Acanthocephalan parasites in the striped mojarra (*Eugerres plumieri*) (Cuvier, 1830) of the *Tamiahua* Lagoon, Veracruz, Mexico

Acantocéfalos parásitos de la mojarra rayada *Eugerres plumieri* (Cuvier, 1830) en la laguna de Tamiahua, Veracruz, México

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Abstract

Striped mojarra is a species of great economic importance as is a fishing resource for which the object of this study is to determine what are major parasites which presents, for this is captured and analyzed a total of 105 copies of *Eugerres plumieri* of the month of October 2013 to the month of March 2014, with a sex ratio of females and 1.44:1 males, females with a size and weight average of 24.05 cm and 178.41 g and males 24,22 cm and 192.09 g, only 21. 9% of the total sample was found to be parasitized, registering 207 parasites, identifying to *Octospiniferoides sp* and *Dollfusentis chandleri*, females being the most parasitized by both species of acanthocephala. The rear segment of the intestine presented many parasites, followed by the segment average and above. In the month of October there was an increased presence of parasites (7.5 parasites per fish) and in February found no parasites. In terms of the parameters of infection *Octospiniferoides sp* presented the highest prevalence (21.90%), medium (1.68 parasites per fish) and mean abundance (7.69 parasites per fish). The species *Dollfusentis chandleri* had individuals with an average of 4.31 mm

Keywords: *Eugerres plumieri*, striped mojarra, parasitic, *Octospiniferoides sp*, *Dollfusentis chandleri*

Resumen

La mojarra rayada es una especie de gran importancia económica ya que es un recurso pesquero por lo cual el objeto de este estudio es determinar cuáles son los principales parásitos que presenta, para esto se capturaron y analizaron un total de 105 ejemplares de *Eugerres plumieri* del mes de octubre 2013 al mes de marzo 2014, con una proporción sexual entre hembras y machos de 1.44:1, las hembras con una talla y peso promedio de 24.05 cm y 178.41 g y los machos 24.22 cm y 192.09 g, únicamente el 21. 9% del total de la muestra se encontró parasitada, registrándose 207 parásitos, identificándo a *Octospiniferoides sp* y *Dollfusentis chandleri*, siendo las hembras las más parasitadas por ambas especies de acantocéfalos. El segmento posterior del intestino presentó la mayor cantidad de parásitos, seguido por el segmento medio y anterior. En el mes de octubre hubo una mayor presencia de parásitos (7.5 parásitos por pez) y en febrero no se encontraron parásitos. En cuanto a los parámetros de infección *Octospiniferoides sp* presento la mayor prevalencia (21.90%), intensidad media (1.68 parásitos por pez) y abundancia media (7.69 parásitos por pez). La especie *Dollfusentis chandleri* tuvo individuos más grandes con un promedio de 4.31 mm.

Palabras clave: *Eugerres plumieri*, mojarra rayada, parasitos, *Octospiniferoides sp*, *Dollfusentis chandleri*

INTRODUCTION

The striped mojarra is a euryhaline fish of great economic and ecological importance and plays a defined role in the food web of the coastal lagoons, (Aguirre *et al*. 1982; Aguirre & Yáñez, 1984; Cervigón *et al.* 1992; Aguirre & Diaz, 2000; Viloria *et al.* 2012), with the mojarras defined as benthic consumers, using a very protactile mouth to feed on the invertebrates of the infauna, (Randall, 1967)

The striped mojarra is also an important fisheries resource, used for consumption and small scale sale (cooperatives and municipal markets).

As with many other wild species, these fish are exposed to parasites, which play a significant role in their hosts, in that they are interrelated, either through food or through the completion of a stage in their life cycle (Torres, 1991; Sánchez *et al.* 2009)

The mojarra *Eugerres plumieri* is distributed along the length of the coastal watershed of the west Atlantic, running from South Carolina and southern Florida in the USA, the Antilles, the Gulf of Mexico (Veracruz, Campeche, Tabasco, and their continental waters), the Mexican Caribbean (Chetumal Bay and the continental waters of Quintana Roo), Central America (Belize, Costa Rica, Guatemala, and Panama), Colombia, and Venezuela, to Southern Brazil (Robins & Ray, 1986; Greenfield, 1997; González, 2005; Mceachran & Fechhelm, 2005; González *et al*. 2007).

Few studies have been conducted in Mexico on the parasites found in populations or communities of marine and/or estuarial fish, owing to the fact that the large majority of studies have focused on freshwater fish. (Jiménez, 1993; Moravec, 1998; Vidal *et al*. 2002; Caspeta, 2005)

A recent study taxonomically identified metazoan parasites as infecting *E. plumieri* in Chetumal Bay and the adjacent lagoon systems in the state of Quintana Roo, finding the acanthocephalans *Gorgorhynchoides bullocki* (juvenile stage) and *Dollfusentis chandleri* and *Octospiniferoides* (adult stage) (Sánchez, 2010)

Reviews have been conducted on *E. plumieri*, *E. mexicanus*, *E. lineatus* and *Diapterus olisthostomus* in Tabasco, Jalisco and Veracruz, reporting the presence of *Ascocotyle tenuicollis*, *Diplostomum compactum, Encotyllabe* sp., *Pseudo haliotrematoides* sp., *Neo diplectanum* sp., *Spiroxys* sp., *D. chandleri, Caballerorhynchus lamothei, Cucullanus* sp. (Salgado, 1977; 1996; Salgado *et al.* 2004; Salgado, 2006).

The information available on these parasites is limited despite their importance.

It is for this reason that it this type of study is of the utmost importance in the Tamiahua Lagoon, in Veracruz, Mexico, where the correct identification of parasites, as well as the establishment of the parameters of infection (abundance and prevalence) aid in the generation of databases on the current situation with regard to parasitic fauna.

This information will also enrich knowledge of the acanthocephalans in the Northern region of the state of Veracruz.

MATERIAL AND METHODS

From October 2013 to March 2014, six collections were carried out in Tamiahua region of Veracruz using casting nets of 3 and 8 m diameter and 7.62 to 10.6 cm mesh size.

A total of 105 organisms were captured, which were then placed in polyethylene bags in order to avoid the loss of parasites, and then stored in an ice cooler in order to avoid decomposition (Salgado, 2006) .They were then transported to the Biology laboratory at the

Faculty of Biological and Agricultural Sciences, in the Poza Rica-Tuxpan region at the Universidad Veracruzana.

The biometrics and parasitological examinations were then carried out.

The taxonomical determination of the acanthocephalans was undertaken up to species level, based on specialized literature. (Salgado, 1976; Suriano *et al.* 2000; Sanchez, 2010)

Statistical analysis:

The formula P = c*1/d*100 was used for the Prevalence analysis (%), where c = number of parasitized fish, 1= a particular species of parasite, d = number of fish of the same species reviewed in one sample.

The average intensity of the infection, taking into account the number of parasites of a species = n, divided by the total number of fish examined in the sample = d, as defined by the following formula I = n/d.

The calculation of the average abundance of parasites used the formula A=n/h, where n = number of parasites of a particular species, and h = total number of hosts infected with this species.

Finally, the association of variables for the size and weight of the host, they were statistically characterized using an analysis by means of the Pearson product-moment correlation coefficient (r) (Rodríguez & Vidal, 2008).

RESULTS

A total of 105 fish were examined, of which 62 were female, with a total average length of 24.05 cm, and 43 were male, with a total average length of 24.22 cm, with average weights of 178.41 g and 192.09 g respectively (Table 1).

The female to male ratio was 1.44:1.

Of the 105 fish analyzed, the presence of acanthocephalans was detected in only 23, of which 15 were female and eight male, which is to say 21.9% of the total size of the sample was found to be parasitized.

A total of 207 parasites were registered, with two acanthocephalan species identified; *Octospiniferoides sp.* (Bullock, 1957) (Fig. 1) 175 in the stomach and intestine and 31 individuals were found in the stomach and intestine of *D. chandleri* (Golvan, 1969) (Fig. 2).

The abundance of parasites was correlated with regard to the size, weight and sex of the host, finding that the correlation between the quantity of parasites and size is very low. The abundance and richness of the parasites do not increase or decrease in relation to the size of the host.

The correlation between the quantity of parasites and weight follows the same pattern.

The correlation between the quantity of parasites and sex indicates an evident preference of the acanthocephalans for the female host, with an average of 12.86 mm for females and 1.75 mm for the males.

In terms of the size of the parasites, the species *Octospiniferoides sp* presented an average of 3.05 mm compared to the species *Dollfusentis chandleri*, which presented an average of 4.31 mm, indicating that *Dollfusentis chandleri* is larger in terms of size.

The longest parasite (8 mm) found was of this species, with the shortest parasite (0.7 mm) being of the *Octospiniferoides sp* species; however, *Octospiniferoides sp* was more abundant.

DISCUSSION

The acanthocephalans are the least represented group of parasites found in the freshwater fish of Mexico. (Jimenez, 1993; Moravec, 1998; Vidal *et al.* 2002; Caspeta, 2005).

In this study, it was only possible to find two species of acanthocephalans, given that the specimens are euryhaline fish. (Suriano, 2000; Salgado *et al*. 2004).

Data has been collected which demonstrates that the nature of the communities of parasitic helminths found in tropical fish is highly variable **(**Choudhury & Dick, 1998).

However, rich communities of helminths have been found in Mexico, while other communities are poor **(**Salgado & Kennedy, 1997; Vidal *et al.* 1998; Vidal & Kennedy 2000; Aguilar *et al*. 2002).

According to the register of acanthocephalan species in freshwater fish, the *Dollfusentis chandleri* species occurs with greater frequency compared to *Octospiniferoides sp*. **(**Salgado *et al.* 2004; Salgado, 2006; Sánchez, 2010).

Based on morphological characteristics, two species, *Octospiniferoides sp.* and *D. chandleri*, were identified in this study. Similarly, these species were reported for *E. plumieri* in Chetumal Bay and the adjacent lagoon systems in Quintana Roo, Mexico **(**Sánchez, 2010) however, *G. bullock*, a juvenile stage acanthocephalan, has also been reported for *E. plumieri*.

Geographically, the majority of parasite species have also been reported for the same species of fish and other hosts. (Aguirre *et al*. 2002; Vidal *et al.* 2002; González, 2005; Álvarez *et al.* 2008; Tuz-Paredes, 2008).

The female *E. plumieri* presented a greater quantity of acanthocephalan parasites, which differs from other analyses that have been undertaken, in that the results show that there is no tendency toward one or another of the sexes. (Garcia, 1988; Sánchez, 2010).

This study does not demonstrate a correlation between the abundance of the parasites and the size and weight of the host.

Of the total number of organisms analyzed, 21.9% were infested by acanthocephalans (*Octospiniferoides sp.* and *D. chandleri)*, which indicates that the *E. plumieri*es population specific to the sampling area is relatively healthy.

In terms of the parameters of infection, prevalence, and average intensity and average abundance, the species *Octospiniferoides sp.* presented higher values compared to *D. chandleri.*

In terms of the association of variables, only a correlation between the abundance of parasites and the sex of the host was found, with the females found to be more parasitized. *Octospiniferoides sp.* is a species that is smaller in size, but more abundant than *D. chandleri*.

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Table 1. Average values for each variable (Lt) total length, (A) height and (P) weight with regard to the sex of each individual *E. plumieri*

Cuadro 1. Valores promedio para cada variable (Lt) Longitud total, (A) altura y (P) peso con respecto al sexo de los individuos de *E. plumieri*

	Lt (cm)	A (cm)	P (g)
Females	24.0	59.14	178.41
Males	24.22	9.12	192.09

Fig. 1. *Octospiniferoides sp*. found in the stomach and intestine of *E. plumieri*

Fig. 1. *Octospiniferoides sp.* Encontrado en el estómago e intestino de *E. plumieri*

Fig. 2. Dollfusentis chandleri, acanthocephalan found in the stomach and intestine of *E. plumieri*

Fig. 2. *Dollfusentis chandleri*, acantocefalo encontrado en el estómago e intestino *de E. plumieri*