

SHORT COMMUNICATION

First record of *Neoechinorhynchus buttnerae* (Eoacantocephala, Neochinorhynchidae) on *Colossoma macropomum* (Characidae) in a fish farm in Roraima, Brazil

Jeffson Nobre PEREIRA, Germán Augusto Murrieta MOREY*

Instituto Nacional de Pesquisas da Amazônia - INPA, Programa de Pós-graduação em Biologia de Água Doce e Pesca Interior - BADPI, Av. André Araújo 2936, Petrópolis, CEP 69067-375 Manaus, Amazonas, Brazil

* Corresponding author: germantiss@hotmail.com; germantiss1106@gmail.com

ABSTRACT

Severe infections by the acanthocephalan *Neoechinorhynchus buttnerae* were reported in *Colossoma macropomum* in fish farms in northern Brazil. The occurrence of the parasite is recorded for the first time in the state of Roraima, Brazil, along with its parasite indexes. Fifty *C. macropomum* from a fish farm were analyzed. We collected a total of 13474 individual parasites. *Neoechinorhynchus buttnerae* had a prevalence of 100%, and mean intensity and mean abundance of 269.48. Significant positive correlations were observed between fish standard length, weight and relative condition factor and the number of parasites. Our results showed evident loss of body mass in the parasitized fish. Fish farmers in Roraima should be advised to manage the infection of *C. macropomum* by *N. buttnerae*, as massive infections of this parasite can deteriorate the health of the fish.

KEYWORDS: Acanthocephala, intestine, parasites, parasitic indexes, tambaqui

Primeiro registro de *Neoechinorhynchus buttnerae* (Eoacantocephala, Neochinorhynchidae) em *Colossoma macropomum* (Characidae) em uma fazenda de peixes em Roraima, Brasil

RESUMO

Infecções severas pelo acantocéfalo *Neoechinorhynchus buttnerae* foram relatados em *Colossoma macropomum* em fazendas no norte do Brasil. O objetivo do presente estudo foi avaliar o primeiro registro de ocorrência deste parasita no estado de Roraima, Brasil, relatando seus índices parasitários. Cinquenta *C. macropomum* de uma fazenda foram analisados. Coletamos um total de 13474 parasitas. *Neoechinorhynchus buttnerae* mostrou uma prevalência de 100%, com uma intensidade média e abundância média de 269,48. O comprimento padrão, peso e fator de condição relativo dos peixes foram correlacionados positiva e significativamente com o número de parasitas. Nossos resultados mostraram perda evidente de massa corporal nos peixes. Nosso registro da presença de *N. buttnerae* infectando *C. macropomum* no estado de Roraima é um alerta aos piscicultores, pois infecções massivas podem deteriorar a saúde dos peixes.

PALAVRAS-CHAVE: Acanthocephala, índices parasitários, intestino, parasitas, tambaqui

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The tambaqui, *Colossoma macropomum* (Cuvier, 1818) is the principal native Amazonian fish species reared in Brazil (IBGE 2014), and has great acceptance by consumers, and high commercial value (Melo *et al.* 2001). Its success in aquaculture is due to characteristics such as rapid growth, omnivorous feeding behavior, and its capacity to support a great variation in physical and chemical characteristics of the water (Melo *et al.* 2001; Gomes *et al.* 2010).

Colossoma macropomum is mainly produced in the Amazon region in semi-intensive and intensive systems (Izet *et al.* 2013). In the north of Brazil, some cases of acanthocephalan dissemination have been reported (Noga 2010). Recently, severe infections by the acanthocephalan *Neoechinorhynchus buttnerae* (Golvan, 1956) have been described in Rondônia, causing economic losses in fish farms (Chagas *et al.* 2015; Oliveira *et al.* 2015).

Fish growth can be affected by *N. buttnerae* infection, since this parasite uses its proboscis to attach to the intestine tissue, causing health and pathological alterations (Melo *et al.* 2014). Due to the importance of *N. buttnerae* in fish farming, the present study reports its occurrence in a fish farm in Roraima, in order to observe pathological alterations and calculate the parasite indexes in heavily infected *C. macropomum*.

Fifty *C. macropomum* individuals with mean 23.6 ± 4.9 cm standard length and mean 360 ± 59.8 g weight were collected from a dam in a fish farm located in the state of Roraima, Brazil, ($02^{\circ}58'48''\text{N} / 61^{\circ}17'31''\text{W}$) in June 2017. Fish were collected with the help of local farm hands. The collected fish were irreversibly anesthetized with Eugenol diluted in water (80 mg L^{-1}) and killed by cerebral concussion. The fishes were then measured and weighed, and the intestinal tract was removed and opened lengthwise to quantify the parasites. The acanthocephalans were removed from the intestine and fixed in AFA (alcohol – formaldehyde and acetic acid) solution under cover slip pressure. Specimens were stained with Langeron's alcoholic carmine, cleared in Eugenol and mounted in Canada balsam as permanent slides (Amato *et al.* 1991). Voucher specimens were deposited in the non-insecta invertebrate collection of the Instituto Nacional de Pesquisas da Amazônia (INPA).

The following ecological parameters of the parasitological infection were determined according to Bush *et al.* (1997): prevalence (number of infected fish / total number of fish examined $\times 100$), intensity (the number of individuals of a particular parasite species in a single infected host, expressed as a numerical range), mean intensity (total number of parasites / number of infected hosts), mean abundance (total number of parasites / number of infected and non-infected hosts). According to Le Cren (1951), the condition factor is a quantitative indicator of fish fitness, reflecting recent feeding condition. The relative condition factor of fish, being a measure or a quantitative indicator of welfare, can serve as a tool to study the relationship between health and natural parasitism (Lizama 2003).

The relative condition factor was calculated using the values of standard length (L) and total weight (Wt) of each host adjusted to the relationship curve Wt/Ls ($Wt = a.Ltb$) and was used to estimate values of the regression coefficients "a" and "b". The "a" and "b" values were used to estimate the expected values for weight (We) using the equation: $We = a.Ltb$. The relative condition factor (Kn) corresponds to the ratio between observed weight and expected weight for a given length ($Kn = Wt/We$) (Le Cren 1951). The Shapiro–Wilk W statistic was used to test for normality of distributions. Spearman's correlation test was used to evaluate the correlation between the total number of parasites and the fish standard length, weight and relative condition factor of the hosts.

Neoechinorhynchus buttnerae (Figure 1) was present in all sampled fish (prevalence of 100%), with a total number of 13474 individuals, and intensity varying from 188 to 388 parasites per fish. The mean intensity and mean abundance were 269.5. The parasites were present along the entire intestine. The infected fish were thin and with evident loss of body mass (Figure 2). The relative condition factor (Kn) of the fish was 0.99 ± 0.10 . There were significant positive correlations between the number of *N. buttnerae* and the standard length, weight and relative condition factor of the hosts ($r = 0.4915$, $p = 0.0003$; $r = 0.6171$, $p = 0.0001$; $r = 0.4493$, $p = 0.0011$, respectively).

The first occurrence in the world of *N. buttnerae* was described by Golvan (1956) from infected *C. macropomum* captured near Manaus, in the state of Amazonas, Brazil (Thatcher 1991). Subsequent records were from C.



Figure 1. *Neoechinorhynchus buttnerae* (Golvan, 1956) collected from *Colossoma macropomum* (Cuvier, 1818) from a fish farm in the state of Roraima, Brazil. Scale bar = 40 mm.



Figure 2. *Colossoma macropomum* (Cuvier, 1818) infected by *Neoechinorhynchus buttnerae* (Golvan, 1956) showing signs of loss of body mass. Bar scale = 50 mm.

macropomum captured near Leticia, Colombia (Schmidt and Huggins 1973), in Tefé and Coari, in the central Brazilian Amazon, and in Santarém, in the state of Pará (Fischer 1998). The first occurrence of this parasite in a fish farm was from *C. macropomum* in Manaus (Malta *et al.* (2001). Recently, high infestation rates have also been reported in the state of Rondônia and other localities in Amazonas (Jerônimo *et al.* 2016), and in different fish farms in Manaus (Silva-Gomes *et al.* 2017). In this study we registered the first occurrence of *N. buttnerae* in the state of Roraima, Brazil. In this way, the geographical distribution of this parasite is expanded to a new state in northern Brazil.

The parasitism by *N. buttnerae* caused great impact on the growth of the fish and had a large impact on the production (Silva-Gomes *et al.* 2017). The fish can survive the infection, but their development is hampered, because the parasite competes with the host for the nutrients consumed by the fish, affecting its development (Silva-Gomes *et al.* 2017). The high parasitic indexes registered and the evident signs of malnutrition in all *C. macropomum* analyzed in this study reinforce this hypothesis.

The increase of parasites in an infracommunity occurs by simple accumulation, as a result of the increase of the size of the fish. In this way, larger fish are expected to have a greater number of parasites, due to the greater availability of space (Dogiel 1970). In the present study larger *C. macropomum* were more parasitized by *N. buttnerae*, accumulating more specimens than small ones.

According to Bauer (1970), the pathogenic activity of parasites necessarily affects host condition in a negative way, but largest individuals with the highest Kn tolerate higher levels of parasitism (Cone 1995). In this study the Kn of the infected fish was considered normal, and the positive correlation between the weight and Kn of infected *C. macropomum* and the number of *N. buttnerae* can be explained by the high number of parasites in the intestines, which may influence the weight of the fish, overestimating the real weight values. This phenomenon needs to be further investigated in studies comparing the Kn of infected and non-infected fish.

Considering the presence of *N. buttnerae* in the state of Roraima, and the intensity of the infection recorded in *C. macropomum*, it is recommended that tambaqui fish farmers in the state carefully monitor their breeding stocks and take prophylactic measures to avoid massive infections by this parasite that can deteriorate the health of the fish, and cause considerable economic losses.

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