

HELMINTH INFRACOMMUNITY OF *Haemulon aurolineatum* Cuvier, 1830 (Haemulidae) FROM THE GULF OF CARIACO, VENEZUELA

Infracomunidad de helmintos *Haemulon aurolineatum* Cuvier, 1830 en el Golfo de Cariaco, Venezuela

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ABSTRACT

This study describes the infracommunity of metazoan parasites from 100 *Haemulon aurolineatum* (Haemulidae) from the Gulf of Cariaco, Venezuela. The fish were sampled at random from the catch of artisanal fishermen from September, 2002 to August 2003. All fish were necropsied and 98% of them were infected with at least one of the 11 helminths reported herein. A total of 1522 parasites individuals were found, one belonging to Monogenea, *Choricotyle aspinachorda*, nine species of trematodes: *Brachadena pyriformis*, *Diplangus paxillus*, *Lasiocotus longavatus*, *Genolopa ampullacea*, *Leodera decora*, *Apocreadium foliatum*, *Haliotrema* spp., *Prolecithochirium* spp, one *Hemiurid* species, and one nematode, *Cucullanus tripapillatus*. Prevalence, mean intensity, abundance, and species richness were calculated for each species of the infracommunity. Brillouin's Diversity was found at 3.326 bits/ind. *Haliotrema* spp. was the dominant trematode species, Length of male and female fish was significantly different ($P<0.01$). Neither length nor sex of fish influenced the occurrence of any helminth species during the year. Non parametric correlation was analyzed to find the interrelationship of helminth species reported herein, and only *C. tripapillatus* and *Prolecithochirium* spp showed significant positive relationship ($P<0.001$).

Key words: Metazoans, fish, infracommunity, *Haemulon aurolineatum*, Gulf of Cariaco, Venezuela.

RESUMEN

Este estudio describe la infracomunidad de parásitos metazoarios de 100 *Haemulon aurolineatum* (Haemulidae) en el Golfo de Cariaco, Venezuela. Los peces fueron muestreados al azar de las capturas de los pescadores artesanales entre septiem-

bre de 2002 y agosto 2003. Todos los peces fueron sometidos a necropsia y el 98% de ellos estaban infectados con al menos uno de los 11 helmintos registrados aquí. Once especies de helmintos fueron registradas en las muestras. Se encontró un total de 1.522 individuos de parásitos, uno perteneciente a Monogenea, *Choricotyle aspinachorda*, nueve especies de trematodos: *Pyriformis Brachadena*, *Diplangus paxillus*, *Lasiocotus longavatus*, *Genolopa ampullacea*, *Leodera decora*, *Apocreadium foliatum*, *Haliotrema* spp, *Prolecithochirium* spp, una especie de *Hemiurid*, y un nematodo, *Cucullanus tripapillatus*. La prevalencia, intensidad media, abundancia, y riqueza de especies se calcularon para cada especie de la infracomunidad. La diversidad de Brillouin se encontró en 3,326 bits/ ind. *Haliotrema* spp (trematoda) fue la especie más dominante en el estudio. La longitud entre los sexos de los peces fue significativamente diferente ($P<0,01$). Ni la longitud ni el sexo de los peces influyeron en la ocurrencia de los helmintos en el estudio. La correlación no paramétrica se analizó para encontrar la interrelación de los helmintos en el presente estudio, y sólo *C. Tripapillatus* y *Prolecithochirium* spp mostraron relación positiva significativa ($P<0,001$).

Palabras clave: Metazoarios, peces, infracomunidad, *Haemulon aurolineatum*, Golfo de Cariaco, Venezuela.

INTRODUCTION

Helminth communities of fish species show considerable spatial [17, 20, 25, 27] and temporal [20, 21] variation in composition and species richness, although there may be an underlying similarity in structure and diversity [20]. It is necessary to identify the species present and determine their abundance to understand the structure of the parasite community. Other parameters such as body size, biomass and density of the species allow better descriptions of the community structure.

Among the factors that influence the composition of parasite fauna, the host's alimentary habit is the most important characteristic since it may include numerous animal which may serve as intermediate hosts, these biotic as well as abiotic environments provide basis for the life of host and the parasites alike [11]. Many studies focused on the importance of body size of host [21] habitat, and diet [25, 28, 32]. Aspects of parasites, such as: microhabitats, body sizes and associations between species have also been studied [13, 22, 30, 32]. According to George-Nascimento *et al.* [11], analyses based only on number of parasites may fail to identify important patterns when there are substantial differences in body size of hosts and parasites as well as the number of parasites. Studies on the ecology of parasites of freshwater fishes have been restricted mostly to the temperate regions of the world. Similar studies in tropical countries are few [2, 9-12, 15, 24, 33].

The grunt, *Haemulon aurolineatum* (Perciformes: Family Haemulidae) is a very common commercial fish in the Caribbean and the Venezuelan coasts and an important marine food fish. The objective of this study was to identify the parasite community of the fish, *H. aurolineatum* in the Gulf of Cariaco and to analyze the infracommunity of the helminths during the period of study.

MATERIALS AND METHODS

Artisanal fishermen collected fish, *H. aurolineatum* Cuvier, 1830 from the interior of the Gulf of Cariaco as shown in FIG 1. by gill nets and seinings. Samples for the study were collected irregularly from the commercial artisanal fish landing station at El Dique, Cumana, Venezuela (10°29' N, 64°12' W). A total of 100 fish were collected and examined during September 2002 to August 2003. Fish were carried to the laboratory at the Institute of Oceanography for processing. Fish were meas-

ured and weighed using a Mettler laboratory balance (U.S.A). Fish were sexed after dissecting and all worms, both internal and external parasites were collected and counted individually, and recorded on the basis of their identity. All parasites were identified using Bosch and Lomb Stereo Zoom Stereoscopic Microscope (U.S.A) based on the keys followed by Yamaguti [37], Gibson *et al.* [14]. The parasites were fixed in FAA (Formaldehyde Alcohol Acid) and transferred to 70% ethyl alcohol for later studies.

Prevalence, mean intensity and mean abundance of parasites were used as defined by Bush *et al.* [4]. Infracommunities were summarized by: species richness, the mean number of helminth individuals per host, and diversity index. A nonparametric Kruskal Wallis test indicated that data were not normally distributed. Non Parametric Correlation analyses (Spearman rho) were used to establish relationship amongst the abundance of metazoan parasites. Influence of sex of host on the abundance of parasites was tested with Kruskal Wallis test. The software JMP IN version 3.1.5 (SAS Institute, Inc) for Windows was used to analyze the data. Variance to mean ratio was used as a measure of the degree of over dispersion in the parasite population.

RESULTS AND DISCUSION

One hundred fish, *Haemulon aurolineatum* Cuvier, 1830 were examined and 98 of them were found infected with one or more metazoan parasites. Eleven species of parasites, totaling 1,522 individual helminths were recovered from 98 infected fishes, one belonging to Monogenea, *Choricotyle aspinachorda* Hargis, 1956, nine species of trematodes: *Brachadena pyriformis* Linton, 1910, *Diplangus paxillus* Linton, 1910, *Lasiocotus longavatus* Hopkins, 1941, *Genolopa ampullaceal* Linton, 1910; *Haliotrema* Johnson y Tieg, 1922; *Leodera decora*, *Apocreadium*

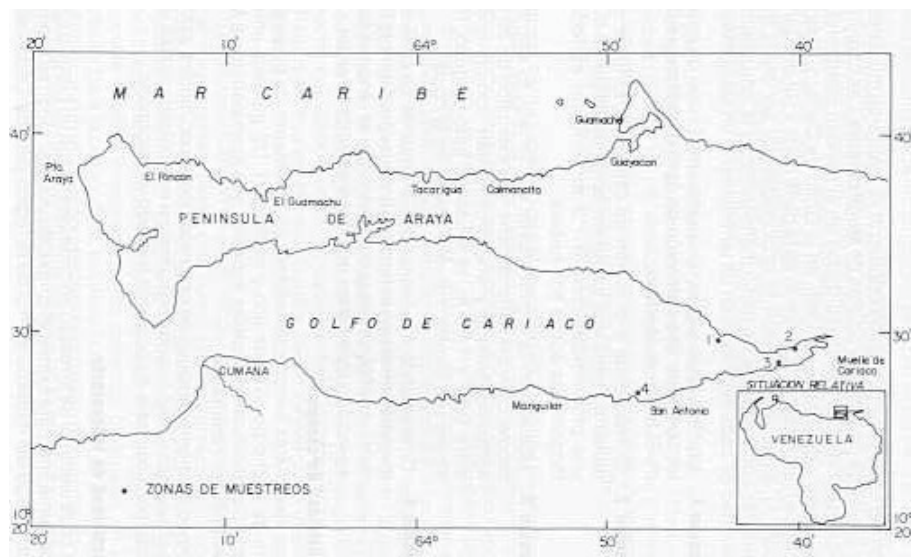


FIG 1. MAP OF GULF OF CARIACO; VENEZUELA, SHOWING LOCATION OF FISHING AREAS.

foliatum Siddiki & Cable, 1960; *Prolecithochirium* spp, one *Hemiurid* spp. and one nematode, *Cucullanus cumanensis*. Out of these 11 metazoans, trematodes were most abundant with nine species, accounting for 78.6% of the total parasites collected. The trematodes, *Haliotrema* spp. and *Diplangus paxillus* were the dominant species in the collection with 225 and 209 individuals, respectively (TABLE I).

All parasites of *H. aurolineatum* showed a typical aggregated pattern of distribution observed in many parasites systems. Abundance of *Prolecithochirium* spp was positively related to host's total length but the mean abundance and prevalence of all parasites were not significantly related to either sex of the host.

Host demographics

The size of host, *H. aurolineatum* ranged from 68 to 188 cm with a mean of 115.4 ± 3.2 cm. Out of 100 fish collected, there were 47 male, ranging in size from 68 to 188 cm, and 53 female, ranging in size from 68 to 168 cm, with a ratio of 1:1.1. No significant differences between male and female fish were observed (F=0.63, P=0.65).

Infracommunity analysis

Helminth infracommunity parameters are summarized in TABLE I. Ninety eight percent of *H. aurolineatum* were parasitized by at least one parasite species. A total of 1,522 metazoan parasites were collected from 100 fish examined, with a mean of 1.37 ± 1.26. The dispersion index was 3.56 for the total individual parasites. The species richness was 3.65 and was correlated with sex of fish host. The Simpson Diversity was (1-D) = 0.896, and Brillouin- based evenness index 0.970 (H/H max). The distribution of *B. pyriformis*, *Prolecithochirium* spp and *C. tripapillatus* were significantly different (TABLE II). The distribution of different helminths in different sexes of the fish host with their respective mean intensity and abundance are

presented in TABLE III. *Haliotrema* sp. appeared to have the highest mean intensity in female host. No significant differences in parasite diversity were observed (t= -0.56, P=0.959) between male and female fish hosts.

Climate affects parasites directly with respect to temperature, which is the most important single extrinsic factor to influence parasites [18, 27]. Chubb [7] stated that patterns of intensity and incidence of infection can be related to the effect of abiotic factors as oxygen tension, water temperature or biotic factors as host species, behavior, or to the interaction of biotic and abiotic factors. Many studies confirmed the effect of temperature on trematodes of fishes of different countries in temperate regions [1, 3, 7, 8, 16, 21, 26, 31, 36]. Temperature in the temperate region between summer and winter are extremely variable and such variation is rare in tropical region. Under such situation, abnormal changes in behavior of parasites are not expected. The variation in prevalence and intensity may be due to movements of host, change of feeding habits, availability of infective stages of parasites and intermediate hosts. The size dependent food selectivity of diet may account for the increase of prevalence and mean intensity of infection in *H. aurolineatum*. This species of fish hosted high metazoan species, dominated by digenetic trematodes, comprising nine species reported. Rado [29] reported four species of trematodes in *Orthopristis ruber* while Luque *et al.* [23] reported seven species of trematodes in *O. ruber* and *H. steindachneri*. Higher infections in larger fish may be transmitted both by the intermediate hosts and fish as paratenic host in the bay. Bibby [3] in *Macrolecithus papilliger*, Rumpus [31] in *Nicolla gallica* and Steinauer and Font [33] in *Lepomis macrochirus* demonstrated that the seasonal cycles and population intensity of these flukes are related to the availability of infective larvae and changes in feeding habits and general physiological condition of the host. The fluctuation could be attributed to the variable nature of the habitat or to the stochastic events that influence transmission dynamics of parasites. Few

TABLE I
PARASITES OF *Haemulon aurolineatum* (N=100) COLLECTED FROM THE GULF OF CARIACO, VENEZUELA,
(TP=TOTAL PARASITES, P= PREVALENCE, MI= MEAN INTENSITY, A= ABUNDANCE)

Parasite group	TP	P (%)	M.I	A
<i>Choricotyle aspinachorda</i>	158	41	3.9 ± 2.92	1.58 ± 2.194
<i>Haliotrema</i> sp.	225	51	4.4 ± 3.46	2.25 ± 2.743
<i>Brachadena pyriformis</i>	124	43	2.9 ± 1.87	1.24 ± 1.782
<i>Diplangus paxillus</i>	209	52	4.0 ± 3.19	2.09 ± 2.738
<i>Lasiotocus longovatus</i>	164	41	4.0 ± 3.45	1.64 ± 2.545
<i>Genolopa ampullacae</i>	191	46	4.2 ± 3.58	1.91 ± 2.917
<i>Apocreadium foliatum</i>	98	37	2.6 ± 2.69	0.98 ± 1.563
<i>Leurodera decora</i>	102	34	3.0 ± 2.87	1.02 ± 1.891
<i>Prolecithochirium</i> spp.	81	38	2.1 ± 2.36	0.81 ± 1.285
<i>Hemiurid</i> spp.	73	33	2.2 ± 2.47	0.73 ± 1.278
<i>Cucullanus tripapillatus</i>	97	32	3.0 ± 2.94	0.97 ± 1.720

TABLE II
SPEARMAN RANK CORRELATION COEFFICIENT (r_s)
AND PEARSON CORRELATION (r) VALUES USED TO
EVALUATE POSSIBLE RELATIONSHIP AMONG THE
TOTAL LENGTH AND SEX OF *H. aurolineatum*,
ABUNDANCE, PREVALENCE OF INFRACOMUNITY
OF HELMINTHS.

Parasites	r_s	P	r	P
<i>Choricotyle aspinachorda</i>	.088	0.381	.064	.527
<i>Haliotrema</i> spp.	-.028	.781	.007	.942
<i>Diplangus paxillus</i>	.026	.798	.058	.564
<i>Brachadena pyriformis</i>	.246*	0.014	0.047	0.687
<i>Lasiocotus longovatus</i>	-.006	.950	-.078	.440
<i>Genolopa ampullacae</i>	-.064	.529	-.088	.382
<i>Leurodera decora</i>	-.080	.426	-.014	.889
<i>Prolecithochirium</i> spp.	0.314**	.001	.408**	.008
<i>Apocreadium foliatum</i>	-.070	.488	-.089	.376
<i>Hemiurid</i> spp.	.020	.846	.078	.443
<i>Cucullanus tripapillatus</i>	.283**	.004	.208*	.038

seasonal studies of trematodes have been attempted in tropical conditions on *Transversotrema patialense* in Sri Lanka [9, 10], *Dormitator latifrons* [35] and *Netuma barba* [34], reported the existence of seasonal cycles.

The annual pattern of occurrence, in theoretical terms, is of gradual increase in incidence and intensity to a peak, followed by a decline to a minimum, after which the generation of worms is complete [8]. This is true for most of the worms in the temperate regions but differ significantly in tropical fish. There may be more than one generation of trematodes available in fish host during the year in the tropical region due to concurrent infection in the nature and similar occurrence was observed in the present study. Both mature and immature *A. fasciatus* were present throughout the year with an indication of seasonal cycle of maturation [24].

Hafizuddin and Bashirullah [15] reported that the infection of *Prosorhynchoides fusiformis* in *Eutropiichthys vacha* gradually increases with the growth of fish. Larger fish were more heavily infected than the smaller one. This observation conforms with that of *Diplostomum gasterostei* in *Orthopristis ruber* where the variation in infection were largely due to changes in age and size of fish [5, 6, 25].

CONCLUSIONS

Infracommunity of metazoan parasites of *Haemulon aurolineatum* (Pisces: Haemulidae) were studied and a total of 1,522 metazoan parasites, belonging to 11 species were collected from 98 infected fish during the study period, with a mean of 15.22 parasites per fish. The trematodes comprised 83% of the total parasites and *Haliotrema* spp was the most dominant species. Neither length nor sex of fish influenced the

TABLE III
PARASITES FROM FISH HOST, *Haemulon aurolineatum*
OF DIFFERENT SEXES (N=100) COLLECTED FROM THE
GULF OF CARIACO, VENEZUELA, (P= PREVALENCE).

Parasite	Sex of host	P (%)	Mean Intensity	Total parasites
<i>Choricotyle aspinachorda</i>	♂	22	3.77	158
	♀	21	3.57	
<i>Haliotrema</i> spp.	♂	29	4.14	225
	♀	22	4.41	
<i>Diplangus paxillus</i>	♂	29	4.10	209
	♀	23	3.91	
<i>Brachadena pyriformis</i>	♂	22	2.82	124
	♀	21	2.95	
<i>Lasiocotus longovatus</i>	♂	20	4.25	164
	♀	22	3.59	
<i>Genolopa ampullacae</i>	♂	18	4.11	191
	♀	28	3.46	
<i>Apocreadium foliatum</i>	♂	18	3.39	98
	♀	19	2.53	
<i>Leurodera decora</i>	♂	14	3.14	102
	♀	20	2.90	
<i>Prolecithochirium</i> spp.	♂	15	2.53	81
	♀	23	1.87	
<i>Hemiurid</i> spp.	♂	14	3.57	73
	♀	19	2.15	
<i>Cucullanus tripapillatus</i>	♂	16	2.63	97
	♀	16	3.44	

occurrence of any helminth species during the study. *Prolecithochirium* spp. and *Cucullanus tripapillatus* showed significant positive relationship.

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