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ORIGINAL ARTICLE / ARTÍCULO ORIGINAL

FIRST RECORD OF *LERNAEA CYPRINACEA* (COPEPODA) IN A NATIVE FISH SPECIES FROM A BRAZILIAN RIVER

PRIMER REGISTRO DE *LERNAEA CYPRINACEA* (COPEPODA) EN UNA ESPECIE NATIVA DE PEZ DE UN RÍO BRASILEÑO

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Abstract

This is the report of the occurrence of *Lernaea cyprinacea* (Linnaeus, 1758) parasitizing the native fish species *Steindachnerina insculpta* (Fernández-Yépez, 1948). Sixty host specimens were captured in Taquari River, municipality of Taquarituba, São Paulo State, Brazil. Three hosts were infested with *L. cyprinacea.* The infestation rate was low, with one parasite per host. Proper management should be applied in fish farms to prevent the escape of this parasite, and its consequent spread.

Keywords: anchor worm - fish ectoparasites - Lernaeosis - *Steindachnerina insculpta*.

Resumen

Este estudio tiene como objetivo registrar por primera vez la presencia de *Lernaea cyprinacea* (Linnaeus, 1758) parasitando a la especie de pez nativa *Steindachnerina insculpta* (Fernández-Yépez, 1948). Una muestra de 60 especímenes fueron capturados en el río Taquari, Taquarituba, São Paulo, Brasil. Tres hospederos estaban infectados con *L. cyprinacea*. La tasa de infestación fue baja con un parásito por hospedero. Un manejo adecuado debe aplicarse en peces cultivados para impedir el escape de este parásito y su consiguiente dispersión.

Palabras clave: ectoparásito de peces - Lernaeosis - *Steindachnerina insculpta* - verme áncora.

INTRODUCTION

Approximately 110 species of lernaeids have been described in 14 different genera (Ho, 1998). The most common species is *Lernaea cyprinacea* (Linnaeus, 1758), which has been widely displaced with cultured fish species and is now found throughout North America, Europe, Asia, southern Africa and eastern Australia (Hoffman, 1970; Lester & Hayward, 2006). There have also been records of *L. cyprinacea* in South America (Gabrielli & Orsi, 2000; Qerol *et al*., 2005; Magalhães, 2006; Gallio *et al.*, 2007; Düpont & Lobe, 2011).

Lernaea cyprinacea is a lernaeid copepod usually known as anchor worm (Thatcher, 2006). The species has nine stages during the life cycle, including three free-living naupliar stages, five copepodid stages, and one adult stage. After male and female adults mate on the fish, the males die and the females metamorphose, insert their anterior body into the host tissue, and produce eggs (Grabda, 1963 *apud* Nagasawa *et al.*, 2007). There are two kinds of adults females, known respectively as premetamorphic and postmetamorphic females. The last are elongate forms whose heads are inserted into the fish tissue, often in a blood vessel, and what is left of the body stays free in the water (Thatcher & Willians, 1998).

The major harms caused by this parasite on fish hosts appear to be on the gills, triggering hemorrhage and necrosis with consequent decrease of breathing capacity. Lernaeid can also cause deep injuries in the tegument, external muscle tissue, eyes surface and even inner organs in some cases. Thus, these injuries may increase the chance of acquiring secondary infections, since infested hosts are more susceptible to bacteria, fungi and virus. Furthermore, some researches related that copepods infestation in fish may cause weight loss, lower growth rate, blood alterations and even behavior alteration (Gabrielli & Orsi, 2000).

Lernaea cyprinacea is an introduced parasite largely studied in Brazil. It was introduced with the beginning of *Cyprinus carpio* (Linnaeus, 1758) farming activities in the 80's. Currently, this parasite has spread almost throughout Brazil with several registers in farming enterprises causing huge losses to the owners. However, some of these enterprises do not apply proper management measures to fully avoid escapes of farmed fish into natural environment, which consequently causes the release of pathogens (Orsi & Agostinho, 1999). Due to this fact, there have been records of *L. cyprinacea* in native fish in natural environment in Brazil (Gabrielli & Orsi, 2000).

Gabrielli & Orsi (2000) recorded *L. cyprinacea* infestation in native fishes during a research conducted in Tibagi River, Parana State, Brazil in 1997 and 1998. The infested species were: *Astyanax bimaculatus* (Linnaeus, 1758); *Iheringichtys labrosos* (Kroeyer, 1874); *Leporinus elongatus* (Valenciennes, 1849); *Leporinus friderici* (Bloch, 1794); *Schizodon intermedius* (Garavello & Britski, 1990); *Serrasalmus spilopleura* (Kner, 1860); and *Schizodon nasutus* (Kner, 1859). Querol *et al.* (2005) recorded *L. cyprinacea* in native species in Arroio Creek, Rio Grande do Sul State, Brazil. Such species were: *Cyphocharax spilotus* (Vari, 1987); *Cyphocharax voga* (Hensel, 1870) and *Steindachnerina biornata* (Braga & Azpelicueta, 1987). Magalhães (2006) also have records in *A. bimaculatus* in Paraíba do Sul River, Minas Gerais State, Brazil. Lastly, Düpont & Lobo (2011) registered for the first time *L. cyprinacea* infestation in *Astyanax fasciatus* (Cuvier, 1819) in Pardinho River, Rio Grande do Sul State, Brazil.

Steindachnerina insculpta is a fish species with iliophagous feeding habit and it is important for maintenance of the food chain (Reis *et al.*, 2003). Infestations with *L. cyprinacea* may jeopardize the fish health leading to death (Thatcher, 2006), thus reducing the number of these fish species may trigger impacts on fish species that feed on fishes (Gabrielli & Orsi, 2000; Agostinho *et al.*, 2007).

This research aims to report for the first time *L. cyprinacea* parasitizing the native species

Steindachnerina insculpta (Fernández-Yépez, 1948) in a tributary of a Brazilian reservoir.

MATERIAL AND METHODS

The fish sampling was composed of 60 specimens of *S. insculpta*, collected during summer (October and November-2011), with half sampled in a lotic stretch (23° 40' 2,90"S; 49° 7' 56,85"W) and the other half in two lentic stretches of Taquari River (23°29' 21,95"S; 49° 9' 43,68"W; 23° 17' 2,80"S; 49° 12' 6.90"W), a tributary of Jurumirim reservoir, located in the municipality of Taquarituba, São Paulo State, Brazil. The fish were collected using gill nets, with mesh size ranging from 3 to 7 cm, set in the afternoon and removed early in the next morning, thus exposed for approximately 14 h. All samples were frozen after collecting and then examined in the laboratory. Their surfaces were analyzed and the lernaeids were carefully removed from the host tissues using tweezers and needle syringes; after removing they were preserved in Alcohol Formalin Acetic Acid solution (AFA). Voucher specimens were deposited in the Coleção Helmintológica do Instituto de Biociências de Botucatu (CHIBB 7056-7058), São Paulo State, Brazil. All collections were authorized by Federal licenses for activities with scientific purposes (SISBIO 15549-1). Photomicrographs of the lernaeids were obtained using Leica Application Suite 3.7.0 software in Leica M125 stereomicroscope.

RESULTS AND DISCUSSION

From 60 host samples of *S. insculpta* analyzed, three were parasitized by *L. cyprinacea* (Figure 1 and 2). One infested host was collected in a lentic stretch of Taquari River, and the other two in a lotic stretch. The rate of infestation was low, with one parasite per host. Among the lernaeids found, there were two pregnant and one non-pregnant female. One host was found with the parasite on the surface, the other attached to the muscle tissue through the cloaca, and the last one was attached to the muscle through one of the pectoral fins.

Leanea cyprinacea has been found infesting native fishes species in Brazil, as follow *A. bimaculatus*, *I. labrosos, L. elongatus*, *L. friderici*, *S. intermedius, S. spilopleura*, *S. nasutus*, *C. spilotus*, *C. voga*, *S. biornata* and *A. fasciatus* (Gabrieli & Orsi, 2000; Querol *et al.*, 2005; Magalhães, 2006; Düpont & Lobo, 2011) Likewise, this parasite has been reported in other countries around the world . Hence, the present study is the first record of *L. cyprinacea* parasitizing the native *S. insculpta*, and further, it is the first record of this parasite in Taquari River, São Paulo State, Brazil.

Lernaeosis has been one of the main concerns in fish farms, triggering mortality and economic losses, since the harms caused by *L. cyprinacea* on fish hosts enable secondary infections precluding the market (Pizzolatti, 2000), specially for cultures of cyprinid (Scholz, 1999). Furthermore, it is difficult to treat an infected fish farm because it is necessary to apply products with high toxicity, and sometimes the only feasible measure is to eliminate the whole fish stock (Gabrielli & Orsi, 2000).

In Brazil, fish farm enterprises have been the main source of species introduction through escapes. These enterprises are usually installed in the vicinity of natural water courses which puts these environments under potential risk of dispersion of exotic species (Agostinho *et al.*, 2007). Lack of proper management in fish farms favor the escapes, such as empting the tanks carelessly, and unpromptness when facing strong flood periods (Orsi & Agostinho, 1999).

The intentional or accidental introduction of exotic species is one of the greatest causes of biological diversity loss, along with habitat destruction, and overexploitation of natural resources. About 40% of recorded extinctions of aquatic organisms were caused by introduced species (Agostinho *et al.*, 2007). The dissemination of diseases is one of the potential impacts of introduced aquatic organisms upon native aquatic communities, altering their abundance and composition. The spread of an exotic pathogen in a large water course is a permanent threat to the integrity of natural

environments (Agostinho *et al.*, 2007). Regarding *L. cyprinacea* as a cosmopolitan parasite (Nagasawa *et al.*, 2007) and the huge dimension of Brazilian reservoirs (Agostinho *et al.*, 2007), this parasite can spread out of control and affect native fish species (Gabrielli & Orsi, 2000).

What is suggested in this work for mitigating and further eliminating the spread of *L. cyprinacea* in natural environment corroborates with the authors that previously recorded these parasites in native species and they recommend that the feasible solution is to prevent future escapes of infected hosts and even the parasites themselves (Gabrielli & Orsi, 2000; Magalhães, 2006; Marina *et al*. 2008; Düpont & Lobo, 2011). To do so, there should be more involvement, investment, and a more efficient surveillance of the government sector responsible for aquaculture in Brazil. Such measures should be educating fish farms owners and the population about the consequences of improper management. Moreover, there should also be rules to be applied in order to prevent the spread of lernaeosis.

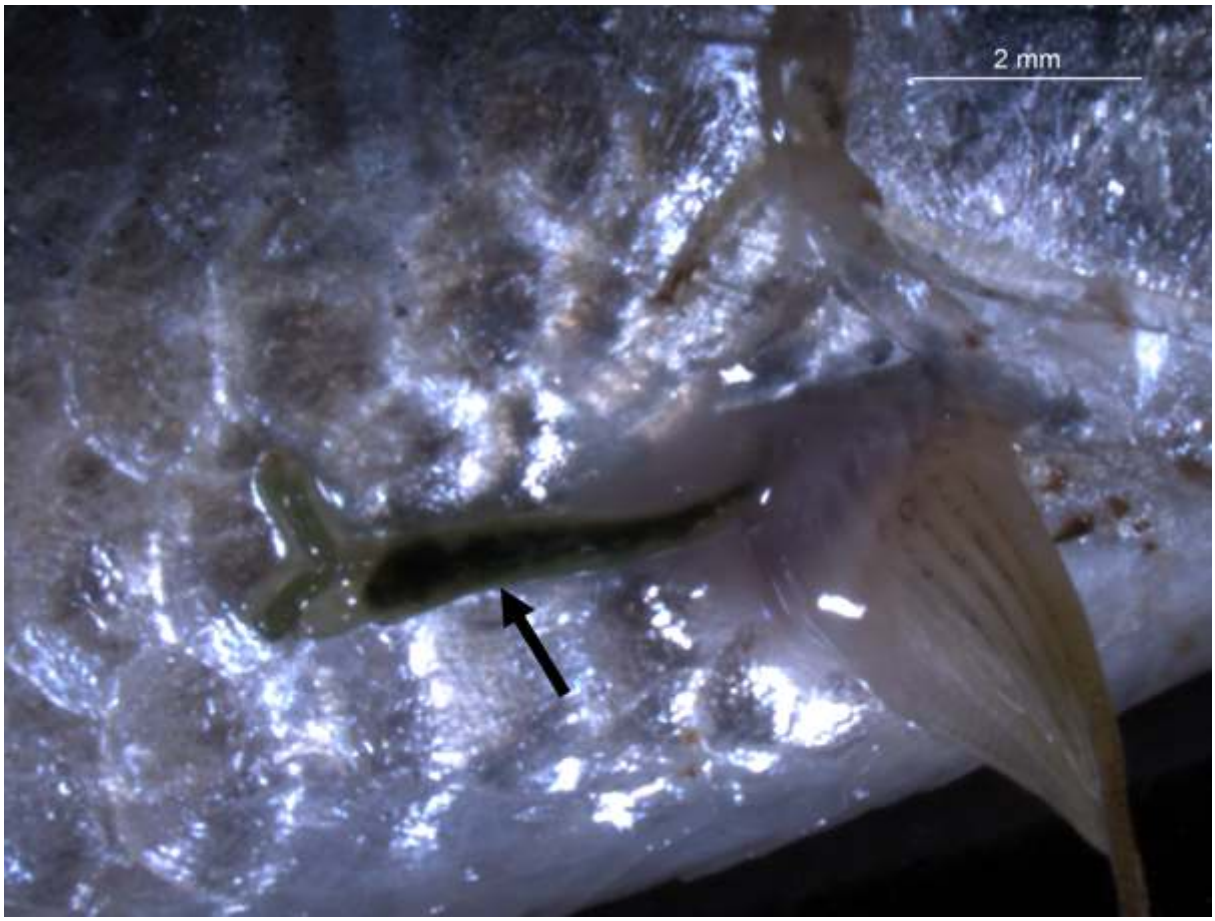

Figure 1. *Lernaea cyprinacea* (arrow) of *Steindachnerina insculpta* from Taquari River, municipality of Taquarituba, São Paulo State, Brazil.

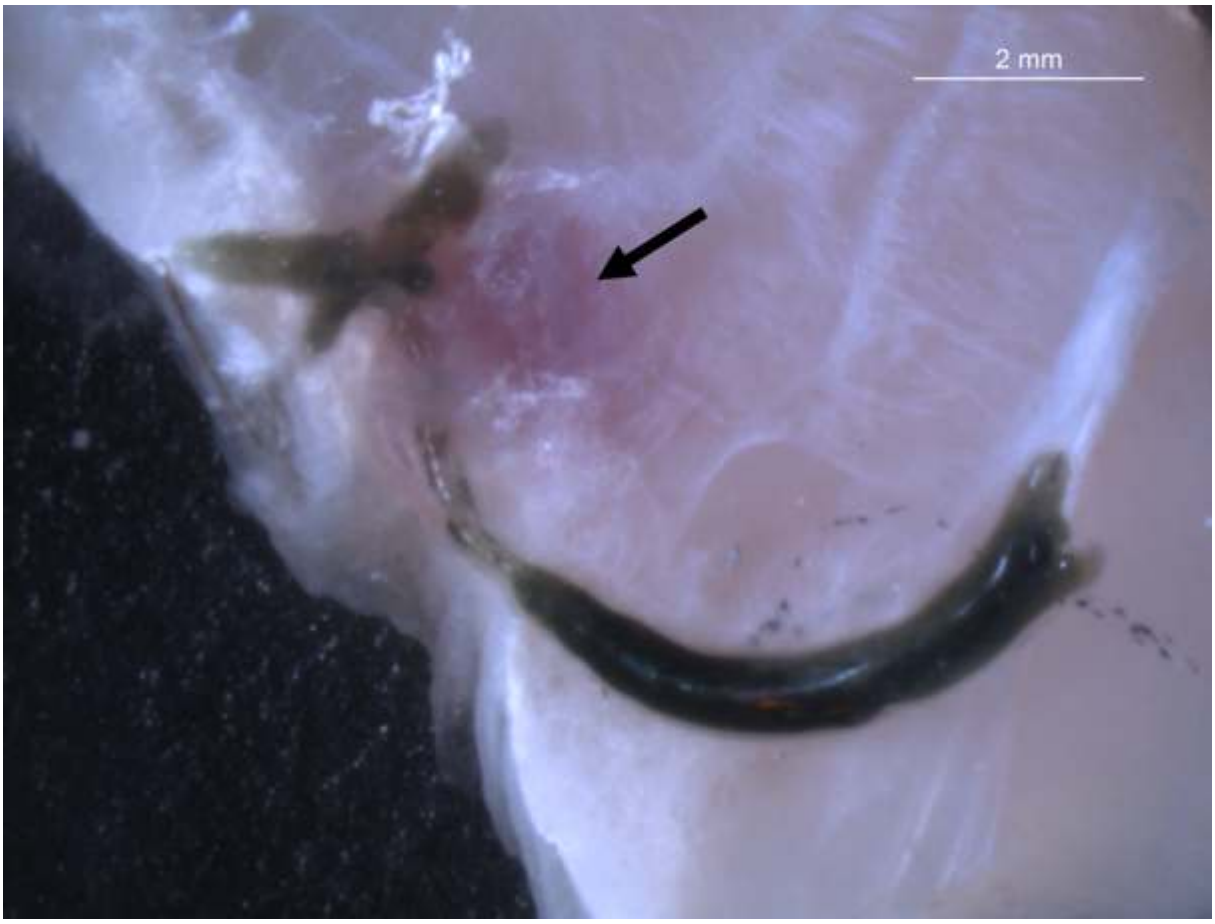

Figure 2. *Lernaea cyprinacea* of *Steindachnerina insculpta* from Taquari River, municipality of Taquarituba, São Paulo State, Brazil. Note the hemorrhagic area around the insertion point of the head of the anchor worm (arrow).

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