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Revista Brasileira de Parasitologia Veterinária, vol. 17, núm. 1, enero-marzo, 2008, pp. 28-32
Colégio Brasileiro de Parasitologia Veterinária
Jaboticabal, Brasil

SEASONAL VARIATION OF PARASITISM IN PEJERREY *Odontesthes bonariensis* (ATHERINIFORMES, ATHERINOPSIDAE) FROM LA VIÑA RESERVOIR (CÓRDOBA, ARGENTINA)

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ABSTRACT:- MANCINI, M.; BUCCO, C.; SALINAS, V.; LARRIESTRA, A.; TANZOLA, R.; GUAGLIARDO, S. **Seasonal variation of parasitism in pejerrey *Odontesthes bonariensis* (Atheriniformes, Atherinopsidae) from la viña reservoir (Córdoba, Argentina).** [Variação sazonal do parasitismo em Peixe-rei O*dontesthes bonariensis* (Atheriniformes, Atherinopsidae) no reservatório La Viña, Córdoba, Argentina.] *Revista Brasileira de Parasitologia Veterinária*, v. 17, n.1, p.28-32, 2008. Facultad de Agronomía y Veterinaria, Universidad Nacional de Río Cuarto. Ruta 36 km 601. CP 5800, Río Cuarto, Córdoba, Argentina. E-mail: mmancini@ayv.unrc.edu.ar

The pejerrey *Odontesthes bonariensis* is the most important freshwater fish of Argentina central region. The present study was conducted to describe the seasonal variation of parasitism in *O. bonariensis* from La Viña reservoir (31º 17´S, 65º 01´W), located in the province of Córdoba, Argentina. Between years 1999 and 2002, 573 fishes were caught, and their parasite infection and relative weight (W*r*) were assesed. Three parasites were found, *Lernaea cyprinacea* (Crustacea), *Contracaecum* spp. larvae (Nematoda) and *Cangatiella macdonaghi* (Cestoda). Overall, *Contracaecum* spp. prevalence and intensity were very low. *Lernaea cyprinacea* and *Cangatiella macdonaghi* prevalences increased during summer and spring ($P < 0.01$), respectively. *Lernaea cyprinacea* infection showed also seasonal differences in intensity ($P < 0.05$), as well as *C. macdonaghi* regarding parasites density ($P < 0.01$). *Cangatiella macdonaghi* average parasites density was 32.0 (±22.5) cestodes per cm^3 of digestive content. No association between parasitism and fish relative weight was found. Besides the seasonality variations observed, the parasite burden found did not compromise fish body condition.

KEYWORDS: *Odontesthes bonariensis*; *Lernaea cyprinacea*; *Contracaecum* spp., *Cangatiella macdonaghi.*

RESUMO

O peixe rei *Odontesthes bonariensis* é um peixe de água doce de grande importância na região central da Argentina. O objetivo deste trabalho foi descrever a sazonalidade do parasitismo de *O. bonariensis* no reservatrio La Viña (31º 17´S, 65º 01´W), província de Córdoba, Argentina. Durante os anos 1999 e 2002 foram capturados 573 peixes. Nestes se fez à avaliação da condição corporal usando como parâmetro o peso relativo e identificaram-se os seguintes parasitos: *Lernaea cyprinacea* (Crustacea), *Contracaecum* spp. (Nematoda) e *Cangatiella macdonaghi* (Cestoda). As prevalências e intensidades de *Contracaecum* spp. foram muito baixas. Houve diferenças nas prevalências de *L. cyprinacea* e *C. macdonaghi* na época do ano ($P < 0,01$), sendo maiores no verão e na primavera, respectivamente. Houve diferenças estacionais na intensidade de *L. cyprinacea* ($P < 0,05$) e na densidade de *C. macdonaghi* ($P < 0,01$), neste ultimo alcançou-se um valor máximo nas amostras de 32,0 (±22,5) parasitos por cm^3 de conteúdo digestivo. Não houve associação entre o parasitismo e o peso relativo dos peixes. Embora haja certa sazonalidade, as diferentes cargas parasitárias encontradas nâo prejudicam a saúde de *O. bonariensis* enquanto sua condição corporal.

PALAVRAS-CHAVE: *Odontesthes bonariensis*; *Lernaea cyprinacea*; *Contracaecum* spp., *Cangatiella macdonaghi.*

INTRODUCTION

The pejerrey *Odontesthes bonariensis* has become the most important freshwater fish from Argentina central región

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(COLAUTTI et al., 2003). An optimal pejerrey production may be challenged by high parasite burden or prevalence (MANCINI et al., 2005).

The fish parasite life cycle involves invertebrates and vertebrates as intermediate hosts such as planktonic crustaceans, fishes and birds (HANZELOVA; GERDEAUX, 2003; MARTINS et al., 2005). The pejerrey is a zooplanktivore fish, fed primarily microcrustaceans (Cladocera and Copepoda). Thus, the pejerrey food habits are an important source of parasitism (DRAGO, 2004) .

O. bonariensis parasitism has been studied in many occasions under extensive conditions (FUSTER DE PLAZA; BOSCHI, 1957; BOSCHI; FUSTER DE PLAZA, 1959; ORTUBAY et al., 1994; GIL DE PERTIERRA; VIOZZI, 1999; GARCÍA ROMERO, 2001; MANCINI et al., 2000; MANCINI et al., 2005; MANCINI et al., 2006). Noneless, little is known about the seasonality variation of the parasitic infection. In view of this, the study we present was conducted to determine the seasonal variation of parasitism in *O. bonariensis* and assess the association between sample parasites prevalence and intensity with the body condition.

MATERIAL AND METHODS

This study was carried in La Viña reservoir (31º 17´S, 65º 01´W), located in the province of Córdoba, Argentina (Figure 1). The lake is a multiple resource environment of eutrophic characteristics (MANCINI et al., 2004), which covers an area of 1,050 ha at 846 m above sea level. The region weather is typically dry, with a minimum and maximum average temperature of 10.3 (July) and 25.0 ºC (January).

Between the years 1999 and 2002, the reservoir was sampled once per season using trawl nets and floatong gill nets.

Standard length (StL) with accuracy of 1 mm and total wet weight (W) with accuracy of 0.1 g were recorded in all caught fishes. Afterwards, the body condition (W*r*) was deduced using the equation reported by Colautti et al. (2003). Water temperature (ºC) were measured simultaneously.

The caught fishes were examined by means of skin and gills scrapings, and were subject to digestive contents analysis. The parasites collected were fixed and cleared according to Noga (1996) and Eiras et al. (2003). The nematodes and crustaceans taxonomic keys used were those suggested by Kabata (1979), Alvarez Pellitero (1988) and Pereira Bueno; Ferre Pérez (1997). Cestodes were identified following Gil de Pertierra and Viozzi (1999) guidelines.

The ecological parameters used to describe the parasitism were prevalence, mean intensity and density (mean number of parasites per unit of digestive content) as reported by Margolis et al. (1982).

The prevalence seasonal differences were tested using Chi-square and confidence intervals (ALTMAN et al., 2000). Seasonality on parasite intensity and density were evaluated by means of Kruskal Wallis test. Bivariate correlations between the parasite prevalence, water temperature, StL and W*r* was examined by means of Spearman rank correlation test (SOKAL; ROHLF, 1969). The analysis was carried out using SPSS for Windows 10.0.

RESULTS

A total of 573 specimens of *O. bonariensis* were caught after 15 consecutive samplings. Table 1 shows the number of fishes captured, water temperature and average fishes length per sampling time. Body condition evidenced a significant seasonal difference ($P < 0.01$), with the highest average during winter (W*r* = 100.79 ± 8.04, Figure 2).

Overall, three parasites were found, *Lernaea cyprinacea*

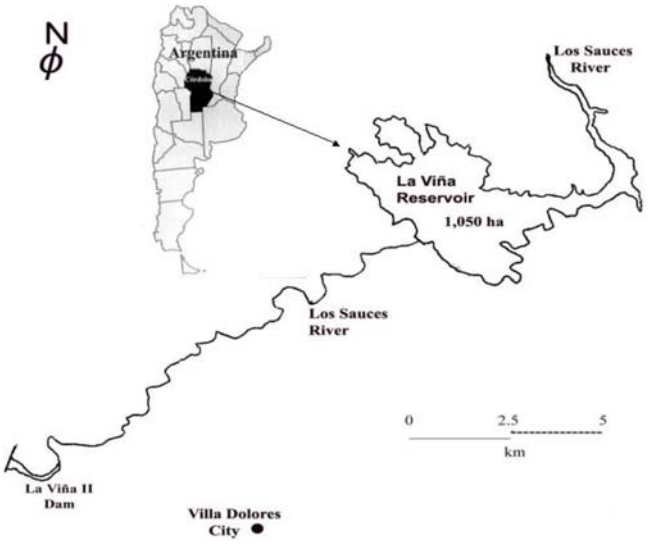

Figure 1. Geographical location of La Viña reservoir.

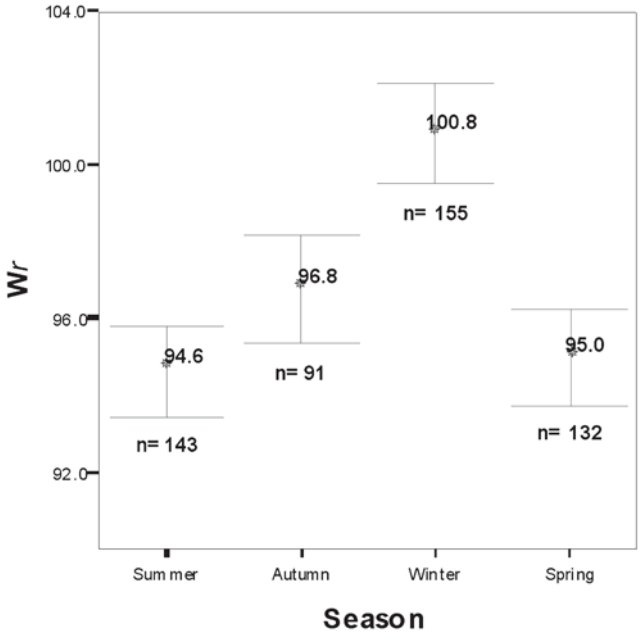

Figure 2. Relative weight (W*r*) of *Odontesthes bonariensis* in La Viña reservoir during different seasons.

Table 1. Water temperature (ºC), number of fishes analyzed (n), media standard length (StL), parasitic prevalence (P), intensity (I) and density (D) of *Odontesthes bonariensis* in La Viña reservoir, shown in correlative samplings.

Sampling (year)	Season	n	T (ºC)	Mean StL (mm)	Parasites					
					Lernaea cyprinacea		*Contracaecum* spp.		*Cangatiella macdonaghi*	
					P (%)	*I*	*P (%)*	*I*	*P (%)*	*D*
1 (Ma-99)	Su	20	24.9	142	0.0	0.0	5.0	3.0 ± 0.0	92.3	3.5 ± 2.4
2 (Au-99)	Wi	21	12.4	120	0.0	0.0	0.0	0.0	89.1	6.5 ± 3.6
3 (No-99)	Sp	30	19.3	195	0.0	0.0	3.4	1.0 ± 0.0	90.0	16.0 ± 11.8
4 (Au-00)	Wi	51	12.1	138	1.2	1.0 ± 0.0	0.0	0.0	100	32.0 ± 22.5
5 (No-00)	Sp	51	21.0	146	0.0	0.0	0.0	0.0	ND	ND
6 (De-00)	Sp	26	24.5	156	3.9	1.0 ± 0.0	0.0	0.0	60.0	5.0 ± 5.9
7 (Fe-01)	Su	51	26.4	155	41.2	1.6 ± 0.6	0.0	0.0	6.2	0.6 ± 0.2
8 (Ju-01)	Au	6	13.6	191	0.0	0.0	16.6	1.0 ± 0.0	ND	ND
9 (Ju-01)	Wi	49	13.5	181	2.1	1.0 ± 0.0	0.0	0.0	66.6	4.7 ± 11.7
10 (Se-01)	Wi	60	14.3	181	0.0	0.0	0.0	0.0	18.7	1.0 ± 3.2
11 (De-01)	Sp	31	25.6	166	6.5	1.0 ± 0.0	0.0	0.0	60.0	2.0 ± 3.6
12 (Ja-02)	Su	34	27.0	158	5.9	1.5 ± 0.7	0.0	0.0	0.0	0.0
13 (Ma-02)	Su	58	24.9	139	15.5	1.3 ± 0.5	0.0	0.0	0.0	0.0
14 (Ma-02)	Au	15	17.4	157	13.4	1.0 ± 0.0	0.0	0.0	73.3	4.3 ± 4.7
15 (Ju-02)	Au	70	12.3	185	5.7	1.0 ± 0.0	0.0	0.0	50.0	45 ± 5.1

Su: Summer; Sp: Spring; Au: Autumn; Wi: Winter
ND: none data

(Crustacea), *Contracaecum* spp. larvae (Nematoda) and *Cangatiella macdonaghi* (Cestoda).

Nine out of fifteen seasonal samples had at least one fish specimen infested with *L. cyprinacea*, which also showed a significant seasonal variation in its prevalence ($\div^2 = 51.3$, $P < 0.01$) with peaks toward summer, especially during February-01 (41.2 %). Also, the intensity of the *L. cyprinacea* evidenced differences across year ($P < 0.05$). *Contracaecum* spp. was detected in 3 out of 15 samples, with a maximum prevalence (16.6 %) and intensity (3 parasites/fish) in June-01, and March-99, respectively (Table 1). Likewise, *C. macdonaghi* prevalence varied according to the time of the year ($\div^2 = 25.4$, $P < 0.01$), with the highest values during March-99 (92.3 %) and August-00 (100 %). On the other hand, seasonal differences in density were also observed ($P < 0.01$, Table 2).

Table 2. Prevalence (%), average intensity (parasite/fish), mean density (parasite/cm^3 of digestive content), samples analyzed of *Odontesthes bonariensis* in La Viña reservoir (per species of helminth and season).

Parasite species	Spring	Summer	Autumn	Winter
Cangatiella macdonaghi				
Prevalence	69.90	42.17	54.12	62.43
Density	7.4 ± 9.7	0.78 ± 1.8	4.81 ± 4.6	9.78 ± 17.0
Fishes analyzed	103	163	85	181
Contracaecum spp.				
Prevalence	0.72	0.61	1.09	0.0
Density	1 ± 0.0	3 ± 0.0	1 ± 0.0	0.0
Fishes analyzed	138	163	91	181
Lernaea cyprinacea				
Prevalence	2.17	19.63	6.59	1.10
Density	1 ± 0.0	1.62±0.7	1 ± 0.0	1 ± 0.0
Fishes analyzed	138	163	91	181

Except for the correlation between *C. macdonaghi* density vs. relative weight ($r_s = 0.76$, $P < 0.01$) and water temperature ($r_s = -0.72$, $P < 0.01$), none association was found between parasite ecological parameters and average W*r*.

DISCUSSION

The wild fish parasite infection is a worldwide problem that can not be subject to eradication due to ecological factors beyond of human control (PEREIRA BUENO; FERRE PÉREZ, 1997). For instance, *Lernaea* spp. has a wide range of host (PIASECKI et al., 2004), fact that makes difficult its control. This copepod, one of the most common parasites of wild and aquacultures fishes of the Argentina central region, and it produces serious economic losses to the fish industry. In this sense, Hepher and Pruginin (1991) claim that pejerrey susceptibility to *Lernaea* spp. infection has been the main obstacle for the production of *O. bonariensis*.

The life cycle of the genus *Lernaea* requires of temperatures above 15ºC, within an optimum range of 25 to 30 ºC (MARCOGLIESE, 1991). The highest prevalence and parasite intensities observed in summer were influenced greately by year 2002 sample. The parasite life cycle is favored by summer temperatures, as it has been reported in other species by Marcogliese (1991). In addition, the winter prevalences observed were lower than those reported for other lakes in the region (MANCINI; GROSMAN, 1998).

Copepods were preferentially located in the base of the dorsal and pectoral fins as well as in the mid-part of the fish body in consistency with other species (MEDEIROS; MALTCHIK, 1999). Williams and Williams (1995), reported that *L. cyprinacea* may seriously injure wild fishes and also

can reduce growth rate. In contrast, we were not able to detect changes in body conditions according to different parasite burden, however, our findings should be interpreted with cautions, because we assessed the association by using correlation at group level.

Haemorragic ulcers were observed in the parasite attachment zone. Such lesion makes fishes look unattractive for human consumption, and therefore, less valuable (PIASECKI et al., 2004).

The genus *Contracaecum* includes anisakid nematodes of worldwide distribution, however in this study the prevalence was very low, and even when the estimated prevalence reached to a maximum, the sample size was low (one out six). Like observations made in other fishes, the number of anisakids larvae increases, as pejerrey gets older (VALLES-RÍOS et al., 2000; MANCINI et al., 2005). That might be the reason why we have found a very low prevalence of anisakids in our study because of a great proportion of the caught fishes were less than 2 years old.

The presence of C. *macdonaghi* in *O. hatcheri* has been reported initially by Szidat and Nani (1951). Due to changes in taxonomy, this parasitosis could have been reported under different name in *O. bonariensis* (FUSTER DE PLAZA; BOSCHI, 1957; BOSCHI; FUSTER DE PLAZA, 1959; GIL DE PERTIERRA; VIOZZI, 1995; MANCINI; GROSMAN, 1998).

The high variability observed in the *C. macdonaghi* density is consistent with previous report (BOSCHI; FUSTER DE PLAZA, 1959). According to García Romero (2001), this parasite is not always capable of inducing important pathological changes in the intestinal epithelium. Therefore, the lack of association between body condition and *C. macdonaghi* burden, sounds biologically feasible. The positive correlation observed between parasite density and W*r* may be indicative of a higher consumption of copepods, the intermediate host (HANZELOVA; GERDEAUX, 2003; PIASECKI et al., 2004). The zooplankton consumption rate (COLAUTTI et al., 2003) and gonadal maturity that happened by the end of winter, may have also implication on the pejerrey W*r*.

The way water quality and eutrophication influence the prevalence and intensity of several fish parasites has been well characterized previously (MACKENZIE et al., 1995; SURES, 2004). The aquatic environment monitoring is very important because sudden changes may stress the fish population or increase the parasite vectors density in the water. Cause of that, the parasite burden is considered a proxy of the water quality (KADLEC et al., 2003). However, the current eutrophic conditions of La Viña reservoir (MANCINI et al., 2004) appeared to have exerted no influence on *O. bonariensis* parasite burden, which in fact was very low.

The reservoirs from the central area of Argentina have remarkable dynamism. Modifications in the ecosystem may drastically affect the transmission of parasites as a result of changes in the planktonic community structure (MARCOGLIESE, 1995). Such changes may explain, in part, the prevalence variation reported among aquatic ecosystems.

The parasite prevalences in *O. bonariensis* from La Viña reservoir was highly variable. *Cangatiella macdonaghi* was the most common parasite. The prevalence and intensity of *Contracaecum* spp. were very low, still it may represent a public health risk. *Lernaea cyprinacea* showed higher prevalence toward the end of the study and specially during the warm season. The intensities and densities of the parasite agents were not associated with fish body condition.

Acknowledgements:- This research was supported by the Secretaría de Ciencia y Técnica of the Universidad Nacional de Río Cuarto, Córdoba. We specially thank the APA II club authorities and personel for their assistance and Elena Fernández for her collaboration with the portugese translation.

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Received on May 03, 2007
Accepted for publication on March 30, 2008.