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NOTA CIENTÍFICA/ RESEARCH NOTE

FIRST REPORT OF *ENTEROGYRUS CICHLIDARUM* PAPERNA 1963 (MONOGENOIDEA: ANCYROCEPHALIDAE) ON NILE TILAPIA *OREOCHROMIS NILOTICUS* CULTURED IN BRAZIL

PRIMER CASO DE *ENTEROGYRUS CICHLIDARUM* PAPERNA 1963 (MONOGENOIDEA: ANCYROCEPHALIDAE) EN TILAPIA DEL NILO *OREOCHROMIS NILOTICUS* DE CAUTIVERIO EN BRASIL

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Abstract

This study reports the presence of *Enterogyrus cichlidarum* Paperna, 1963 (Monogenoidea: Ancyrocephalidae) in the stomach of Nile tilapia, *Oreochromis niloticus* Linnaeus, 1758, cultured in the State of Santa Catarina, Southern Brazil. A total of 98 fish originating from a fish pond culture in Joinville, South Brazil, were examined. The fish were collected in the winter of 2007, in the summer, autumn, winter and spring of 2008. After anesthetized and sacrificed in a benzocaine solution, their stomachs were removed, bathed in 55°C water, fixed in 5% formalin for quantification and attainment of the prevalence rate, mean intensity, mean abundance and mounted in Hoyer's. Prevalence rate throughout the period was 94%. The greatest mean intensities occurred in August 2008 and November 2008, followed by July 2007, January and May 2008. The great majority of Monogenoidea are branchial and cutaneous ectoparasites, however reports of its invasion in the internal organs are rare. This study is the first report of *Enterogyrus* in Nile tilapia cultured in Brazil.

Keywords: Brazil - *Enterogyrus cichlidarum* - stomach - Nile tilapia.

Resumen

El presente estudio reporta la presencia de *Enterogyrus cichlidarum* Paperna, 1963 (Monogenoidea: Ancyrocephalidae) en el estomago de tilapia del Nilo, *Oreochromis niloticus* Linnaeus, 1758, de cautiverio en el Estado de Santa Catarina, Sur de Brasil. Un total de 98 peces de cautiverio en Joinville, Santa Catarina fueron examinados. Los peces fueron colectados en invierno del 2007, en primavera, otoño, invierno y primavera del 2008. Después de la anestesia y muerte en benzocaina, sus estómagos fueron removidos, bañados en agua caliente a 55°C, fijados en formalina 5% para el conteo y evaluación de las tasas de prevalencia, intensidad de infección, abundancia media y montaje en Hoyer. La tasa total de prevalencia por todo el periodo fue 94%. Las más altas intensidades de infección ocurrieron en agosto 2008 y noviembre 2008 seguidas de julio 2007, enero y mayo 2008. La mayor parte de Monogenoidea habitan las branquias y cuerpo de los peces, pero pocos son los encontrados en otros órganos. Este estudio es el primer caso de *Enterogyrus* en tilapia del Nilo en Brasil.

Palabras clave: Brasil - *Enterogyrus cichlidarum* - estómago - tilapia del Nilo.

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INTRODUCTION

Monogenoidea are commonly found on the surface and gills of freshwater and marine fish (Thatcher, 2006; Bakke *et al*., 2002). Differently, some species can be found in the stomach and viscera of cichlid fish (Noga & Flowers, 1995).

There are eleven species of *Enterogyrus*: *Enterogyrus cichlidarum* Paperna, 1963 was first identified in "redbelley tilapia" *Tilapia zilli* Gervais, 1848, and "Nile tilapia" *Oreochromis niloticus* Linnaeus, 1758 by Paperna (1963); *E. globodiscus* and *E. papernai* in "banded etropuls" *Etroplus suratensis* Bloch, 1790 (Gussev & Fernando, 1973); *E. melensis* in "banded jewelfish" *Hemichromis fasciatus* Peters, 1857 (Bilong Bilong *et al.,* 1989); *E. malmbergi* in Nile tilapia; *E. barombiensis* in "pungu" *Pungu maclareni* Trewavas, 1962, "pindu" *Stomatepia pindu* Trewavas, 1972 and "konye" *Konia eisentrauti* Trewavas, 1962 (Bilong-Bilong *et al*., 1991); *E. foratus* and *E. coronatus* in "guinean tilapia" *Tilapia guineensis* Gunther, 1862 (Parisele *et al*., 1991); *E. crassus* in *Tilapia nyongana* Thys van den Audenaerde, 1971; *E. amieti* in "chinese tilapia" *Sarotherodon galilaeus sanagaensis* Thys van den Audenaerde, 1966 (Bilong-Bilong *et al*., 1996), *E. hemihaplochromi* in "egyptian mouthbrooder" *Hemihaplochromis multicolor* Schller, 1903 (Cone *et al*., 1987).

This genus is well adapted to live in the stomach and to withstand the digestive enzymes (Cone *et al*., 1987). These authors argued that the body thickness of the parasites might be responsible for their survival in the stomach. Occasionally, the worms may cause chronic mortality in *Tilapia mossambica* Peters, 1852 fry as observed by Noga & Flowers (1995). In this case, the fish showed skin darkness, loss of appetite, muscular softening, invasion of the submucosa of the intestinal tract and inflammatory reaction in the visceral cavity (Noga & Flowers, 1995). This study describes the presence of *E. cichlidarum* in the stomach of Nile tilapia cultured in Brazil for the first time.

MATERIAL AND METHODS

Ninety eight fish from two ponds and two different brood stocks in a fish farm located in the City of Joinville, Santa Catarina, South Brazil (26°18'16''S, 48°50'44''W) were examined, in winter 2007 (n=20), summer 2008 (n=20), fall 2008 (n=20), winter 2008 (n=20) and spring 2008 (n=18). The water quality was measured on the sample days. Dissolved oxygen varied from 5.9 to 8.9 $mg \cdot L^{-1}$, transparency from 38 to 77 cm, pH from 6.0 to 7.7, ammonia from 0.1 to 0.5 $mg\ L^{-1}$ and water temperature from 18.0 to 25.1 °C.

After anesthetized and sacrificed and maintained in a benzocaine solution ($50\ mg \cdot L^{-1}$) (approved by Ethic Comittee n° 23080055748/2006-04/UFSC/CEUA), their stomachs were removed, bathed in warm water at 55°C, fixed in a 5% formalin solution for parasite counting. Prevalence rate, mean intensity and mean abundance were calculated (Bush *et al.*, 1997) and the specimens mounted using the Hoyer's method for identification through the esclerotised parts of the parasites (Fig. 1) (Kritsky *et al*., 1995).

The data were submitted to variance analysis and when significant they were submitted for Tukey test to mean comparison at a significant level of 5% (Zar, 1999).

RESULTS

The water quality was maintained at the normal values for freshwater fish culture (Boyd & Tucker, 1992) during samples. As shown in Table 1, the highest dissolved oxygen level observed in 2008 was possibly related to the low water temperature. In summer of 2008 the smallest fish ($P<0.05$) in relation to the other months.

The worms were identified as *E. cichlidarum* based on the descriptions of Paperna (1963) and Gussev & Fernando (1973) and Bilong-Bilong

et al. (1989). The total prevalence rate was 94% during the whole period. The highest mean intensity was observed in winter of 2008 (17.4 parasites) and spring of 2008 (17.3) with mean abundance 16.5 and 17.3, respectively (Table 1).

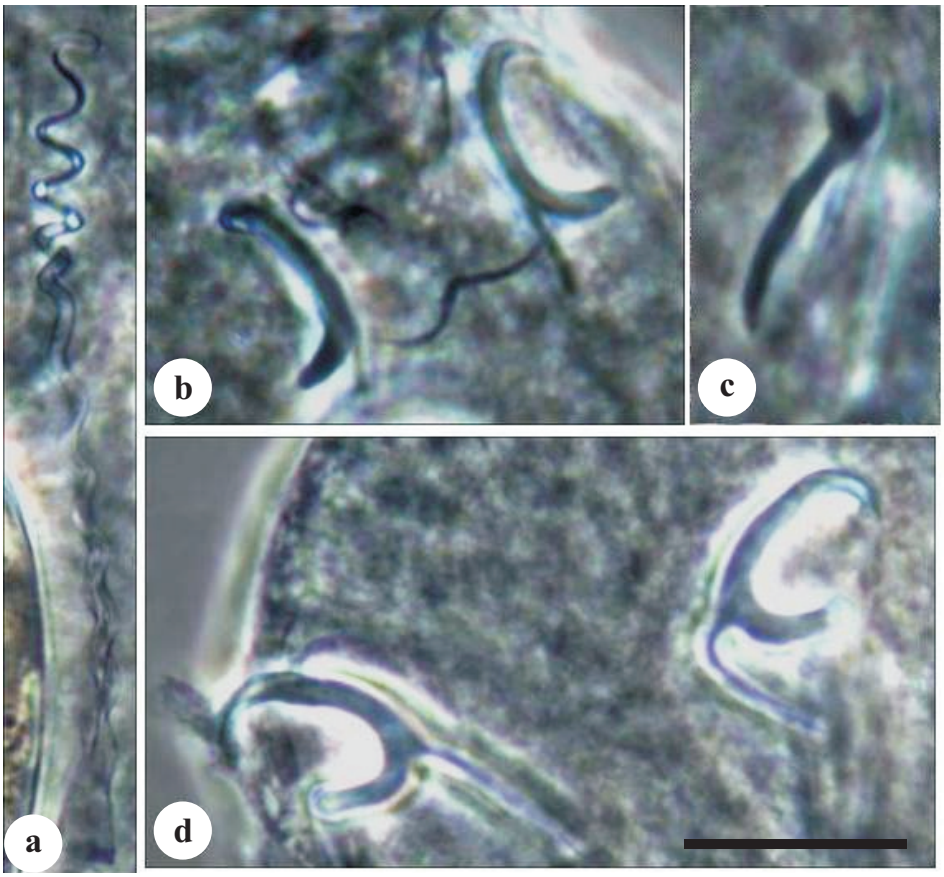

Figure 1. Sclerotized structures of *Enterogyrus cichlidarum* from Nile tilapia reared in Brazil. A-copulatory organ, b-ventral hamuli, c-ventral hooklet, d-dorsal hamuli. Bar = 10 µm

Table 1. Mean values and standard deviation of fish weight and length, and parasitological data of Nile tilapia cultured in South Brazil. Different letters indicate significant difference amongst seasons (P<0.05).

Parameters	Winter 2007	Summer 2008	Fall 2008	Winter 2008	Spring 2008
Weight (g)	230.7±46.2 b	118.0±50.4 c	174.0±30.3 b	239.9±86.7 b	302.7±34.54 a
Length (cm)	20.8±1.5 b	17.5±2.2 c	20.1±1.4 b	21.9±2.3 b	25.8±0.9 a
Parasitized fish/ Examined fish	19/20	19/20	17/20	19/20	18/18
Prevalence (%)	95	95	85	95	100
Mean intensity	4.1±1.8 b	2.3±1.4 b	1.5±0.8 b	17.4±9.4 a	17.3±14.0 a
Range	1 a 7	1 a 5	1 a 3	5 a 44	3 a 61
Mean abundance	3.9±2.0 b	2.1±1.4 b	1.2±0.8 b	16.5±10.0 a	17.3±14.0 a

DISCUSSION

These results are in agreement with Khidr (1990) wich studying the populational dynamic of *E. cichlidarum* in, *O. niloticus* and *T. zilli* from Nile River, Egypt, observed the highest prevalence and mean intensity of parasites in the winter.

The mean intensity of infection observed in this research was similar to that of Noga & Flowers (1995) in severe infection by the same parasite. An important consideration is that fish examined by those authors were smaller than that were utilized in this work. They argued that the infection was age dependent, in which younger fish were more affected. With this point of view, the smallest fish examined in summer 2008 possibly showed neither clinical signs ofarasitosis nor mortality due to low number of parasites that corroborate the observations of Noga & Flowers (1995).

The mean abundance observed in this work was higher than that related by Jiménez-Garcia *et al.* (2001) which described new species of Monogenoidea in native cichlid fish from México. In this case, the authors observed the presence of *E. malmbergi* Bilong-Bilong, 1988 in *O. niloticus* and *Cichlasoma callolepis* Regan, 1904, with an abundance of 0.15 and 1, respectively. Jiménez-Garcia *et al.* (2001) have also argued that the parasite may have been introduced with tilapia from the African continent. As a result of the lack of studies on parasitological analysis in the stomachs of tilapia, the parasite had not yet been detected in Brazil until this moment.

The relation among host/parasite/environment is easily broken into conditions of poor water quality, inadequate feeding, high stocking density and stress of handling, as supported by Moraes & Martins (2004) and Martins *et al*. (2004). Contrary to that observed by Noga & Flowers (1995), in this study, no clinical signs were noticed, especially on fish collected in winter 2008 that had the highest number of parasites. The studies of Cone *et al.* (1987) showed that the dorsal hamulus of *E. cichlidarum* remained firmly attached into host tissue. In heavy infection the attachment of enterogyrids can cause an inflammatory reaction and loss of intestinal epithelium (Noga & Flowers, 1995).

It must be emphasized that the presence of enterogyrids in the Brazilian cultured tilapia might be common. The fish farmers must be encouraged to utilize fish health diagnostics and to follow an adequate sanitary plan. Consequently, the fish farmers must to know what parasite level their fish present. Moreover, the parasitological exam of fry is important to avoid mortalities caused by a heavy fish infection. However, studies on histopathology are also necessary to verify eventual changes and the degree of injury of enterogyrids on the stomach epithelium.

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