue. This is the first

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[1] Present address: Department of Microbiology, School of Veterinary Medicine, Auburn University, Auburn, Alabama 36830, USA.

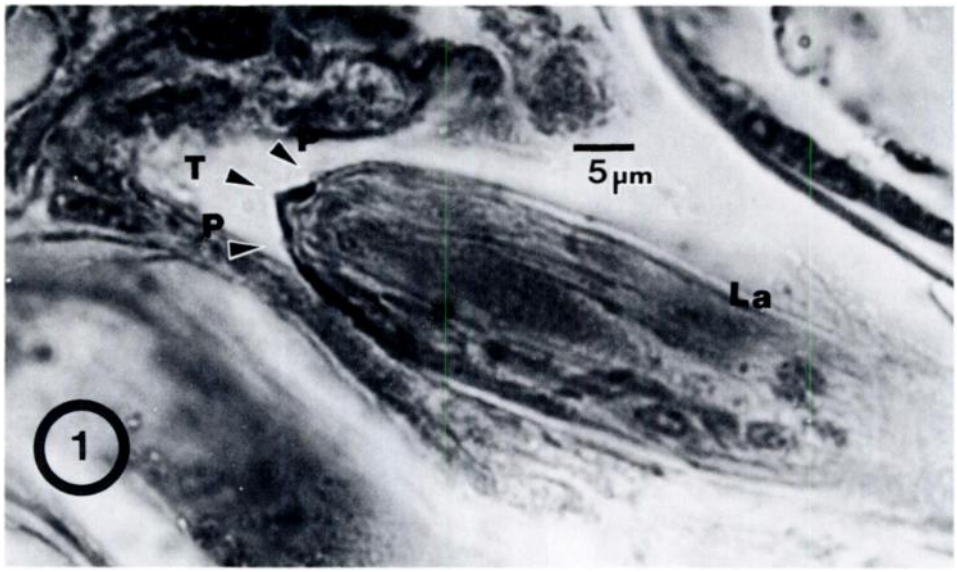

FIGURE 1. Sagittal section showing the anterior portion of a nematode larva (La, larva; P, papilla; T, tooth). ×1,500.

report of philometrid larvae in ovarian tissue in black-tip sharks.

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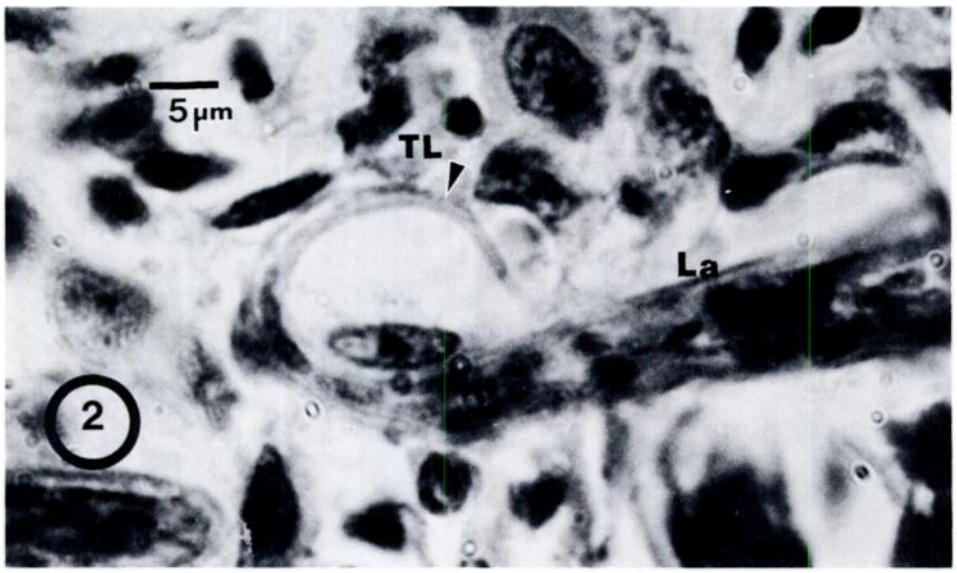

FIGURE 2. Sagittal section showing the tail portion of a larva (La, larva; TL, tail). ×1,200.

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Archinephric Duct Lesions Caused by *Phyllodistomum superbum* and *P. lysteri* (Digenea: Gorgoderidae) in Catostomid Fishes

Larry N. Gleason, Department of Biology, Western Kentucky University, Bowling Green, Kentucky 42101, USA; **Bruce M. Christensen,**[1] Department of Biological Sciences, Murray State University, Murray, Kentucky 42071, USA; **and Yui Tan Chung,** Department of Biology, Western Kentucky University, Bowling Green, Kentucky 42101, USA

The effects of trematodes upon epithelial linings have been examined for a variety of host–parasite systems, but few studies have been reported on the effects of those that inhabit the archinephric ducts of fish. Choquette (1947, Can. J. Res. 16: 131–135) reported that *Phyllodistomum lachancei* Choquette caused dilation of the lumen and flattening of the cells of the epithelial lining in the ureters (=archinephric ducts) of the eastern brook trout, *Salvelinus fontinalis* (Mitchill). Herein are reported observations on the lesions occurring in the archinephric ducts of the hogsucker, *Hypentelium nigricans* (Lesueur), and the spotted sucker, *Minytrema melanops* (Rafinesque), attributed to infections with *Phyllodistomum superbum* Stafford and *P. lysteri* Miller, respectively.

Material for this study was obtained from naturally infected fish. Hogsuckers were collected from the West Fork of Drake's Creek, Simpson Co., Kentucky, by electrofishing, brought to the laboratory alive and killed. Spotted suckers were collected from Kentucky Lake, Trigg Co., Kentucky by gill netting, and stored on ice for a maximum of 3 hr before necropsy. In both cases, the kidneys and archinephric ducts were removed intact, fixed in Bouin's solution, sectioned at 6 μm, and stained with hematoxylin and eosin. Uninfected ducts from both species of fish were collected in a similar manner and were used for comparative purposes. Representative whole mount specimens of *P. lysteri* and *P. superbum*, and two slides of sections from naturally infected fish of both species have been deposited in the U.S. National Parasite Collection, Beltsville, Maryland (USNM Helm. Coll. Nos. 77373–77375).

Phyllodistomum superbum and *P. lysteri* were observed in the lumens of the archinephric ducts of their respective hosts. The *P. superbum* were found more frequently in the distal region of the duct in hogsuckers, while *P. lysteri* from spotted suckers were found in the proximal region. Trematodes almost completely occluded the ducts in several specimens, and cellular debris was concentrated in the lumen of the ducts proximal to this blockage. There did not seem to be any major differences in the lesions caused by the two species of *Phyllodistomum* in their hosts. Pathologic changes associated with the flukes seemed to be entirely mechanical and were primarily related to feeding and(or) attachment activities of the oral sucker and acetabulum. Not all flukes were attached with both or either sucker, and in some cases there was no evidence of recent attachment sites in the vicinity of the fluke.

The oral suckers and acetabula of the trematodes often were filled with epithelial cells (Figs. 1, 2). Frequently these cells were still a part of the epithelial lining, but occasionally they had been completely separated from the

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[1] Present address: Department of Veterinary Science, University of Wisconsin, Madison, Wisconsin 53706, USA.