



## PARASITIC HELMINTHS INFECTING *Eucinostomus melanopterus* AND *Eugerres plumieri* (PERCIFORMES: GERREIDAE), FROM BOCA DEL RIO, VERACRUZ, MÉXICO

### Helminths parásitos de *Eucinostomus melanopterus* y *Eugerres plumieri* (Perciformes: Gerreidae), de Boca del Río, Veracruz, México

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#### RESUMEN

Se efectuó un examen helmintológico a 14 especímenes de *Eucinostomus melanopterus* (mojarra bandera) y 19 *Eugerres plumieri* (mojarra rayada), de los cuales se recolectaron un total de 461 helmintos. Se identificaron 12 taxones (cinco a nivel de especie, cinco a género y dos a familia) como sigue: cuatro monogéneos, cinco digéneos (cuatro adultos, una metacercaria), un céstodo (plerocercario) y dos nemátodos (larvas). La prevalencia más alta fue para *Neodiplectanum mexicanum* (29%) en *E. melanopterus* y *Aristocleidus hastatus* (37%) en *E. plumieri*. Ambos hospederos comparten el 50% de los taxones de parásitos. Ninguno de los helmintos representa un riesgo zoonótico.

**Palabras clave:** Helmintos, intensidad media, parásitos, prevalencia.

#### ABSTRACT

A helminthological examination was carried out on 14 specimens of *Eucinostomus melanopterus* (flagfin mojarra) and 19 *Eugerres plumieri* (striped mojarra), of which a total of 461 helminths were collected. As a result, and 12 taxa were registered (five species, five genus and tow family), as follows: four monogeneans, five digeneans (four adults, one metacercaria), one cestode (larva) and tow nematodes (larvae). The highest prevalence was for *Neodiplectanum mexicanum* (29%) infecting *E. melanopterus* and *Aristocleidus hastatus* (37%) infecting *E. plumieri*. Both hosts shared 50% of recorded species, and none of the identified helminthes represents a zoonotic risk.

**Keywords:** Helminth, mean intensity, parasites, prevalence.

Flagfin or striped mojarras of the Gerreidae Family are a relevant ecological and biological resource in rivers, estuaries and coastal lagoons in tropical areas (Aguirre-León and Yáñez-Arancibia, 1986; Díaz-Ruiz *et al.*, 2003). They are also a fishing resource locally used as bait, and barely for human consumption (Jiménez-Badillo *et al.*, 2006); however, it is critical to determine if such consumption poses risks to human health. *Eucinostomus melanopterus* has no records of helminth parasites, while *Eugerres plumieri* include *Caballerorhynchus lamothiei* and *Gorgorhynchoides bullocki* from the southeastern Gulf of México (Salgado-Maldonado and Amin, 2009); *Cucullanus* sp., *Contracaecum* sp., *Hysterothylacium* sp., *Pseudoterranova* sp., *Spirocerca* sp., *Dollfusentis chandleri*, *G. bullocki*, *Neodiplectanum wenningeri*, *Haliotrema* sp., *Ascocotyle* (A.) *leighi*, *Cryptogonimus* sp., *Diplostomum* sp., and *Mesostephanus appendiculatoides* from Chetumal Bay, Quintana Roo (Aguirre-Macedo *et al.*, 2007; Sánchez-Ceballos *et al.*, 2010); *Aristocleidus hastatus* from the Máquinas River, Los Tuxtlas, Veracruz (Mendoza-Franco *et al.*, 2009); and *Pleorchis magniporus* from Florida, USA (Overstreet *et al.*, 2009). Other helminth parasites have also been recorded in other species from the Gerreidae Family, such as *Diapterus auratus* (Mendoza-Franco *et al.*, 2009; 2018; Monks *et al.*, 2009; Zarza-Meza *et al.*, 2016), *Diapterus rhombeus* (Mendoza-Franco *et al.*, 2008; Salgado-Maldonado and Amin, 2009) and *Eugerres brasiliensis* (Mendoza-Franco *et al.*, 2008). Therefore, we have a partial knowledge about worm parasites that is infecting *E. plumieri*, but no knowledge on the helminths that parasitizing *E. melanopterus*. On this basis, we are describing in the present study the prevalence and mean intensity of parasites for both hosts.

The helminthological study was performed on 19 specimens of *E. plumieri* [total length 8.4–13.3 cm ( $11.4 \pm 1.1$  cm), weight 20.0–98.0 g ( $51.3 \pm 20$  g)] and on 14 specimens of *E. melanopterus* [total length 5.4–13.5 cm ( $7.9 \pm 1.9$  cm), weight 3.0–54.0 g ( $14.7 \pm 12.8$  g)], which were captured between March and October 2017, in the Arroyo Moreno, Boca del Rio, Veracruz, México ( $19^{\circ}06'01''$  N -  $96^{\circ}06'43''$  W and  $19^{\circ}07'07''$  N -  $96^{\circ}07'49''$  W), by local fishermen using throw nets. Specimens were examined within 24 hours post-capture. All tissues and organs, excepting bones and blood, were reviewed under a stereomicroscope. The parasites were fixed in hot formalin 4 % and preserved in 70 % alcohol. Then, permanent preparations were made, stained with Mayer's Carmine or Gomori's triple stain, cleared with clove oil, and mounted in Canada balsam (Lamothe-Argumedo, 1997; Vidal-Martínez *et al.*, 2001). Voucher parasite specimens were deposited at the Colección Nacional de Helmintos, Instituto de Biología, UNAM, México. Prevalence (percentage of infected fish) and mean intensity (average of helminths found in infected fish for each helminth species) were calculated according to Bush *et al.* (1997).

A total of 461 individual helminths (69 in *E. melanopterus* and 392 in *E. plumieri*) were recovered, belonging to 12 taxa (five species, five genus and two families). Nine taxa in *E. melanopterus*: three monogeneans; three digeneans (one adult and two metacercariae); one larval cestode; and two larval nematodes. *Eugerres plumieri* hosted nine taxa: three monogeneans; four digeneans (three adults and one metacercaria), one larval cestode, and one larval nematode. Helminths with the highest prevalence were *Neodiplectanum mexicanum* (29 %) infecting *E. melanopterus*; *Aristocleidus hastatus* (37 %) and *Neodiplectanum mexicanum* (32 %) both infecting *E. plumieri*. Parasites with the highest mean intensity were *Crassicutis marina* (57) and *A. hastatus* ( $31.4 \pm 29.5$ ) infecting *E. plumieri*; *Stephanostomum* sp. ( $17.5 \pm 23.3$ ) infecting *E. melanopterus* (Table 1). Six common species were registered in both hosts: *A. hastatus*, *N. mexicanum*, *C. marina*, *Stephanostomum* sp., and the larvae of Tetraphyllidae and *Cucullanus* sp. However, the prevalences of parasite species between both hosts showed no difference ( $p = 0.428$ , Fisher's exact test). It is essential to highlight that this study contributes to 16 new host records and three new local records (Table 1).

Regarding new host records, nine species were found in *E. melanopterus* and seven species in *E. plumieri* increasing from 16 to 23 known taxa in the latter host, of which it shares the records of *Cucullanus* sp., with hosts from Chetumal, Quintana Roo (Sánchez-Ceballos *et al.*, 2010), and *A. hastatus* with hosts from the Tuxtlas, Veracruz (Mendoza-Franco *et al.*, 2009). The prevalences that we recorded for the monogeneans of both hosts were lower than that of *Aristocleidus hastatus* (100 %) in *E. plumieri* from Veracruz (Mendoza-Franco *et al.*, 2009) and *Neodiplectanum mexicanum* (100 %) in *D. rhombeus* from Campeche (Mendoza-Franco *et al.*, 2008). While for nematodes, even when they are low, they were slightly higher than those registered for *Cucullanus* sp. (2 %) and *Hysterothylacium* sp. (3.5 %) parasites of *E. plumieri* from Chetumal (Sánchez-Ceballos *et al.*, 2010). On the other hand, the number of species registered in the present study, nine species for both hosts, including those of *E. plumieri*, are less than the 13 species accumulated in hosts from Chetumal, due probably to the sample size (68 hosts,  $n = 10$ , Aguirre-Macedo *et al.*, 2007;  $n = 58$ , Sánchez-Ceballos *et al.*, 2010), plus and the conditions of the collection sites. In this respect, the proximity of the river's mouth to the sea could facilitate the presence of hosts and parasites from both fresh and sea water, increasing or decreasing the number of species found in our study compared to that in Chetumal where the conditions can limit the presence of intermediate and definite hosts, regulating intestinal helminth infections (Aguirre-Macedo *et al.*, 2007). Such is the case of acanthocephalan, which was not recorded in the fish species examined here, but they are registered in gerreids from other sites as the southeastern of the Gulf of México (Monks *et al.*, 2009; Salgado-Maldonado and

**Table 1.** Prevalence, mean intensity, and site of infection of helminth parasites in *Eucinostomus melanopterus* and *Eugerres plumieri*, from Arroyo Moreno, Boca del Rio, Veracruz, México.

Helminths <sup>1</sup>	Site <sup>2</sup>	<i>E. melanopterus</i> (n = 14)			<i>E. plumieri</i> (n = 19)		
		nhp (p%)	mi (± sd)	range	nhp (p%)	mi (± sd)	range
MONOGENEA							
<i>Aristocleidus hastatus</i> *	G	1 (7)	4 ± -	4	7 (37)	31.4 ± 29.5	1-94
<i>Neodiplectanum magnodiscatum</i> * <sup>†</sup>	G	1 (7)	1 ± -	1			
<i>Neodiplectanum mexicanum</i> * <sup>**,m</sup>	G	4 (29)	3.7 ± 2.7	1-7	6 (32)	14 ± 12.1	3-36
<i>Octouncuhaptor eugerrei</i> * <sup>**,†</sup>	G				3 (16)	1 ± 0	1-1
DIGENEA							
<i>Crassicutis marina</i> * <sup>**,†</sup>	I	1 (7)	1 ± -	1	1 (5)	57 ± -	57
<i>Homalometron</i> sp. **	I				1 (5)	4 ± -	4
<i>Lepocreadium</i> sp. **	I				2 (11)	6 ± 7.1	1-11
<i>Stephanostomum</i> sp. * <sup>**,m</sup>	I	2 (14)	17.5 ± 23.3	1-34	2 (11)	4.5 ± 3.5	2-7
Didymozoidae gen. sp. * <sup>**,m</sup>	I	2 (14)	1 ± 0	1-1			
CESTODA (Larva)							
Tetraphyllidea gen. sp. * <sup>**,p</sup>	I	2 (14)	2 ± 1.4	1-3	1 (5)	2 ± -	2
NEMATODA (Larvae)							
<i>Cucullanus</i> sp. * <sup>†</sup>	I	2 (14)	1.5 ± 0.7	1	1 (5)	1 ± -	1
<i>Hysterothylacium</i> sp. * <sup>†</sup>	I	1 (7)	4 ± -	4			
Total species			9			9	

<sup>1</sup> \*, new host record for *Eucinostomus melanopterus*; \*\*, new host record for *Eugerres plumieri*; †, new geographical record; I, larva; m, metacercaria; mi, mean intensity; n, number of hosts examined; nhp, number of hosts parasitized; p, plerocercoid; (p%), prevalence.

<sup>2</sup> G, Gills; I, Intestine.

Amin, 2009), Chetumal (Sánchez-Ceballos *et al.*, 2010), and Tamiahua (Zarza-Meza *et al.*, 2016). The fact that *E. melanopterus* and *E. plumieri* share about 50 % of parasite species could be because they belong to the same family and are distributed in tropical latitudes along the Atlantic west coast (Aguirre-León and Yáñez-Arancibia, 1986). For instance, the monogeneans *A. hastatus*, *N. mexicanum*, *Neodiplectanum magnodiscatum*, and *Octouncuhaptor eugerrei* infect the same hosts in México, Venezuela, and Panama (Mendoza-Franco *et al.*, 2008; 2009). Finally, no species posing zoonotic risks were registered (e.g. *Anisakis* sp., or *Gnathostoma* sp.; Salgado-Maldonado *et al.*, 2005), but viral or bacterial infections in fish could be latent (Sánchez-Domínguez *et al.*, 2015), because two municipal plants pour treated water into the Arroyo Moreno (López-Portillo *et al.*, 2009), with all the health risks that this could imply.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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