

THE RELATIONSHIP BETWEEN *Lobatostoma hanumanthai* AND *L. kemostoma* (TREMATODA: ASPIDOGASTRIDAE) PARASITOLOGICAL INDEXES AND THE ONTOGENETIC DIET VARIATION OF *Trachinotus marginatus* FROM THE RIO GRANDE DO SUL COAST, BRAZIL

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ABSTRACT

The prevalence, mean intensity of infection and mean abundance of the parasites *Lobatostoma hanumanthai* and *L. kemostoma* (Aspidogastrea) in 100 individuals of *Trachinotus marginatus* from the Rio Grande do Sul coast were used to investigate the existence of a relationship between the parasitological indexes (PI) and the ontogenetic diet variation of the host. Clusters analyses and the "K-means" algorithm were used and show that six host length classes dendrograms produce the same results as previously established for smaller length fish. Other limits are obtained for larger fish when *Lobatostoma* PI are used as criterion. The absence of *Lobatostoma* may be related to the fact that the pharyngeal teeth are not fully formed in the smallest fishes. Therefore the smallest fishes are inapt to the mollusks consumption. Variations in the PI of the two *Lobatostoma* species can also be connected to ontogenetic variations in the fish diet.

Key words: Aspidogastrea; *Lobatostoma*; parasitological indexes; diet; *Trachinotus marginatus*; ontogenetic variation

A RELAÇÃO DOS ÍNDICES PARASITOLÓGICOS DE *Lobatostoma hanumanthai* E *L. kemostoma* (TREMATODA: ASPIDOGASTRIDAE) COM A VARIAÇÃO ONTOGENÉTICA DA DIETA DE *Trachinotus marginatus* DA COSTA DO RIO GRANDE DO SUL, BRASIL

RESUMO

A prevalência, intensidade média de infecção e abundância média dos parasitos *Lobatostoma hanumanthai* and *L. kemostoma* (Aspidogastrea) em 100 exemplares de *Trachinotus marginatus*, coletados na costa do Rio Grande do Sul, foram usadas para verificar se esses índices parasitológicos (PI) têm relação com a variação ontogenética da dieta do hospedeiro. Análises de clusters e o algoritmo "K-means" foram usados e mostram que dendrogramas com seis classes de comprimento do hospedeiro repetem resultados prévios estabelecidos para os peixes de menor comprimento. Outros limites são obtidos para peixes maiores quando os IPs de *Lobatostoma* são usados como critério. A ausência de *Lobatostoma* nos peixes menores pode estar relacionada ao fato de os dentes faríngeos não estarem completamente formados. Isso impede que moluscos, os quais são hospedeiros intermediários de *Lobatostoma*, façam parte da dieta destes peixes menores. Portanto, variações dos PIs das duas espécies de *Lobatostoma* podem estar relacionadas com mudanças ontogenéticas da dieta do peixe.

Palavras-chave: Aspidogastrea; *Lobatostoma*; índices parasitológicos; dieta; *Trachinotus marginatus*; variação ontogenética

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INTRODUCTION

Trachinotus marginatus CUVIER, 1832 (Carangidae) occurs in coastal waters, from Rio de Janeiro to Uruguay (FIGUEIREDO and MENEZES, 1980; CUNHA, 1987). Young forms of the species are abundant in the surf zone, which is used as nursery and growth area (MODDE, 1980; CUNHA, 1981; MODDE and ROSS, 1983; RUPLE, 1984; PAIVA-FILHO and TOSCANO, 1987; ROSS *et al.*, 1987; DE LANCEY, 1989; MONTEIRO-NETO and CUNHA, 1990). Studies of the feeding habits of *Trachinotus* show evidence of ontogenetic and seasonal diet variations, which may be related to space and resource partition (MODDE and ROSS, 1983; PETERS and NELSON, 1987; DE LANCEY, 1989).

Based on the frequency of diet items, MONTEIRO-NETO and CUNHA (1990) defined, for *T. marginatus* from the Rio Grande do Sul coast, three length classes (LC) (Class 1 = > 20-49 mm; Class 2 = > 50-69 mm; Class 3 = > 70-149 mm), identifying two main stages. Those authors observed ontogenetic and seasonal diet patterns related to food availability, although without having examined fishes larger than 149 mm. Specially *Donax hanleyanus* and *Mesodesma mactroides*, both Molusca, Bivalvia, are important alimentary items for *T. marginatus* from the Rio Grande do Sul coast (MONTEIRO-NETO and CUNHA, 1990), like was also observed in other *Trachinotus* species (FIELDS, 1962; ARMITAGE and ALEVISION, 1980). MONTEIRO-NETO (person. commun.) informs that the study results found in MONTEIRO-NETO and CUNHA (1990) do not include larger TL fish.

In this study, the parasitological indexes (PI) - prevalence (P%), mean intensity of infection (MII) and mean abundance (AX) (*sensu* BUSH *et al.*, 1997) of *Lobatostoma hanumanthai* Narasimhulu and Madhavi, 1980 and of *L. kemostoma* MACCALLUM and MACCALLUM, 1913 (Aspidogastrea) were established in *T. marginatus* with 20 to 330 mm total length (TL), captured at Cassino Beach, Rio Grande do Sul coast (32°20' S; 52°00' W). Those aspidogastrea are commonly associated with *Trachinotus* (ROHDE, 1973; GOMES and FÁBIO, 1976; SÁNCHEZ-RAMÍREZ and VIDAL-MARTÍNEZ, 2002) and are acquired by the ingestion of mollusks, the intermediate hosts in their life cycle (HOPKINS, 1958; SPARKS, 1962; ROHDE, 1973; HENDRIX and OVERSTREET, 1977). This allows to suppose that the PI variations of the two *Lobatostoma* species may be indicative of ontogenetic changes in the host diet. As the sampling done in this study includes hosts with a TL greater

than that of the hosts examined by MONTEIRO-NETO and CUNHA (1990), it is possible to verify whether the LC limits established by those authors can be maintained when the PIs of the two species of *Lobatostoma* are used as criteria.

MATERIAL AND METHODS

A total of 100 individuals of *Trachinotus marginatus*, a common host of the parasites *Lobatostoma hanumanthai* and *L. kemostoma*, were initially divided into the three LC established by MONTEIRO-NETO and CUNHA (1990). The parasites were fixed, unpressed, in AFA (ethanol, formalin, acetic acid) and preserved in 70% ethanol. Sub-samples were stained with Semichon's carmine, dehydrated in a graded ethanol series, cleared with beechwood creosote and mounted on permanent slides with Canada balsam, according to the protocol established by AMATO *et al.* (1991). Matrices were prepared in which the attributes are the established indexes of the two *Lobatostoma* species in each LC, with up to 13 LC host. Cluster analysis (Ward's method and Euclidian distance), using the Statistical Analysis System-Healthy, 1998, was used to test the LC limits.

RESULTS AND DISCUSSION

Several forms exist to interpreting the results in a dendrogram (Figure 1). One of the alternatives is the visual analysis of the branches, compared with the expressed values in the numeric matrix that was used for its generation (PI in Table 1).

The visual analysis of the dendrogram (Figure 1) suggests the formation of four clusters, if the 50 similarity line (approximately) was considered. Using that criterium, the cluster 1 would be formed by LC I, II and III, the cluster 2, by LC IV, the cluster 3, by LC V, and the cluster 4, by LC VI. In this case, the cluster 1 would be characterized by the absence of *L. kemostoma* and the cluster 2, by the presence of the two *Lobatostoma* species. The clusters 3 and 4, that harbor the CL V and CL VI, respectively, are separated especially by the differences among the prevalence values of the two *Lobatostoma* species and by the MII and AX different values of *L. hanumanthai*, in those two CL.

Another alternative is the establishment of the clusters composition and the importance of the PI obtained with the utilization of "K-means" algorithm. This method eliminates subjective dendrogram interpretations. In this case, the resulting dendrograms of each matrix were appraised by the number and limits of the host LC.

Table 1. *Trachinotus marginatus* length classes (LC) and respective clusters, length class limits and sample size (n); number of *Lobatostoma hanumanthai* and *L. kemostoma* collected specimens (Collected specim.), positive hosts to the parasitose, prevalence (P%), mean intensity of infection (MII) and mean abundance (AX)

LC/ Clusters	Class Limits (mm)	Sample size (n)	<i>Lobatostoma hanumanthai</i>					<i>Lobatostoma kemostoma</i>				
			Collected specim.	Positive hosts	P%	MI	AX	Collected specim.	Positive hosts	P%	MI	AX
I / (1)	20-49	30	-	-	-	-	-	-	-	-	-	-
II / (1)	50-69	30	59	13	4.43	4.54	1.97	-	-	-	-	-
III / (2)	70-159	11	6	4	36.36	1.50	0.55	-	-	-	-	-
IV / (3)	160-219	10	1214	10	100	121.40	121.40	12	3	30	4	1.2
V / (4)	220-279	11	487	10	90.91	48.70	44.27	69	9	81.82	7.67	6.27
VI / (4)	280-330	8	84	6	75.0	14.0	10.50	37	4	50.0	9.25	4.62

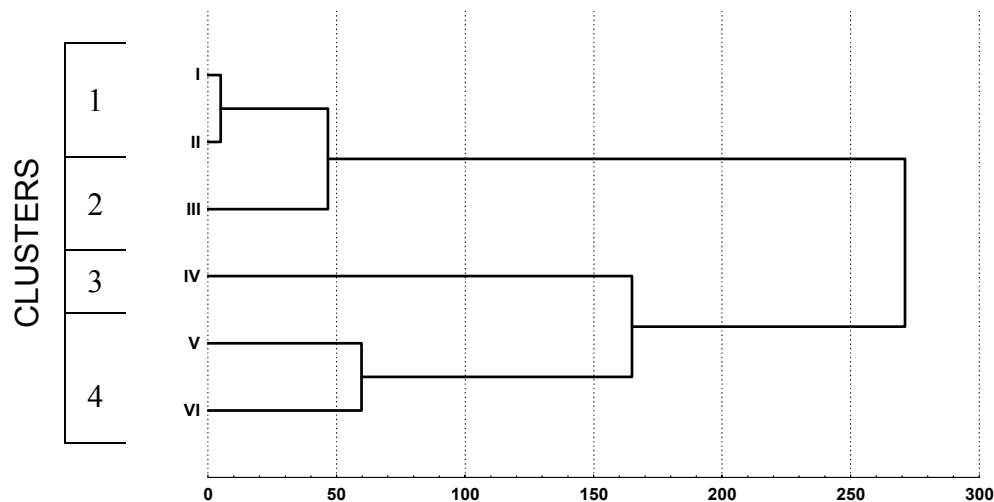


Figure 1. Dendrogram of *Trachinotus marginatus* length classes elaborated from the prevalence, mean intensity of infection and mean abundance values matrices of *Lobatostoma hanumanthai* and *L. kemostoma* from the Rio Grande do Sul coast

Using the “K-means” algorithm, the dendrogram with six LC (Figure 1) gives a better demonstration of the known biology of *T. marginatus*, *L. hanumanthai* and *L. kemostoma*. The PI and the LC limits are in table 1 and the resultant clusters can be observed in figure 1.

The composition of the four clusters observed in the dendrogram (Figure 1) obtained with the “K-means” algorithm shows that cluster 1 is formed by LC I and II; 2, by LC III; 3, by LC IV; and cluster 4, by LC V and VI.

The absence of the two *Lobatostoma* species in LC I and of *L. kemostoma* in LC II and LC III is the main factor in the composition of cluster 1 (Figure 2). *Lobatostoma hanumanthai* occurs with low indexes in

LC II (Table 1) and this corroborates the observations of MONTEIRO-NETO and CUNHA (1990) on the *T. marginatus* diet. The fact can also be explained by FRANCILLON-VIEILLOT *et al.* (1994) study, which shows that the development of the pharyngeal teeth is completed when *Trachinotus* reaches a LC around 5.0 cm - the LC II lower limit. This enables the fish to triturate shells, and may determine the inclusion of mollusks in its diet.

The *L. hanumanthai* prevalence index elevation from 4.43% in LC II to 36.36% in LC III defines the cluster 2 (Figure 2). This may indicate the importance of the increase of the mollusks participation in the host diet with the growth of *T. marginatus*, as was also verified

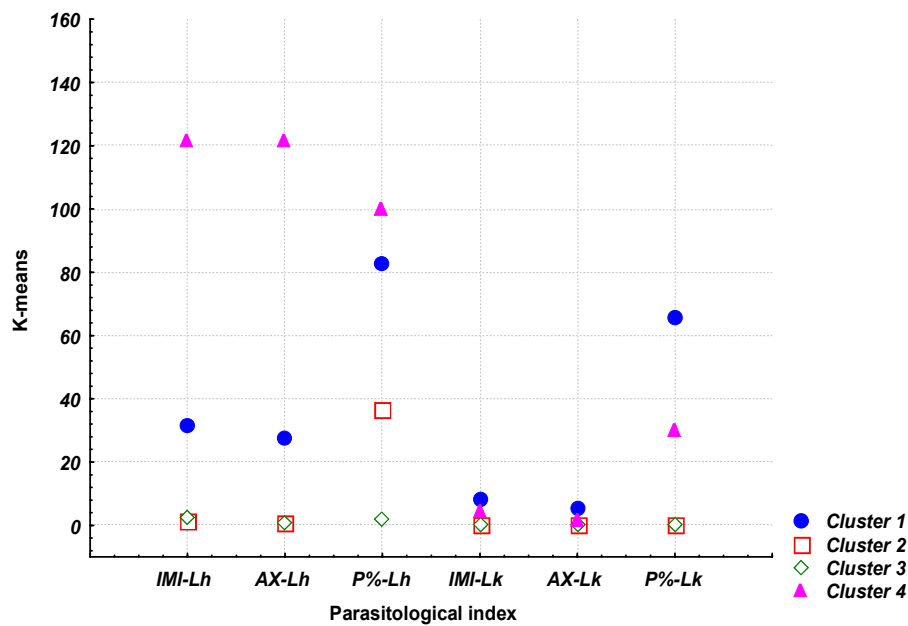


Figure 2. Graph based on the “K-means” algorithm, showing the importance of the parasitological indexes - prevalence (P%), mean intensity of infection (MII) and mean abundance (AX) - of *Lobatosoma hanumanthai* (Lh) and *L. kemostoma* (Lk) to the clusters of the length class definition of *Trachinotus marginatus* from the Rio Grande do Sul coast

by HELMER *et al.* (1995) for *T. falcatus*. The high values of all the *L. hanumanthai* PI and the high prevalence index of *L. kemostoma* define cluster 3 formed by LC IV, suggesting that other mollusks start to be included in the host diet in that LC. The relatively low values of *L. kemostoma* MII and AX may be due to the fact that the other new mollusk species does not become part of the host diet until it reaches 16 cm. The fact that *Trachinotus* is a predator, which demonstrates an opportunistic behaviour (MONTEIRO-NETO and CUNHA, 1990; HELMER *et al.*, 1995), reinforces this hypothesis.

The cluster 4, formed by LC V and VI, is defined by the high values of prevalence of the two species of *Lobatosoma*. At the same time, the decrease of MII and AX values in *L. hanumanthai* in cluster 4 repeat what was postulated through the observations made for cluster 3. This also suggests that mollusks become less important in the host diet when the fish reach larger lengths, as demonstrated by HELMER *et al.* (1995) for *T. carolinus*.

Those results make it possible to affirm that the PI of *Lobatosoma* does not have discriminatory capacity to separate LC I and II, unlike the *T. marginatus* diet items, as demonstrated by MONTEIRO-NETO and CUNHA (1990). However, the use of *Lobatosoma* PIs as criteria shows that the LC III fish, both in

MONTEIRO-NETO and CUNHA (1990) and in this study, have very similar class limits. Fishes over 15.9 cm TL, which were not included in MONTEIRO-NETO and CUNHA, (1990) studies, could be separated in two clusters when *Lobatosoma* PIs were used as criteria.

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