

FIRST RECORD OF *Gotocotyla acanthura* ON THE GILLS OF *Katsuwonus pelamis* IN THE SOUTHWESTERN ATLANTIC OCEAN

(Primeiro registro de *Gotocotyla acanthura* nas brânquias de *Katsuwonus pelamis* no sudoeste do Oceano Atlântico)

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ABSTRACT

Little is known regarding the geographical distribution of parasites in marine environments and monogenea are parasites that tend to exhibit host specificity and are commonly found on fins, body skin, gills, chambers branchial, oral cavity, cornea and nostrils of the host. Currently, the genus *Gotocotyla* has seven described species, with fish in the genus *Scomberomorus* being the natural hosts. This study reports, for the first time, *Gotocotyla acanthura* on a new host, skipjack tuna (*Katsuwonus pelamis*), in Brazil, Southwest Atlantic Ocean. One hundred two Skipjack tuna (*K. Pelamis*) were acquired between the months of collection and examined for monogenean parasites. *Gotocotyla acanthura* was identified with ecological indexes including prevalence (11.76), mean intensity (1.55±0.53) and mean abundance (0.14±0.47).

Keywords: Parasite, Monogenea, Ecological indexes, Fish hosts, Specificity

RESUMO

Pouco se sabe sobre a distribuição geográfica de parasitos em ambientes marinhos e os monogênicos são os parasitos que tendem a exibir especificidade em hospedeiro e são comumente encontrados em nadadeiras, pele corporal, brânquias, câmara branquial, cavidade oral, olhos e narinas do hospedeiro. Atualmente, o gênero *Gotocotyla* possui sete espécies descritas, sendo os peixes do gênero *Scomberomorus* seus hospedeiros naturais. Este estudo relata, pela primeira vez, *Gotocotyla acanthura* infestando um novo hospedeiro, bonito listrado (*Katsuwonus pelamis*), no Brasil, sudoeste do Oceano Atlântico. Cento e dois atuns de bonito listrado (*K. Pelamis*) foram adquiridos entre os meses de coleta e examinados. *Gotocotyla acanthura* foi identificado com índices ecológicos, incluindo prevalência (11,76), intensidade média (1,55±0,53) e abundância média (0,14±0,47).

Palavras-chave: Parasito, Monogenea, Índices ecológicos, Peixes hospedeiros, Especificidade

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INTRODUCTION

Little is known regarding the geographical distribution of parasites in marine environments (ROHDE, 2005). Platyhelminthes is a phylum and worldwide large and diverse, it is estimated that there may be up to 25,000 species of ectoparasites of class Monogenea (AIKEN *et al.*, 2007), mainly parasitizing chondrichthyan and teleost fishes (PREEZ *et al.*, 2008). Monogeneans are generally considered host specific parasites and are commonly found on fins, body skin, gills, branchial chambers, oral cavity, cornea and nostrils of the host (COSTA e CHELLAPPA, 2016).

In Brazil, studies on the Monogenea in Scombridae were performed by Kohn (1961), Travassos *et al.*, (1965, 1969), Hsu (1968), Vicente e Santos (1974), Fernandes *et al.* (1985, 2002), Rohde e Watson (1985), Eiras e Rego (1987), Rohde *et al.* (1995), Hayward e Rohde (1999), Kohn *et al.* (2001, 2003, 2004), Mogrovejo e Santos (2002), Mogrovejo *et al.* (2004), Kohn e Justo (2006), alves e Luque (2006), Fernandes *et al.* (2009), Pamplona-Basilio *et al.* (2011), Justo *et al.* (2013), Justo e Kohn (2015). By the number of species that make up the Scombridae family (54), it can be determined that there are few

studies related to the parasitic fauna of Monogenea in Brazil.

The family Gotocotylidae (Monogenea) infecting Scombridae as natural fish hosts is currently represented by four genera, i.e., *Cathucotyle*, *Swakopella*, *Pseudomicrocotyle* and *Gotocotyla* (KOHN e COHEN, 1998; HAYWARD e ROHDE, 1999; HADI e MUJIB, 2012). The fishes of the family Scombridae are the natural hosts of these genera (HAYWARD e ROHDE, 1999).

The representatives of Gotocotylidae have many dozens of clamps, the component copulatory is cylindrical and has thorns on large in an arrangement securely packaged, and is surrounded by a pouch (HAYWARD e ROHDE, 1999). Currently, the genus *Gotocotyla* has seven described species, *Gotocotyla acanthura*, *G. africanensis*, *G. bivaginalis*, *G. elagatis*, *G. heapae*, *G. niphonii* and *G. queenslandici* (HAYWARD e ROHDE, 1999; ROHDE, 1976; MESERVE, 1938).

The migratory species *Katsuwonus pelamis* Linnaeus, 1758 (Scombridae), is distributed from tropical to temperate waters worldwide (AOKI *et al.*, 2016). It is a commercially important fish species for food and trade worldwide. Humans catch approximately 1.4 million tons of tuna per year, which accounts for

more than 70% of its global stock (YEN *et al.*, 2017).

DEVELOPMENT

This study reports, for the first time, the monogenea *Gotocotyla acanthura* on the gills of skipjack tuna (*Katsuwonus pelamis*) in Southwest Atlantic Ocean (Brazil) and to evaluate their parasite-host relationship with ecological indices.

They have been obtained 102 specimens of skipjack, *Katsuwonus pelamis*, these were sampled from December 2015 to November 2016, the fishing region of Rio Grande do Norte, northeastern Brazil (Southwest Atlantic Ocean, 04° 57' 22" S and 37° 08' 13" W). The identification of fish was confirmed using the identification of characteristics morphometric-meristic (BEZERRA *et al.*, 2012). The fork length (FL, in millimeters) and the total weight (TW, in grams) of all fish were measured. Student's t test at 5% probability ($p < 0.05$) was used to verify differences between sex and biometric data (length and weight).

The fish were examined for ectoparasites with a stereomicroscope. The body regions analyzed included the tegument, nasal cavity and oral, fins and gills. All were collected, cleaned and fixed

in 70% ethanol for later identification. The ecological parameters were calculated according to Bush *et al.* (1997) and Lima *et al.* (2005).

To determine the preference of micro-habitat of the species of parasite, we used data of abundance and made comparisons between the sites of infection. The Pearson correlation coefficient was used to determine the possible correlation between host length and weight and the prevalence of parasite infection / infestation. The species of the genus *Gotocotyla* was identified in accordance with Hayward e Rohde (1999) and Hendrix (1994).

The fish that were acquired between the months of collection presented minimum values of FL 423mm and a maximum 800mm (mean, M 553.3 and \pm standard deviation, SD 69.2); minimum TW of 940.8 g and a maximum of 10100 g (M 3287.3 and \pm SD 1545.4), these 54 were males and 48 females, in reproductive stages (in maturing and mature). No significant difference was observed in relation to the biometric data of males and females ($p > 0.05$).

Specimens of *Gotocotyla acanthura* (Fig. 1) had a body stretched; haptor on the posterior portion as an extension of the body; a single vagina; male copulatory organ with thorns thinner with subsequent tips in the form of arrow;

previous spines simple and strongly crooked; mouth opening is subterminal and lap at the forward end of the body; cirrus present and armed with bones; haptor lengthened; staples pedunculated

distributed symmetrically in a row on each side and features a pair of hooks on its tip; each clamp is composed of two articulated jaws by a sclerite.

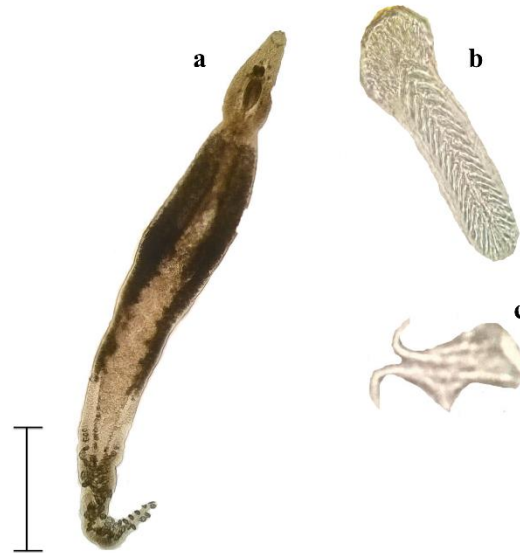


Figure 1: Monogenetic of *K. pelamis*: a, ventral view of *Gotocotyla acanthura*; b, cirrus; c, pair of hooks. Scale bar: a, 1 mm.

This ectoparasite was identified from their morphological characteristics as *G. acanthura* parasitizing only microhabitat of the branchial chambers of the host.

The genus *Gotocotyla* has never been registered parasitizing a host of the genus *Katsuwonus*, so this is the first record of the parasite infesting a new host, skipjack tuna (*K. pelamis*). This previously parasite has already been found parasitizing most species of *Scomberomorus*, these are *S. brasiliensis* and *S. cavala* in Brazil; *S. maculatus* in the USA; *S. regalis* in Panama and

Suriname; *S. tritor* in Liberia and Ghana; *S. commerson* in the Philippines and Indonesia; *S. Guttatus* in India; *S. koreanus* and *S. Niphonius* in China; *S. multiradiatus* in New Guinea; *S. Plurilineatus* in South Africa; and *S. munroi*, *S. semifasciatus* and *S. queenslandicus* in Australia (ROHDE, 1976; HAYWARD e ROHDE, 1999; LUQUE e CHAVES, 1999; ALVES e LUQUE, 2006; MADHI e BELGHYTI, 2006; PAMPLONA-BASILIO *et al.*, 2011). This shows that the relationship host-parasite is influenced by factors phylogenetic. In Brazil, Kohn *et al.* (1971)

described *Gotocotyla travassosi* in *Pomatomus saltator*, then Hayward e Rohde (1999) rated *G. Travassosi* as a synonym of *G. acanthura*, being this a possible case of accidental parasitism.

The ecological indexes monthly of *G. acanthura* in skipjack tuna are

In the *Scomberomorus commersoni* (P% = 80.0); in *S. Queenslandicus* (P% = 100); in *S. brasiliensis* (P% = 43.2); in *Pomatomus*

shown in Tab. 1, these had a general prevalence (P% = 11.76), mean Intensity (mI = 1.55±0.53) and mean abundance (mA = 0.14±0.47), were below to other species of fish that this parasite has infected, the prevalence of these range from 32.7 to 100%.

data (fork length and total weight) of the host.

The highest prevalence's and intensities parasitic diseases occurred in

Table 1: Monthly number of *Katsuwonus pelamis* collected (n) and infected by the monogenean *Gotocotyla acanthura* (prevalence P%, mean abundance mA, and mean intensity mI) from December 2015 to November 2016 in Rio Grande do Norte (Brazil). Standard deviation in parentheses.

Month	n	P%	mA	mI
december	5	0.0	0.0	0.0
january	11	27.3	0.27 (0.65)	1.50 (0.71)
february	10	30.0	0.30 (0.67)	1.50 (0.71)
march	10	50.0	0.50 (0.85)	1.67 (0.58)
april	5	0.0	0.0	0.0
may	10	0.0	0.0	0.0
june	5	0.0	0.0	0.0
july	10	0.0	0.0	0.0
august	10	20.0	0.20 (0.63)	2.00 (0.0)
september	11	18.2	0.18 (0.40)	1.00 (0.0)
october	10	20.0	0.20 (0.63)	1.00 (0.0)
november	10	0.0	0.0	0.0

saltator (P% = 32.7); in the *Trachinotus ovatus* (P% = 53) (ROHDE, 1976; LUQUE e CHAVES, 1999; ALVES e LUQUE, 2006; MADHI e BELGHYTI, 2006; PAMPLONA-BASILIO *et al.*, 2011). No significant correlation was found between prevalence and biometric

the months of January, February and March, months these which are characterized in rainy season in the region under study. According to Schalch (2006) in habitats where there is constant water temperature, as in the intertropical regions, seasonal variations of parasitism are not significant.

CONCLUSION

In conclusion, this study reports the first occurrence of the parasite metazoan monogenea *Gotocotyla acanthura* infesting branchial chambers of a new host Skipjack tuna (*Katsuwonus pelamis*) in Brazil (Southwest Atlantic Ocean).

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