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Diplostomatid Metacercariae in the Brain of Silversides from Lake Riñihue, Chile

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ABSTRACT: The tissue locations and effects produced by metacercariae of *Diplostomum (Austrodiplostomum) mordax* and *Tylodelphys destructor* in the brain of 30 silversides (*Basilichthys australis*) from Lake Riñihue in Chile, were evaluated. Metacercariae were mainly observed in the interlobular infoldings, meninges and ventricles of the brain. The prevalence was 18 (60%) and the intensities were usually low (1 to 9 metacercariae), with no inflammation or invasion of the parenchyma, except for one fish which had 130 parasites associated with a moderate inflammatory reaction. Asymmetry in the distribution of metacercariae in the cerebral hemispheres was observed in one (3%) of the 30 fish.

Key words: Trematodes, Diplostomatidae, *Diplostomum (Austrodiplostomum) mordax*, *Tylodelphys destructor*, freshwater fishes, *Basilichthys australis*, brain, South America.

In Chile, the metacercariae of *Diplostomum (Austrodiplostomum) mordax* (Szidat and Nani, 1951) and *Tylodelphys destructor* Szidat and Nani, 1951 in the silverside (*Basilichthys australis* Eigenmann, 1927) (Atherinidae), an authocthonous Chilean freshwater fish was first reported by Bravo (1981).

The metacercariae of *D. mordax* have been recorded in the brain of various freshwater fish of the Argentinian Patagonia such as *Oncorhynchus mykiss, Galaxias maculatus, Galaxias platei, Aplochiton taeniatus, Jenynsia lineata, Patagonina hatcheri* and *Percichthys trucha* (Ortubay et al., 1994). Similarly the metacercariae of *T. destructor* have been identified in *O. mykiss, J. lineata, Odonthestes bonariensis, P. hatcheri,* and *P. trucha,* also in the Argentinian Patagonia (Ortubay et al., 1994). In addition, metacercariae of *D. mordax* has been found in *Orestias* sp. (Mueller, 1972), in *Orestias agasii, Orestias olivaceous, Orestias luteus* and *O. bonariensis* from Lake Titicaca, Perú (Heckmann, 1992).

Nevertheless, knowledge about the injury induced by the metacercariae of *D. mordax* and *T. destructor* is restricted to that produced in *P. hatcheri* in the Argentinian Patagonia (Szidat and Nani, 1951) and to those originated by *D. mordax* in *Orestias* sp. (Mueller, 1972), *Orestias* spp., and *O. bonariensis* (Heckmann, 1992) from Lake Titicaca.

Torres et al. (1996) observed that the intensities of the infection by *D. mordax* and *T. destructor* in adult silversides in Lake Riñihue (39°50′S, 72°20′W) were mild, considering that no more than five and 15 metacercariae of each trematode were found, respectively. The objective of the present study was to determine the locations and effect produced by *D. mordax* and *T. destructor* metacercariae in adult silverside tissues.

By using fishing nets, 30 silversides were collected, during 1993 and 1994, simultaneous with the sampling of fishes for the survey of Torres et al. (1996). The brain was extracted from each fresh fish and fixed in buffered 10% formalin. Paraffin-embedded serial frontal sections (9μm thick) were cut from each brain, and stained with hematoxylin and eosin; the number of metacercariae were counted in these sections for each fish. Voucher specimens have been deposited in the collection of the Instituto de Parasitología, Universidad Austral de Chile, Valdivia, Chile (IPUAT 0249–0252).

Of the 30 silversides analyzed, 18 (60%) were infected by *D. mordax* or *T. destructor* metacercariae. In general, the intensity of the infection was low (one to nine metacercariae) in most specimens; however, one fish had 130 parasites. All metacercariae were found free, unencysted, mainly associated in the interlobular infoldings

FIGURE 1. Diplostomatid metacercariae (M) in the interlobular infoldings of the brain of *Basilichthys australis*. The arrow indicates a moderate inflammatory reaction.

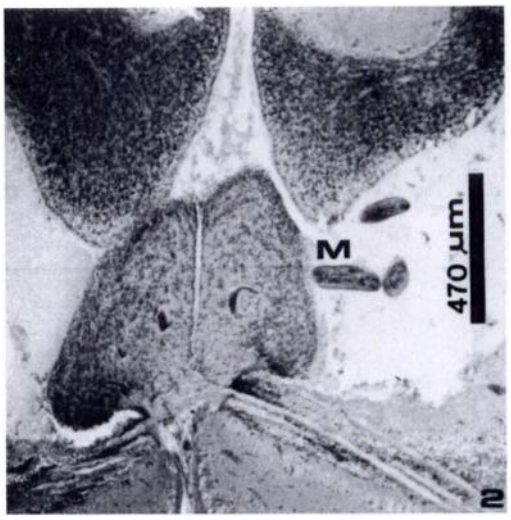

FIGURE 2. Diplostomatid metacercariae (M) in the ventricular cavities of the brain of *Basilichthys australis*.

(Fig. 1), ventricular cavities (Fig. 2) and external meninges (Fig. 3). In no fish did we observe a clear invasion of the cerebral parenchyma or severe inflammation. The fish carrying 130 parasites had a moderate inflammatory reaction in the meninges.

Mean numbers of metacercariae in infected fishes were 8.9 and 7.7 for left and right cerebral hemisphere, respectively. There were no significant differences in the mean numbers of metacercariae using a Mann Whitney *U*-test ($U = 38.5$; $P > 0.05$) (Siegel, 1991).

From the 18 infected fish nine had only one metacercariae and five had equal numbers of parasites in each hemisphere, one to three individual parasites each. Four fish had an asymmetrical distribution of metacercariae in their cerebral hemispheres. However, based on a chi-square test (Siegel, 1991), only one of these four fish had a significant ($P < 0.05$) difference, based on a chi-square test; thus one (3.3%) of the 30 fish had an asymmetric distribution of metacercariae. These result are in accordance with the distribution of *Diplostomum pseudospathaceum* in fish eye lenses that were almost completely symmetrically distributed in many naturally infected fish (Graczyk, 1991).

Szidat and Nani (1951) associated intense infection by metacercariae in juvenile (30 to 70 parasites) and adult forms (more than 200 parasites) of *P. hatcheri* with deformation of the spinal cord, mortality, and severe damage of the brain cerebellum, including the optic center. Heckmann (1992) has also described severe

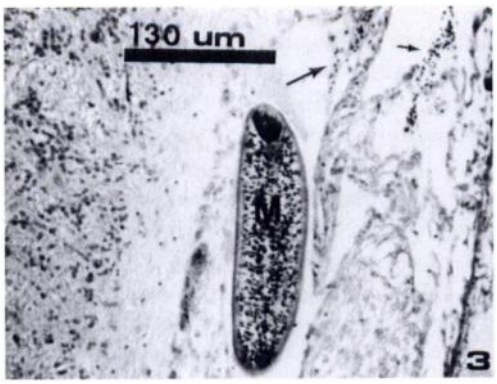

FIGURE 3. Diplostomatid metacercariae (M) in the external meninges of the brain of *Basilichthys australis*. The arrow indicates a moderate inflammatory reaction.

damage in the cerebral ventricles and parenchyma of brain and cerebellum of *Orestias* spp. and *O. bonariensis*.

The sparse damage induced by these parasites in the cerebral parenchyma of silversides living in Lake Riñihue, in relation to other hosts from other geographical locality (Szidat and Nani, 1951; Heckmann, 1992) may be closely related to the light intensity of infection and the general symmetry in distribution of the metacercariae. Szidat (1969) and Ostrowski de Nuñez (1977, 1982) have shown piscivorous birds *Phalacrocorax brasilianum* (=*Phalacrocorax olivaceus*) are definitive hosts of *D. mordax*. Lake Riñihue does not have many aquatic birds (Schlatter, 1976). The intensity of infection could also vary in other freshwater ecosystems of the southern Chile, where piscivorous birds, that act as definitive hosts, are abundant.

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