

# Ecological aspects of *Diplectanum piscinarius* (Platyhelminthes, Monogenea) parasite of gills of *Plagioscion squamosissimus* (Osteichthyes, Sciaenidae) in the Upper Paraná River floodplain, Brazil

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**ABSTRACT.** Thirty-nine specimens of *Plagioscion squamosissimus* Heckel, 1840 were collected through nets of different mesh sizes in the Upper Paraná River floodplain. The occurrence of *Diplectanum piscinarius* Kritsky and Thatcher, 1984 was registered and it presented mean abundance of 31, mean intensity of 31.8 and prevalence of 97%. This paper also brings an ecological analysis of some aspects of the host-parasite relationship between *D. piscinarius* and *P. squamosissimus*. There were not significant differences between the prevalence and intensity of parasitism of males and females. There were not correlations between abundance and prevalence and the standard length of the hosts; and between relative condition factor (Kn) and abundance. From the results it is possible to assume that there are few physiological and behavioral differences between male and female hosts. Physiological changes probably do not occur during the development of the hosts and parasites do not seem to be very pathogenic.

**Key words:** *Plagioscion squamosissimus*, *Diplectanum piscinarius*, host-parasite relationship, Paraná River, Brazil.

**RESUMO.** Aspectos ecológicos de *Diplectanum piscinarius* (Platyhelminthes, Monogenea) parasita de brânquias de *Plagioscion squamosissimus* (Osteichthyes, Sciaenidae) da planície de inundação do Alto rio Paraná, Brasil. Trinta e nove espécimes de *Plagioscion squamosissimus* Heckel, 1840 foram coletados com redes de espera de diferentes malhagens na planície de inundação do Alto rio Paraná. Foi registrada a ocorrência de *Diplectanum piscinarius* Kritsky e Thatcher, 1984, que apresentou abundância média igual a 31, intensidade média 31,8 e prevalência 97%. Realizou-se uma análise ecológica de alguns aspectos da relação parasita-hospedeiro entre *D. piscinarius* e *P. squamosissimus*. Não houve diferenças significativas entre prevalência e intensidade de parasitismo em machos e fêmeas. Não houve correlações entre abundância e prevalência com o comprimento padrão dos hospedeiros e entre o fator de condição relativo com a abundância. Através dos resultados, é possível supor que, provavelmente, existem poucas diferenças fisiológicas e comportamentais entre hospedeiros machos e fêmeas, não ocorrem mudanças fisiológicas durante o desenvolvimento dos hospedeiros e o parasita exibe baixa patogenicidade.

**Palavras-chave:** *Plagioscion squamosissimus*, *Diplectanum piscinarius*, relação parasita-hospedeiro, rio Paraná, Brasil.

## Introduction

*Plagioscion squamosissimus* Heckel, 1840, popularly known as “curvina”, occurs in Venezuela, Peru and Brazil. It is characteristic of benthopelagic habitats and it occupies very diversified biotopes, the young mainly feeding with larvae of crustaceans and insects and the adults with fish (Froese *et al.*, 2004). In 1967 the curvina was introduced in Pardo River, State of São Paulo, and it was spread out through the Southeastern and Southern rivers and lakes becoming one of the species of interest for the commercial fishing in the Paraná River basin

(Agostinho *et al.*, 1999).

According to Kritsky and Thatcher (1984), the Diplectanidae are predominantly parasite of gills of Perciformes. The authors described four species of the *Diplectanum* genus parasitizing gills of *P. squamosissimus* in the Amazonian basin: *D. decorum*, *D. gymnopus*, *D. piscinarius* and *D. pescadae*.

The aim of this work is to develop an ecological analysis of some aspects of the host-parasite relationship between *D. piscinarius* and *P. squamosissimus*, considering that the size of the parasites population can be related to

the standard length of the host (Dogiel, 1961), that the parasitism level can be influenced by physiological and behavioral differences between males and females (Esch *et al.*, 1988), and that the amount of parasites can influence the health state of the fish, represented by relative condition factory (Kn).

### Material and methods

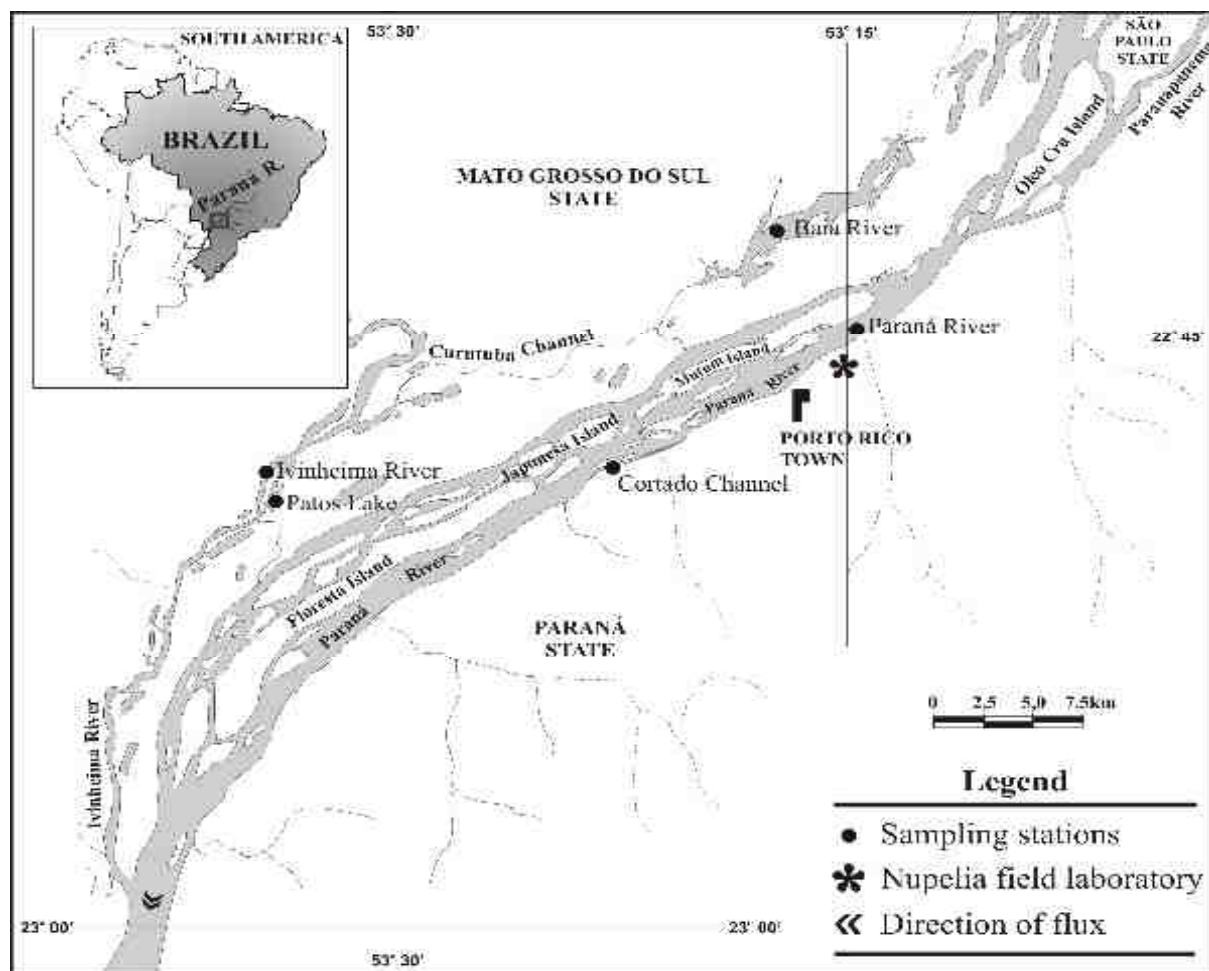
Thirty-nine specimens of *P. squamosissimus* were captured between April, 1992 and February, 1995 in the Upper Paraná River floodplain (22°50'- 22°70'S and 53°15'-53°40'W) (Figure 1). Total weight, standard length and sex were duly registered.

The gills were removed and conserved in formalin 5%. Later the parasites were removed from the gills with the aid of a stereomicroscopic and conserved in alcohol 70%.

Some monogeneans were stained with Gomori's trichome, dehydrated in absolute alcohol and cleared with faia creosote to observe the internal organs. Other specimens were mounted in Hoyer's medium for the

study of the sclerotized structures (Eiras *et al.*, 2000).

Statistical analyses were carried out, such as: Pearson's linear correlation "r", with previous angular transformation of the prevalence value ( $\arcsin \sqrt{x}$ ), to determine the correlation between the standard length of the host and the prevalence of infestation (Zar, 1996); Spearman's rank correlation "rs" to determine the possible correlations between the standard length of the host and the intensity of infestation and for verification of correlations of the parasites abundance with the relative condition factor of the hosts (Zar, 1996); Test "U" of Mann-Whitney to verify the influence of the sex of the host on the infestation intensity of each species of parasite (Siegel, 1975); Test "F" of Fisher using the contingency table 2x2, to determine the effect of the sex of the host on the prevalence of each species of parasite (Zar, 1996). The relative condition factor (Kn) is related to the quotient between the observed weight and the weight theoretically expected for a certain length (Le Cren, 1951).



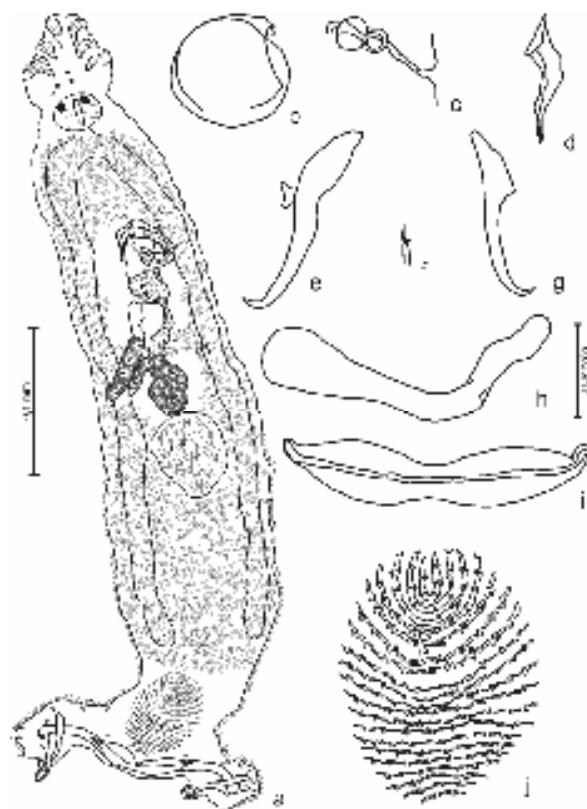
**Figure 1.** Upper Paraná River floodplain with the sampling stations of the hosts during the period between April, 1992 and February, 1995.

The values of the tests were considered significant when  $p \geq 0.05$ . The terms prevalence, mean intensity and abundance were used according to Bush et al. (1997).

Voucher specimens were deposited in the helminthological collection of the "Instituto Oswaldo Cruz" (CHIOC), Rio de Janeiro, Brazil (No. CHIOC 36625, 36626).

## Results

The monogenans were identified as *Diplectanum piscinarius* Kritsky and Thatcher, 1984 characterized by the presence of the body elongate, cephalic lobes poorly developed, peduncle broad, squamodiscs subovate, similar hooks, wide bar and scales in the posterior part of the body, being the last one a characteristic found in marine parasites of the Diplectanidae family (Figure 2). It presented mean abundance of 31, mean intensity 31.8 and prevalence of 97%.

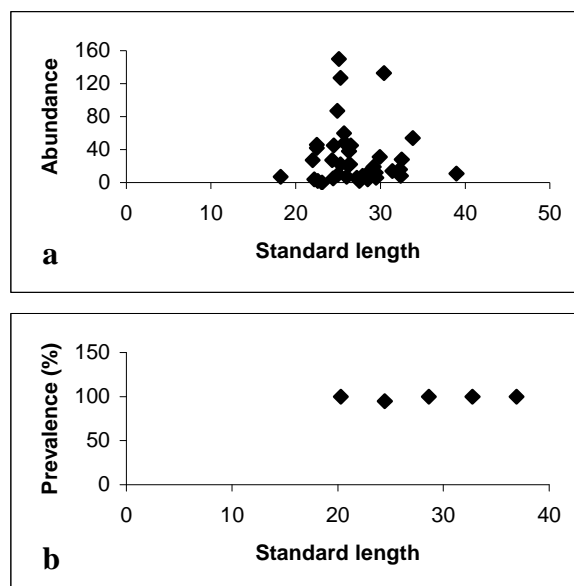


**Figure 2.** *Diplectanum piscinarius* Kritsky and Thatcher, 1984. a. Composite drawing of whole mount (ventral); b. Egg; c. Vagina; d. Copulatory complex; e. Ventral anchor; f. Hook; g. Dorsal anchor; h. Dorsal bar; i. Ventral bar; j. Ventral squamodisc.

The male hosts presented the following amplitudes standard length 22.2-29.9 cm and weight 224.3-512.2 g, while female hosts presented standard length 18.2-33.8 cm and weight 122.2-1307.2 g.

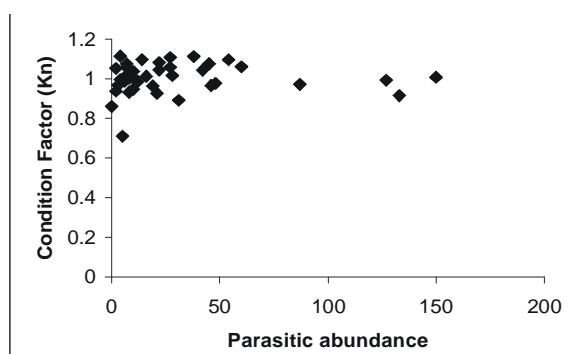
There was not correlation between abundance and

standard length of the hosts ( $r_s = 0.0018$ ;  $p = 0.9915$ ) (Figure 3a) and between the prevalence and the standard length of the hosts ( $r = 0.3536$ ;  $p = 0.5594$ ) (Figure 3b).



**Figure 3.** (a) Correlation between parasitic abundance of *D. piscinarius* and standard length of *P. squamosissimus*. (b) Correlation between the prevalence of *D. piscinarius* and standard length of collected *P. squamosissimus* in the Upper Paraná River floodplain.

Eighteen males and 21 females were examined, 94.4% of males and 100% of females were infested. There were not significant differences between the prevalence of males and females ( $F = 0.2713$ ;  $p = 0.4615$ ), between the intensity of parasitism of males and females ( $Z = -0.0140$ ;  $p > 0.50$ ) and between the relative condition factor (Kn) and abundance ( $r_s = -0.1008$ ;  $p = 0.5417$ ) (Figure 4).



**Figure 4.** Correlation between parasitic abundance of *D. piscinarius* and relative condition factor (Kn) of *P. squamosissimus* in the Upper Paraná River floodplain.

## Discussion

The only species of monogenean found parasitizing the gills of *P. squamosissimus* of the

Upper Paraná River floodplain in the sampling period was *D. piscinarius*.

The only study about host-parasite relationship between *D. piscinarius* and *P. squamosissimus* is related to the prevalence and seasonality of *D. piscinarius* in Volta Grande reservoir, State of Minas Gerais (Martins et al., 2000).

The non-existence of correlation between the number of parasites and the prevalence with the size of the host can be due to uniformity in the levels of parasitism for host length classes, as well as almost the totality of the host sample (99%) being adult specimens, as only one female with 18.2 cm was found. According to Suzuki et al. (2004) the length of first gonadal maturation  $L_{50}$  (length in which 50% of the population is able to reproduction) for males of the floodplain of the Upper Paraná River is 16.1 cm standard length and for females 19.8 cm. Similar results were observed in *Satono perca papaterra*. This can be explained by the occurrence of ontogenetic variation in the species (Lizama and Takemoto, 1998).

The parasitism levels are related to the standard length of the host (Dogiel, 1961), as well as to its age (Shotter, 1976). Therefore, it is expected that the increase in the age of the host increases the level of parasitism, due to the cumulative effect accomplished by the increase in the size of the host and/or by the increase in time of exposition to the parasites. For the present study this correlation was not observed, which is possible to be related to the fact of low amplitude of the standard lengths and the absence of individuals with less than 18 cm and above 39 cm. In the Upper Paraná River floodplain there is a maximum standard length register of 47.9 cm (Suzuki et al., 2004).

It is possible to observe that the intermediate length classes presented the higher abundance, while the extreme length classes showed lower abundance, explaining the absence of correlation between them.

According to Esch et al. (1988), behavioral and physiological differences between the sexes of the hosts can influence parasitism levels. For *P. squamosissimus* significant differences between prevalence and intensity of parasitism between males and females have not been observed. From this data it is possible to assume that there are few physiological and behavioral differences between males and females or that the levels of parasitism for this case are not affected by these differences.

Lizama (2003) found significant positive correlation between parasitic abundance of *Rhinonastes pseudocapsaloideum* and the relative condition factor (Kn) of *Prochilodus lineatus*. For *P.*

*squamosissimus* the same correlation was not observed, indicating that the amount of parasites (*D. piscinarius*) did not influence on the health state of the fish, represented by Kn.

According to the data it is possible to assume that the parasite shows low pathogenicity for the host, although in confined environments the values of abundance and intensity can increase and great infestations can lead the host to death, as the fish reacts to the attachment of the parasites with the production of mucus, that in great amounts compromise the breathing.

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