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Prosthenhystera obesa (Digenea), parasite of *Salminus maxillosus* (Characidae) of the floodplain of the upper Paraná River, Paraná Brazil: influence of the size and sex of host

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ABSTRACT. A hundred and twenty-six specimens of *Salminus maxillosus* Valenciennes, 1849, were analyzed. Fishes were collected in the floodplain of the upper Paraná river in lotic environments, represented by the Paraná and the Ivinheima rivers and by the Cortado channel, and a semi-lotic one represented by the Baía river. Capture of hosts was undertaken by gill nets of various mesh sizes. Prior to light microscopy, the specimens were fixed in AFA (alcohol, formalin, acetic acid) under slight coverslip pressure, stained in Mayer's acid carmalum, dehydrated in an alcohol series, cleared in creosote and mounted in Canada balsam. Prevalence of *Prosthenhystera obesa* Diesing, 1850 was 14.3% and mean intensity of infection 1.75 (range: 1-3). Prevalence of *P. obesa* is not correlated with standard length of host, a fact that may indicate homogeneity in behavior of *S. maxillosus* during part of its development. Infection intensity is directly related with increase in size of host. There was no influence of sex of host on prevalence and infection intensity of *P. obesa*. This fact may suggest similarity in behavior with regard to feeding habit and habitat of males and females. All parasitized hosts were captured in lotic environments.

Key words: digenea, *Prosthenhystera obesa, Salminus maxillosus*, influence of size, influence of sex, Paraná river.

RESUMO. *Prosthenhystera obesa* (Digenea), parasita de *Salminus maxillosus* (Characidae) da planície de inundação alto rio Paraná, Brasil: influência do tamanho e do sexo do hospedeiro. Foram analisados 126 espécimes de *Salminus maxillosus* Valenciennes, 1849, coletados na planície de inundação do alto rio Paraná em ambiente lótico, representado pelos rios Paraná, Ivinheima e canal Cortado e semi-lótico, representado pelo rio Baía. Para a captura dos hospedeiros utilizaram-se redes de espera de malhagens variadas. Os parasitas foram comprimidos e fixados em AFA (álcool, formalina, ácido acético), corados em carmalúmen de Mayer, desidratados em sequência alcoólica, clarificados em creosoto e montados em bálsamo do Canadá. *Prosthenhystera obesa* Diesing, 1850 apresentou prevalência de 14,3% e intensidade média de infecção de 1,75 (amplitude: 1-3). A prevalência de *P. obesa* não apresentou correlação com o comprimento-padrão do hospedeiro, o que poderia indicar homogeneidade no comportamento de *S. maxillosus* durante parte de seu desenvolvimento. A intensidade de infecção está diretamente relacionada com o aumento no tamanho do hospedeiro. O sexo dos hospedeiros não influenciou o prevalência e a intensidade de infecção de *P. obesa,* sugerindo uma semelhança no comportamento em relação ao hábito alimentar e habitat de machos e fêmeas. Todos os hospedeiros parasitados foram capturados em ambiente lótico.

Palavras-chave: Digenea, *Prosthenhystera obesa*, *Salminus maxillosus*, influência do tamanho, influência do sexo, rio Paraná.

Salminus maxillosus Valenciennes, 1849, popularly known as "dorado", is a fish of the Order Characiformes and reaches it largest size in the Paraná river basin. Its area of distribution comprises the Paraná, Paraguay, Uruguay and Amazon rivers (Fuem/Nupélia/Finep, 1989).

The "dorado" has carnivorous feeding habits, preferably piscivorous (Hahn *et al.,* 1997). Stomach

analysis indicates that its diet is composed of 45 feeding items such as fish, insects, fragments of birds and mammals and vegetation (Fuem/Nupélia/Finep, 1989).

Besides being found in the biliary vesicle of *Salminus maxillosus, Prosthenhystera obesa* Diesing, 1850, is also found in many fish species such as *S. brevidens, Leporinus friderici, Leporinus sp, Pseudopimelodus zungaro, P. roosevelti, Pimelodus fuer and Astyanax bimaculatus* (Travassos *et al.* 1969). The pathology of the parasite was studied only by Pavanelli *et al.* (1992) who dealt with possible changes in the histological structure of the organ parasitized by this species.

The aim of this paper is the analysis of the influence of host size and sex on prevalence and intensity of parasitism of *P. obesa*.

Material and methods

Capture of fishes was carried out in the floodplain of the upper Paraná river (22º 43'S and 53º 10W) (Fig. 1) in two different environments: a lotic environment characterized by swift water and represented by the Paraná and Ivinheima rivers and by the Cortado channel and a semi-lotic, intermediary between lotic and lentic (Thomaz *et al*., 1991), represented by the Baía river on the right margin of the Paraná river in the state of Mato Grosso do Sul.

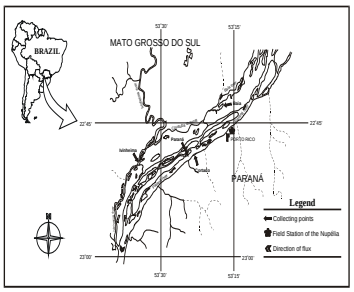

Figure 1. Sites of the collecting points

A hundred and twenty-six specimens of *Salminus maxillosus* were collected between March 1992 and February 1995. Capture of fish was undertaken with gill nets of various mesh sizes. Total weight, total and standard length and sex of each specimen were registered.

Prior to light microscopy, the specimens were fixed in AFA (alcohol, formalin, acetic acid) under slight coverslip pressure, stained in Mayer's acid carmalum, dehydrated in an alcohol series, cleared in creosote and mounted in Canada balsam.

Data analysis was undertaken by the following statistical tests: Student's "t" test to verify whether standard length of male and female hosts were similar; Mann-Whitney's "U" test to verify whether there is any influence of host's sex on the infection intensity of parasite (Siegel, 1975); log-likelihood "G" test with contingency table 2x2 to verify possible effects of host's sex in infection prevalence of parasite (Zar, 1984); the correlation coefficient "r" was used as an indication of the relationship between the total length of hosts and the prevalence of parasites, with previous transformation of the prevalence data (arcsine $\sqrt{x}$) (Zar, 1984); Spearman's ranks correlation coefficient "rs" to determine possible correlation between length of host and infection intensity of parasite.

Only 119 specimens were used to analyze the difference at the level of parasitism between male and female hosts. Sex of the remaining specimens could not be determined.

Prevalence and intensity concepts were suggested by Margolis *et al.* (1982), and revised by Bush *et al.* (1997). Statistical significant level used is $P < 0.05$.

Helminth was deposited in the Helminthological Collection of the Instituto Oswaldo Cruz (CHIOC) in Rio de Janeiro, Brazil (CHIOC no. 34237).

Results

Prevalence of 14.3 % and mean intensity of 1.75 (range 1-3) were calculated for *Prosthenhystera obesa*. Student's "t" test showed that there was no significant difference between standard length of males and females ($t = 99.35$; $P<0.05$). Sex of host was not taken into account for analysis of possible correlation between standard length and levels of parasitism.

Correlation coefficient "r" demonstrated that prevalence of *P. obesa* had no relationship with standard length of host ($r = 0.51$; $0.2>P>0.10$). Correlation coefficient "rs" for Spearman's rank indicated that increase in infection intensity is directly related to increase in size of host ($rs = 0.36$; $P<0.001$).

Out of the 119 fish specimens, 44 were male and 75 female, 9.1% of males and 16% of females were parasitized. Results of "G" log-likelihood and Mann-Whitney "U" tests respectively showed that the hosts' sex did not have any influence on prevalence and infection intensity of *P. obesa* ($G = 1.19$; $0.25<P<0.50$ and $Z = 1.03$; $0.02<P<0.50$) [Z = value of normal approximation of "U" test]. It

was verified that 100% of parasitized fish were captured in a lotic environment.

Discussion

Prosthenhystera obesa is a digenetic trematode, as adult, parasitizes the biliary vesicle of *Salminus maxilosus* and other fish species (Travassos *et al*. 1969). The parasite is relatively large when compared with the size of the organ it parasitizes. Probably it damages the host since it ingests bile, besides reducing the storing capacity of the biliary vesicle (Pavanelli *et al*. 1992).

Differences may exist in the feeding of the fish according to its age (Nikolski, 1963). Wooton (1990) states that differences may be explained by acquisition of a greater locomotion ability or by the usage of different habitats. As the fish gets bigger many changes occur in its behavior and biology. These facts may influence directly its feeding habits. Such changes may affect the parasite fauna, especially endoparasites acquired by ingestion of intermediary hosts. Since there is no difference in prevalence of infection of young and adult specimens in the present research, homogeneity in the behavior of *Salminus maxillosus* during a phase of its ontogenetic development is suggested.

Positive correlation between infection intensity and standard length of host indicates that an increase in length of fish implies an increase in infection levels. According to Dogiel (1970), length of host is considered an expression of its age. Larger specimens would have a longer time of contact with infected forms and thus an accumulation of parasites occurs.

Sex may influence and even determine levels of parasitism (Esch *et al*. 1988) since physiological factors such as hormonal differences, for instance, may influence parasite fauna (Paling, 1965; Janovy and Hardin, 1987). Fernandez (1985) mentions differences in behavioral and diet composition between males and females. Such facts may lead to differences in prevalence and infection intensities.

There was no influence of the hosts' sex on prevalence and infection intensity of *P. obesa*. This fact suggests homogeneity in behavior with regard to feeding habit and to the habitat of dorado males and females. It may also be related to a similarity in standard length of males and females. In this research it is the significant influence factor on parasitism in *S. maxillosus*.

The occurrence of parasites in hosts captured only in lotic environments is probably due to the fact that intermediate hosts of *P. obesa* are also preferentially present in this environment. Contact of host with infected forms is thus made easy and completes the parasite's life cycle.

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