

NEW GEOGRAPHIC OCCURRENCE: DIGENEA Lobatozoum multisacculatum (DIDYMOZOIDAE) ON LITTLE TUNNY, Euthynnus alletteratus (SCOMBRIDAE)

Nova ocorrência geográfica:
Digenea Lobatozoum multisacculatum (Didymozoidae)
em bonito-pintado, *Euthynnus alletteratus* (Scombridae)

Cláudio Giovanio da Silva¹, Beatriz Cristina Lopes¹,
Erivaldo Laurindo Gomes¹, Guelson Batista da Silva²

¹ Programa de Pós-Graduação em Produção Animal, Universidade Federal Rural do Semi-Árido, Mossoró, RN, Brasil. E-mail: giovaniosl@bol.com.br

² Centro de Ciências Agrárias, Universidade Federal Rural do Semi-Árido, Mossoró, RN, Brasil

ABSTRACT

Considering that the quantitative and ecological studies related to parasites of scombrids are scarce in Brazil and that in Rio Grande do Norte (RN) there are no records, specially of Trematoda in *Euthynnus alletteratus*, this work reports the presence of the digenean *Lobatozoum multisacculatum* as well as their ecological parasitic indexes in this host species.

Keywords: geographic distribution, Didymozoids, Trematoda in scombrids, little tunny.

RESUMO

Considerando que os estudos quantitativos e ecológicos relacionados a parasitas de scombrídeos são escassos no Brasil e que no Rio Grande do Norte (RN) não existem registros, principalmente de Trematoda em *Euthynnus alletteratus*, este trabalho relata a presença do Digenético *Lobatozoum multisacculatum*, bem como seus índices ecológicos parasitários nessa espécie hospedeira.

Palavras-chave: distribuição geográfica, Didymozoídeos, Trematoda em escombrídeos, bonito-pintado.

Recebido em: 28/06/2020

Aprovado em: 28/03/2022

Publicado on-line em: 10/08/2022

INTRODUCTION

Parasites are very useful to investigate the biology, ecology, migration and the population structure of marine organisms, and have been used successfully to clarify the diverse taxonomic relations between their hosts (Whiteman & Parker, 2005; Mackenzie & Abaunza, 2014; Mele *et al.*, 2015).

Digeneans of the Didymozoidae family are generally parasites of pelagic oceanic fish with worldwide distribution in tropical and subtropical areas, they are considered to be one of the groups with more complex taxonomy (Mladineo; Tomaš & Stanić, 2015). Within this group, we have the genus *Lobatozoum* that has, globally, ten species described. In general, their life cycle follows the typical propagation of digeneans, where cephalopods act as intermediate vectors and pelagic fish as definitive hosts (Mele *et al.*, 2016).

The dispersion pattern of the parasites has been considered of great importance to the population dynamics of the host-parasite relationship, and the processes dependent on the parasite geographic distribution exert an influence on the survival or fecundity of the hosts. Generally, the damage caused to the host by parasitic diseases is related to the parasite species, their feeding habits, the host's affected organ or tissue, parasitism intensity and the general state of the host (Choi *et al.*, 2014; Rynkiewicz, 2015; Penczykowski; Laine & Korkkela, 2016; Carvalho *et al.*, 2017).

Little tunny, *Euthynnus alletteratus* (Rafinesque, 1810) is a pelagic and highly migratory fish of the family Scombridae that inhabits the tropical and subtropical coastal waters of both sides of the Atlantic Ocean. There are three main populations of *E. alletteratus* known in the Atlantic Ocean, located in the center-east, in the southeast and in the west of the Atlantic Ocean (Karakulak *et al.*, 2016; Mele *et al.*, 2016). It is considered an abundant fish species in the Brazilian Northeast coast (Lucena *et al.*, 2004) with very little information regarding its parasitic fauna in this region (Alves & Luque, 2006). Considering that, in the state of Rio Grande do Norte, there are no records on quantitative and ecological studies related to parasites of this species of scombrid, the present work aims to report the occurrence of the digenean *Lobatozoum multisacculatum* (Ishii, 1935) in *E. alletteratus*, as well as to determine its ecological parasitic indexes.

MATERIAL AND METHODS

Specimens of *E. alletteratus* fish were purchased from fishermen in the coastal region of Areia Branca, Rio Grande do Norte State (4°55'50.6" S and 37°04'48.7" W), between 2015-2016. All specimens were packed in individual bags, stored in iceboxes and transported to the Laboratório de Sanidade Aquática of the Universidade Federal Rural do Semi-Árido (LASA-UFERSA), for identification according to Figueiredo and Menezes (2000) and Figueiredo (2002) and processing. The biometry of these animals was performed, and the total weight in grams (gr) as well as the total length in millimetres (mm) were recorded. These data were expressed as mean values, standard deviations, and minimum and maximum values through the statistical program SPSS version 21. Parasite investigation was performed by necropsy, with observation of the integument and gills. The gills were removed and inspected for parasite collection through stereomicroscopy, followed by fixation and preservation in 70% alcohol (Eiras; Takemoto & Pavanelli, 2006). The parasites that were collected are kept in the formal collection of the LASA-UFERSA and subsequently submitted to a reference collection.

The parasites were identified through specific taxonomic keys (Ishii, 1935; Skrjabin, 1955; Pozdnyakov & Gibson, 2008). Ecological parasitic parameters, such as prevalence (percentage of infected hosts), mean intensity (average number of parasites per infected host) and mean abundance (mean number of parasites per host examined) of infection were calculated according to Bush *et al.* (1997).

RESULTS AND DISCUSSION

In total, 105 specimens of *Euthynnus alletteratus* were analyzed between the years of 2015 and 2016. The following biometric data were gathered: mean weight 529.1 ± 325.4 (159.8 - 2,065.0) and mean length $452,8 + 75,4$ (325,0 - 695,0). There was a predominance of males during the period of the study, 59 of the specimens collected were males and 46 were females, but there was no significant relationship between sex and biometric data with parasitism ($p > 0.05$).

Six specimens (5.7%) had the gill parasitized by *Lobatozoum multisacculatum* (Trematoda, Digenea, Didymozoidae) (Figure 1). Mean intensity was 1.3 and average abundance 0.08 parasites per fish. These indexes are lower than those observed by Alves and Luque (2006) when they investigated the same host species, but in the state of Rio de Janeiro. These differences that were observed can be justified by the fact that the studies took place in different geographic areas.

The parasitism by *Lobatozoum multisacculatum* in *Euthynnus alletteratus* has been recorded in Brazil by Alves and Luque (2006), in Rio de Janeiro (RJ) state, also inhabiting the gills of this host species. *Lobatozoum multisacculatum* was also found in the Pacific parasitizing other scombrid fish, namely *Katsuwonus pelamis* and *Thunnus orientalis* (Ishii, 1935) and Mediterranean Sea in *K. pelamis* (Mele *et al.*, 2012).

According to Justo and Kohn (2014), the typical long migrations of tunas and consequent exposure to different environments with a wide range of water temperatures facilitates infections by several parasitic groups, mainly by members of the family Didymozoidae. According to the same authors, such parasites have remarkable diversity and high levels of prevalence and abundance, which was not observed in the present study.

Pavanelli, Eiras and Takemoto (2008) and Appeltans *et al.* (2012) report that several studies have been conducted over the years to determine the diversity and effect of

Figure 1 - Didymozoidae *Lobatozoum multisacculatum* (Ishii, 1935) in the gill filaments of Scombridae *Euthynnus alletteratus* (Rafinesque, 1810) in the coastal region of Areia Branca, Rio Grande do Norte State (Brazil). Scale bar: 1cm



parasitism in the world. However, there is little information on parasites, specially digeneas in *E. alletteratus* and other species of the family Scombridae on the northeast coast of Brazil.

CONCLUSION

Lobatozoum multisacculatum had its geographical occurrence expanded to coastal waters of Rio Grande do Norte, Brazil, having occurred with low levels of infection in little tunny, *Euthynnus alletteratus*. Therefore, we broaden the knowledge regarding the occurrence of the parasite-host relationship between *E. alletteratus* and *L. multisacculatum*, in another Brazilian geographic location.

Acknowledgments – The authors are grateful to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes) for assisting in research with the support of scientific initiation and postgraduate studies scholarships.

REFERENCES

- Alves, D.R. & Luque, J.L. Ecologia das comunidades de metazoários parasitos de cinco espécies de Escombrídeos (Perciformes: Scombridae) do litoral do estado do Rio de Janeiro, Brasil. *Rev. Bras. Parasitol. Vet.*, v. 15, p. 167-181, 2006. <https://doi.org/10.1590/S1519-69842004000100019>.
- Appeltans, W.; Ahyong, S.T.; Anderson, G.; Angel, M.V.; Artois, T.; Bailly, N. & Błazewicz-Paszkowycz, M. The magnitude of global marine species diversity. *Current Biology*, v. 22, p. 2189-2202, 2012. <https://doi.org/10.1016/j.cub.2012.09.036>.
- Bush, A.O.; Lafferty, K.D.; Lotz, J.M. & Shostak, A.W. Parasitology meets ecology on its own terms: Margolis et al. revised. *Journal of Parasitology*, v. 83, p. 575-583, 1997. <https://doi.org/10.2307/3284227>.
- Carvalho, A.R.; Martins, R.T.; Bellei, P.M. & Sousa-Lima, S. Aspectos ecológicos da helmintofauna de *Hoplias malabaricus* (Bloch, 1794) (Characiformes, Erythrinidae) da Represa Dr. João Penido (Juiz de Fora-MG, Brasil). *Revista Brasileira de Zootecnia*, v. 18, n. 1, p. 7-20, 2017. <https://doi.org/10.34019/2596-3325.2017.v18.24413>.
- Choi, Y.J.; Aliota, M.T.; Mayhew, G.F.; Erickson, S.M. & Christensen, B.M. Dual RNA-seq of parasite and host reveals gene expression dynamics during filarial worm-mosquito interactions. *PLOS Neglected Tropical Diseases*, v. 8, n. 5, 2014. <https://doi.org/10.1371/journal.pntd.0002905>.
- Eiras, J.C.; Takemoto, R.M. & Pavanelli, G.C. *Métodos de estudo e técnicas laboratoriais em parasitologia de peixes*. Maringá: Eduem, 2006, 199 p.
- Figueiredo, J.L. & Menezes, N.A. *Manual de peixes marinhos do Sudeste do Brasil*. São Paulo: Museu de Zoologia, 2000, 116 p.
- Figueiredo, J.L. *Peixes da zona econômica exclusiva da região Sudeste Sul do Brasil*. São Paulo: Edusp, 2002, 248 p.

- Ishii, N. Studies on the family Didymozoidae (Monticelli, 1888). *Japanese Journal of Zoology*, v. 6, p. 279-335, 1935.
- Justo, M.C.N. & Kohn, A. Monogenoidea and Digenea parasites of *Thunnus atlanticus* (Perciformes, Scombridae) from Rio de Janeiro Coast of Brazil. *Neotropical Helminthology*, v. 8, n. 2, p. 339-348, 2014. <https://www.arca.fiocruz.br/handle/icict/10564>.
- Karakulak, F.S.; Oray, I.K.; Addis, P.; Yildiz, T. & Uzer, U. Morphometric differentiation between two juvenile tuna species [*Thunnus thynnus* (Linnaeus, 1758) and *Euthynnus alletteratus* (Rafinesque, 1810)] from the Eastern Mediterranean Sea. *Journal of Applied Ichthyology*, v. 32, n. 3, p. 516-522, 2016. <https://doi.org/10.1111/jai.13090>.
- Lucena, F.; Lessa, R.; Kobayashi, R. & Quiorato, A.L. Aspectos biológico-pesqueiros da serra, *Scomberomus brasiliensis*, capturada com rede-de-espera no Nordeste do Brasil. *Arq. de Ciên. do Mar*, v. 37, n. 1-2, p. 93-104, 2004.
- Mackenzie, K. & Abaunza, P. Parasites as biological tags, p.185-203, in Cadrin, S.X.; Kerr L.A. & Mariani, S. (ed.). *Stock identification methods*. San Diego: Academic Press, 2014. <https://doi.org/10.1016/B978-0-12-397003-9.00010-2>.
- Mele, S.; Macías, D.; Gómez-Vives, M.J.; Garippa, G.; Alemany, F. & Merella, P. Metazoan parasites on the gills of the skipjack tuna *Katsuwonus pelamis* (Osteichthyes: Scombridae) from the Alboran Sea (western Mediterranean Sea). *Diseases of Aquatic Organisms*, v. 97, n. 3, p. 219-225, 2012. <https://doi.org/10.3354/dao02421>.
- Mele, S.; Saber, S.; Gómez-Vives, M.J.; Garippa, G.; Alemany, F.; Macías, D. & Merella, P. Metazoan parasites in the head region of the bullet tuna *Auxis rochei* (Osteichthyes: Scombridae) from the western Mediterranean Sea. *Journal of Helminthology*, v. 89, n. 6, p. 734-739, 2015. <https://doi.org/10.1017/s0022149x14000662>.
- Mele, S.; Pennino, M.G.; Piras, M.C.; Macias, D.; Gómez-Vives, M.J.; Alemany, F. & Merella, P. Ecology of the Atlantic black skipjack *Euthynnus alletteratus* (Osteichthyes: Scombridae) in the western Mediterranean Sea inferred by parasitological analysis. *Parasitology*, v. 143, n. 10, p. 1330-1339, 2016. <https://doi.org/10.1017/s0031182016000792>.
- Mladineo, I.; Tomaš, M. & Stanić, R. Cross-fertilization as a reproductive strategy in a tissue flukes *Didymosulcus katsuwonicola* (Platyhelminthes: Didymozoidae) inferred by genetic analysis. *Parasitology*, v. 142, n. 11, p. 1422-1429, 2015. <https://doi.org/10.1017/s0031182015000839>.
- Pavanelli, G.C.; Eiras, J.D.C. & Takemoto, R.M. *Doenças de peixes: profilaxia, diagnóstico e tratamento*. Maringá: Eduem, 2008, 305 p.
- Penczykowski, R.M.; Laine, A.L. & Koskella, B. Understanding the ecology and evolution of host-parasite interactions across scales. *Evolutionary Applications*, v. 9, n. 1, p. 37-52, 2016. <https://doi.org/10.1111/eva.12294>.
- Pozdnyakov, S.E. & Gibson, D.I. Family Didymozoidae Monticelli, 1888, p. 631-734, in Bray, R.A.; Gibson, D.I. & Jones, A. (ed.). *Keys to the Trematoda*. Wallingford: CABI, 2008.
- Rynkiewicz, E.C. An ecosystem approach to understanding and managing within-host parasite community dynamics. *Trends in Parasitology*, v. 31, n. 5, p. 212-221, 2015. <https://doi.org/10.1016/j.pt.2015.02.005>.

Skrjabin, K.I. Suborder Didymozoata Skjrabin et Schulz, 1937. *Osnovy Trematodologii*, v. 11, p. 5-254, 1995.

Whiteman, N.K. & Parker, P.G. Using parasites to infer host population history: a new rationale for parasite conservation. *Animal Conservation*, v. 8, p. 175-181, 2005. <https://doi.org/10.1017/S1367943005001915>.