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Scientific Note

Occurrence of *Gamispatulus schizodontis* Thatcher & Boeger, 1984 (Cyclopoida, Ergasilidae) in the nasal cavities of Erythrinidae fishes from Brazil

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Abstract. *Gamispatulus schizodontis* (Copepoda) was collected by the first time on two erythrinid fish species from Furnas Hydroelectric Reservoir, southeastern Brazil. The highest values of prevalence and abundance of the copepod were recorded on *Hoplias lacerdae*, an allochthonous species, introduced in this reservoir.

Key words: *Hoplias malabaricus*, *Hoplias lacerdae*, fish parasite, Copepoda, Neotropical region

Resumo. Ocorrência de *Gamispatulus schizodontis* Thatcher & Boeger, 1984 (Cyclopoida, Ergasilidae) nas cavidades nasais de peixes da família Erythrinidae no Brasil. *Gamispatulus schizodontis* (Copepoda) foi coletada pela primeira vez em duas espécies de peixes eritrinídeos do Reservatório da Usina Hidrelétrica de Furnas, sudeste do Brasil. Os mais altos valores de prevalência e abundância do copépode foram registrados em *Hoplias lacerdae*.

Palavras-chave: *Hoplias malabaricus*, *Hoplias lacerdae*, ictioparasito, Copepoda, região Neotropical

Currently over than 260 species were described for the family Ergasilidae von Nordmann 1832 (see Boxshall & Halsey 2004). In Brazil, the first species described belonging to the family Ergasilidae, infecting freshwater fishes was *Ergasilus iheringi* Tidd 1942, collected from the gills of *Hoplias malabaricus* (Bloch 1794), from the State of Paraíba. *Hoplias malabaricus* popularly known as "trahira", is the most widespread species among erythrinids fishes, occurring in almost all river basins of Central and South America (Oyakawa 2003). *Hoplias lacerdae* Miranda-Ribeiro 1908, popularly known as "giant trahira", is primarily endemic to the Ribeira do Iguape River basin, in São Paulo and Paraná State (Oyakawa 2003), but due to the aquaculture practices, currently it has been introduced in several hydrographic basins from Brazil.

Studies about the parasitic fauna of *H. lacerdae* are scarce and few associations have been known for this host in wild environment. The recorded parasite species was *Contracaecum* sp., *Heterotyphlum* sp., *Hysterothylacium* sp., *Procamallanus* (*S.*) *inopinatus* Travassos 1929, *Procamallanus* (*S.*) *hilarii* Vaz & Pereira 1934 and *Dolops* sp. (Rodrigues *et al.* 1991, Moreira 1994, Brasil-Sato 2003, Thatcher 2006). Copepods have not been recorded infecting this fish species. In contrast, the parasite fauna of *H. malabaricus* has been widely studied and appears to be the third in species richness in the Neotropics, with 67 parasitic associations recorded (Luque & Poulin 2007). Eight species of copepods have been recorded for this host species, *Taurocherus tarangophilus* Paggi 1976, recorded in Argentina, and *Bedsylernaea collaris* Thatcher & Williams 1998, *Lernaea devastatrix* Boxshall, Montú & Scharzbold 1997, *Lernaea cyprinacea* Linnaeus 1758, *Gamidactylus hoplius* Varella & Malta 1995, *Pindapixara tarira* Malta 1994, *Ergasilus iheringi* Tidd 1942 and *Ergasilus*

sp. that were found in Brazil (Thatcher 2006, Paraguassú & Luque 2007, Luque & Tavares 2007). Only *G. hoplius* had been reported from the nasal cavities of *H. malabaricus*. In the present study, we recorded another copepod species infecting the nasal cavities of erythrinid fishes for the first time. Also, results from qualitative and quantitative analysis from two congeneric host species, *H. malabaricus* (native species) and *H. lacerdae* (introduced species), were included herein.

During October 2006, 32 specimens of *H. malabaricus* and 14 individuals of *H. lacerdae* were captured from the Machado River, located at the State of Minas Gerais, Brazil (21º26'S and 45º50'W), using fishing gillnets of different mesh sizes, set out for two consecutive days. Fishes were collected every 12 hours. The study area belongs to the Upper Paraná River basin and is a portion of the Machado River into Furnas Hydroelectric Reservoir. This reservoir was built in the 1960s by damming of Grande and Sapucaí Rivers. The Machado River, an affluent of the Sapucaí River, discharges into the reservoir suffering the consequences of flooding caused by the impoundment. All fishes were measured in total length and total weight and sex were also determined. The nasal cavities of each specimen were washed with water. The copepods were collected, fixed and preserved into alcohol 70ºGL, and latter clarified in lactic acid. Identification was performed following Thatcher (2006) and Thatcher & Boeger (1984). The prevalence, mean intensity and mean abundance were calculated according to Bush *et al.* (1997). The comparison of prevalence value obtained for *H. malabaricus* and *H. lacerdae* was carried out by the log-likelihood *G*-test with the use of a 2x2 contingency table (Zar 1996). In addition, the abundance values of the congeneric fish species were compared by Student *t*-test on $\log_{10}(x+1)$ previously transformed data (Zar 1996). In all comparisons, data differences were considered significant when $P<0.05$. The specimens of *H. malabaricus* analyzed measured 34.1 ± 2.2 (29.8–37.9) cm of average total length and 523.5 ± 83.1 (386.0–725.0) g of average total weight, including 16 males and 16 females. Individuals of *H. lacerdae* measured 40.1 ± 6.2 (32.6–52.5) cm of average total length and had 792.9 ± 406.2 (370.0–725.0) g of average total weight, being 8 males and 6 females.

The nasal cavities of both fish species were parasitized by specimens of *Gamispatulus schizodontis* Thatcher & Boeger 1984. All copepods found were recognized as adult females. A total of 78 individuals of *G. schizodontis* were accounted, eight for *H. malabaricus* and 70 for *H. lacerdae*. The quantitative descriptors of parasite populations determined are presented in Table I. The comparison of the values of prevalence between the two fish species revealed significant differences ($G=20.312$; $P=0.0001$) between these host species. Likewise, the values of abundance has been different for the native and non-native species as seen by the Student *t*-test ($t=4.650$; $P=0.0001$).

Table I. Quantitative descriptors of *Gamispatulus schizodontis* from the nasal cavities of two erythrinid fish species from Furnas Hydroelectric Reservoir, Brazil (n = sample size; SD = standard deviation)

Host	n	Prevalence (%)	Intensity range	Mean intensity ± SD	Mean abundance ± SD
Hoplias malabaricus	32	12.5	1–5	2.0 ± 2.0	0.3 ± 0.9
Hoplias lacerdae	14	85.7	1–24	5.8 ± 7.0	5.0 ± 6.7

The copepod *G. schizodontis* remains as the only species of the genus and was originally described from *Schizodon fasciatus* Spix & Agassiz 1829, collected at Amazon River basin. Later, it has been found infecting other species of fishes from the family Anostomidae, as *Leporinus elongatus* Valenciennes 1850, *Leporinus obtusidens* (Valenciennes 1837), *Leporinus lacustris* Amaral Campos 1945 and *Leporinus friderici* (Bloch 1794) from the Upper Paraná River floodplain, at the State of Paraná (Luque & Tavares 2007). Lacerda *et al.* (2007) studied the parasitic copepods of the nasal fossae of fishes, also from the Upper Paraná River floodplain and observed the presence of *G. schizodontis* in two Characidae species, *Serrasalmus marginatus* Valenciennes 1837 and *Serrasalmus maculatus* Kner 1858, and also in another Anostomidae species, *S. borelli* (Boulenger 1900).

Anostomidae can be considered as the principal host family for *G. schizodontis*. However, the records of this copepod infecting Characidae and from now, also Erythrinidae fishes, suggest *G. schizodontis* as a generalist species. According to Poulin (2007), parasites with low host specificity are those capable of broad taxonomic jumps during their evolutionary history, regularly switching from one host species to a distantly related one. Poulin (2005) has found that the efficiency of host exploitation is

not necessarily reduced, even when host switches occurs across large taxonomic distances. Two explanations can be assigned to the higher levels of infestation of *G. schizodontis* and increased susceptibility to *H. lacerdae*, when compared to *H. malabaricus* from Furnas Hydroelectric Reservoir.

First, these congeneric species have different preferences regarding the choice of a habitat within the aquatic system. While *H. malabaricus* is sedentary, living in lentic waters, supporting oscillations of pH and low levels of oxygen, *H. lacerdae* prefers lotic waters and more stable environmental conditions, being more sensitive to aquatic hypoxia (Godoy 1975). According to Thatcher (1998), the highest population densities of free-living copepods of zooplankton at floodplains occur due to an increase on the availability of oxygen dissolved into the water during the dry season. At this time, *H. lacerdae* probably spends more time near to the water surface in the Furnas Hydroelectric Reservoir, where the availability of dissolved oxygen and of the infective copepodits of *G. schizodontis* is higher.

Second, the two erythrinid fishes studied have different residence time into the Furnas Hydroelectric Reservoir. While *H. malabaricus* is a native species, *H. lacerdae* is an allochthonous species that was recently introduced in that area (Santos & Formagio 2007). According to Rauque *et al.* (2003), on shorter time-scales, parasites can even switch to distantly related, recently introduced fish species and achieve higher infection levels in these new hosts. These authors observed that in the freshwater fish community of Lake Moreno in Argentina, the low host specificity of the acanthocephalan *Acanthocephalus tumescens* (von Linstow 1896) and its capacity for post-cyclic transmission, added to the introduction of exotic salmonids, allowed for the enlargement of the host range. Marcogliese *et al.* (2009) conducted a survey regarding the parasites of an exotic cyprinid species that was introduced illegally from Europe to Canada and then escaped into the Richelieu River due to aquaculture operations. These authors found the generalist copepod *Ergasilus megaceros* Wilson 1916 as the most abundant species on the fish host, and pointed it as an acquired native parasite since the introduction of the cyprinid into the Richelieu River. Generally, introduced fish species tend to lose specialist parasites most easily, and readily acquire generalist parasites from native fauna (Kennedy & Bush 1994).

This work had extended the occurrence of *G. schizodontis* to a new locality and enlarged the host range for this parasitic copepod, recording its occurrence by the first time in the nasal cavities of *H. lacerdae* and *H. malabaricus*.

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