Metazoan Parasites (Crustacea, Digenea and Monogenea) from Atlantic Black Skipjack Euthynnus alleteratus: A Checklist

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Abstract
A checklist of the metazoan parasites of host fish Atlantic black skipjack (Euthynnus alleteratus) was compiled from parasitological records published between 1967 and 2018. The checklist is arranged alphabetically, providing valid names and authorities of the parasite species, its capture sites, author(s) and date of published records. A total of 18 valid species are listed from E. alleteratus. Parasite species where host data are missing or where the parasite was found not associated with a E. alleteratus not are included.

Keywords: Checklist; Fish parasites; Crustacea; Digenea; Monogenea

Introduction
The dispersion pattern of the parasites has been considered of great importance to the population dynamics of the parasite-host relationship [1,2]. Are the parasitic abundance dependent processes influence on survival and fertility of hosts [3].

Bullard et al. [4] mentioned that the behaviour of forming shoals facilitates the horizontal dispersion of the larvae in some species of fish. Various studies have been conducted over the years to determine the diversity and relative effect of parasitism in the world [5].

Parasites are now recognized as important components in global biodiversity [6], helping to understand the biology, survival, host population structure and ecosystem functioning, directly influencing fish populations by mortality or indirectly in reducing fecundity, behavioral changes, reduced swimming speed or increased risk of predation by the host [7].

The parasites Crustaceans are the most diverse and ubiquitous subphylum of arthropods in the seas. Most of the crustacean parasites are ectoparasites of a wide range of marine invertebrate and vertebrate organisms [8]. Monogeneans are a group of largely ectoparasitic members of the phylum Platyhelminthes. These worms are considered to be among the most host-specific parasites in fish, commonly found on fins, body skin, gills, gill chambers, buccal cavity, cornea and nostrils of their host [9]. Digeneans have a ventral or postero-ventral sucker, sometimes absent and the adults are primarily parasites of the gut, but they also occur free or encapsulated in the tissues of the vertebrates [10,11].

The Atlantic black skipjack Euthynnus alleteratus (Rafinesque, 1810) is a pelagic scombrid fish that inhabits the coastal tropical and subtropical waters of both sides of the Atlantic Ocean [12]. In the world, there is no checklist of parasites that infest the host fish Euthynnus alleteratus, which can generate deficiencies for the understanding of new studies.

This study is a start in correcting this deficiency by giving an updated checklist of the Metazoan parasites that infest the host fish Euthynnus alleteratus, using current and, as far as is possible to determine, correct nomenclature, can be a useful tool for studying the parasite distribution as well as the general parasite diversity in E. alleteratus, and it may also be an important tool for planning research activities in marine fish parasitology.

Methods
To compile the list parasites of Atlantic black skipjack Euthynnus alleteratus in the world, the records were obtained by searching the SciELO, Web of Science, Scopus, Springer, Elsevier, in the Portal of Periodicals CAPES / MEC and the mechanism of search of Google Scholar. To compile the data of the parasitic fauna of Atlantic black skipjack (E. alleteratus) data were compiled from the following studies: Palombi [13]; Cressey & Cressey [14]; Hendrix [15]; Fuentes [16]; Alves & Luque [17]; Chisholm & Whittington [18] and Mele et al. [12].
Checklist

This metazoan parasite checklist includes only Crustacea, Digenea and Monogenea. This checklist was compiled from records published between 1949 and 2016, covering a total of 7 papers. The papers analysed by us recorded 26 valid species parasitizing *E. alletteratus*. Reports of seven parasites that had not been identified to the species level were included in this checklist. Parasite species where host data are missing or where the parasite was found not associated with a *E. alletteratus* are not included. The results are presented as a list of parasite species in *E. alletteratus* (Table 1). The specific distribution of species in the host fish is also recorded.

Table 1: Checklist of the metazoan parasites of Atlantic black skipjack *Euthynnus alletteratus* (Parasite-Host list).

| Parasite Species          | Location                        | Author And Record |
|---------------------------|---------------------------------|-------------------|
| **Monogenea**             |                                 |                   |
| *Capsala gouri*           | Northwest Atlantic Ocean        | Chisholm & Whittington [18] |
| *Capsala magronum*        | Southwest Atlantic Ocean        | Chisholm and Whittington [18] |
| *Capsala manteri*         | Mediterranean Sea                | Mele et al. [12]  |
|                           | Central-eastern Atlantic Ocean  | Chisholm & Whittington [18] |
|                           | Central-western Atlantic Ocean  | Chisholm & Whittington [18] |
|                           | Southwest Atlantic Ocean        | Chisholm & Whittington [18] |
| *Capsala onchidiocotyle*  | Northwest Atlantic Ocean        | Chisholm & Whittington [18] |
| *Hexostoma euthynnii*     | Southwest Atlantic Ocean        | Alves & Luque [17] |
| *Hexostoma thunninae*     | Mediterranean Sea                | Mele et al. [12]  |
|                           | Mediterranean Sea                | Palombi [13]      |
|                           | Mediterranean Sea                | Palombi [13]      |
|                           | Southwest Atlantic Ocean        | Alves & Luque [17] |
| *Metapseudaxine ventrosicula* | Southwest Atlantic Ocean | Alves & Luque [17] |
| *Neohexostoma mochima*    | Southwest Atlantic Ocean        | Zambrano [16]     |
| *Udonella caligorum*      | Northwest Atlantic Ocean        | Hendrix (1994)    |
| **Digenea**               |                                 |                   |
| *Didymocystis sp. 1*      | Mediterranean Sea                | Mele et al. [12]  |
| *Didymocystis sp. 2*      | Mediterranean Sea                | Mele et al. [12]  |
| *Didymozoinii sp.*        | Mediterranean Sea                | Mele et al. [12]  |
| *Didymozoon sp.*          | Mediterranean Sea                | Mele et al. [12]  |
| *Neonematobothrium cf. kawakawa* | Mediterranean Sea | Mele et al. [12]  |
| *Lobatozoon multisacculatum* | Southwest Atlantic Ocean | Alves & Luque [17] |
| *Melanocystis cf. kawakawa* | Mediterranean Sea                | Mele et al. [12]  |
| *Oesophagocystis sp. 1*   | Mediterranean Sea                | Mele et al. [12]  |
| *Oesophagocystis sp. 2*   | Mediterranean Sea                | Mele et al. [12]  |
| **Crustacea**             |                                 |                   |
| *Caligus bonito*          | Northwest Atlantic Ocean        | Cresssey & Cresssey [14] |
|                           | Southwest Atlantic Ocean        | Alves & Luque [17] |
|                           | Mediterranean Sea                | Mele et al. [12]  |
| *Caligus coryphaenae*     | Central-western Atlantic Ocean  | Cresssey & Cresssey [14] |
| *Caligus pelamydis*       | Southwest Atlantic Ocean        | Alves & Luque [17] |
| *Caligus productus*       | Northwest Atlantic Ocean        | Cresssey & Cresssey [14] |
| *Ceratocolax euthynnii*   | Mediterranean Sea                | Mele et al. [12]  |
| *Unicolax collateralis*   | Mediterranean Sea                | Mele et al. [12]  |
| *Pseudocycnus appendiculatus* | Mediterranean Sea                | Mele et al. [12]  |
|                           | Northwest Atlantic Ocean        | Cresssey & Cresssey [14] |
|                           | Central-western Atlantic Ocean  | Alves & Luque [17] |
|                           | Southwest Atlantic Ocean        | Mele et al. [12]  |
| *Isopoda gen. sp.*        | Southwest Atlantic Ocean        | Alves & Luque [17] |
It is noticed the importance of literature review works, since it facilitates the work of future researchers, when there is a checklist of a certain species. During the research, it is understood that there are few researches in the branch of parasitology and mainly in Brazil there are few reports of parasite works of fish of the species *E. alletteratus*, even with this species inhabiting the entire Brazilian coast.

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