Calyptospora sp. in Brachyplatystoma vaillantii
trapped at the Vigia, State of Pará, Brazil

Calyptospora sp. em Brachyplatystoma vaillantii capturadas no município de Vigia, Estado do Pará, Brasil

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Abstract

The article describes the first occurrence of hepatic coccidiosis in catfish of the species Brachyplatystoma vaillantii, captured in the coastal region of the Vigia city, state of Pará, Brazil, caused by species of the genus Calyptospora, family Calyptosporidae. Thirty specimens of piramutabas were examined where 60% were infected with liver location, featuring numerous mature and immature oocysts, grouped or isolated, with four sporocysts in pyriform shape. They were described on their morphology and dimensions of the oocysts and sporocysts, obtained from light microscopy and differential interference contrast.

Keywords: Coccidiosis, Brachyplatystoma vaillantii, Calyptospora, Piramutaba, liver.

Resumo

O artigo descreve a primeira ocorrência de coccidiose hepática em bagres da espécie Brachyplatystoma vaillantii, capturados na região costeira do Município de Vigia, Estado do Pará, Brasil, causada por espécies do gênero Calyptospora, família Calyptosporidae. Foram examinados trinta exemplares de piramutabas, dos quais 60% encontravam-se parasitados com localização hepática, apresentando vários oocistos maduros e imaturos, agrupados ou isolados, com quatro esporocistos de formato piriforme. São descritas as características morfológicas e dimensões dos oocistos e esporocistos, obtidas a partir de microscopia de luz em campo claro e em contraste interferencial de fases.

Palavras-chave: Coccidiose, Brachyplatystoma vaillantii, Calyptospora, Piramutaba, fígado.

Coccidia comprise a large group of obligate intracellular parasites frequently found in all classes of vertebrate hosts as well as in some invertebrates. Some pathogenic and parasitic forms affect mollusks and fish (MATOS et al., 2004). Indeed, coccidia are common in marine and freshwater fish including the genus Calyptospora (DAVIES; BALL, 1993; MOLNÁR, 2006). The family Calyptosporidae was first described in fishes by Overstreet et al. (1984) and comprises only five species: Calyptospora funduli (OVERSTREET et al., 1984); C. empristica (FOURNIE et al., 1985); C. serrasalmi (CHEUNG et al., 1986); C. tucunarensis (BÉKÉSI; MOLNÁR, 1991), and C. spinosa (AZEVEDO et al., 1993).

Three species of the genus have been described parasitizing the liver of Brazilian fish: C. serrasalmi in Serrasalmus niger (CHEUNG et al., 1986), C. tucunarensis in Cichla ocellaris (BÉKÉSI; MOLNÁR, 1991), and C. spinosa in Crenicichla lepidota (AZEVEDO et al., 1993). Moreover, Bonar et al. (2006) reported the occurrence of Calyptospora sp. and Dawwestrema cycloicistrium (Ancyrocephalinae) in seven juvenile specimens of fish species Arapaima gigas (aka pirarucu) which were exported from Manaus to the USA and became ill died four to six weeks after arrival showed lesions mainly in the liver, gills, brain, and gastrointestinal tract. Further, among the most common parasites found in the Amazon fish, Azevedo et al. (1993) found C. spinosa in fish of the species Hoplosternum littorale (aka tamoatá) and in Crenicichla lepidota (aka jacundá), all naturally occurring in the Amazon River basin.
There is a lack of studies on ictioparasitoses in fish of high economic value such as the one contemplated by this study (Piramutaba Brachyplatystoma vaillantii). Such knowledge is important to correlate disease outbreaks with biotic and abiotic factors and for implementation of necessary mitigation measures to avoid or minimize the impact on fish stocks. Thus, the objective of this study was to describe the morphology of Calyptospora oocysts found in the liver of B. vaillantii, by conventional light microscopy and differential interference contrast and thereby to make an initial assessment of the coccidiosis affecting this fish from the Amazon River basin.

Material and Methods

Thirty specimens of B. vaillantii weighing 380-450 g and measuring between 28.5 and 45.5 cm were captured in the estuary at the Municipality of Nazareth Vigia in the State of Pará, Brazil (00° 51’ S and 48° 08’ W) by fishermen and donated to this study. The specimens were necropsied following the methods described by Azevedo et al. (1993). To highlight the oocysts, sporocysts, and sporopodium contours we employed differential interference (Nomarski) optics.

Results and Discussion

In fresh preparations of the 18 B. vaillantii specimens found positive for liver coccidiosis and, a large amount of grouped and isolated spherical oocysts were observed (Figure 1a). In many cases, the host hepatic parenchyma was replaced by numerous groups of oocysts, distributed irregularly. Azevedo et al. (1993) found infections in which the liver of the host C. lepidota also held numerous groups of oocysts of Calyptospora sp. arranged irregularly in the liver parenchyma.

The main organ affected by Calyptospora sp. in the examined fish was the liver, corroborating the findings reported for Arapaima gigas (ALBUQUERQUE; BRASIL-SATO, 2010), C. lepidota (AZEVEDO et al., 1993; 1995), C. ocellaris (BÉKÉSI; MOLNÁR, 1991), fishes of the genus Serrasalmus (CASAL et al., 2007), S. niger (CHEUNG et al., 1986), and Fundulus notti (FOURNIE et al., 1985). The prevalence of infected livers disease was 60%, a finding similar to the rates reported by Azevedo et al. (1993) and Békési and Molnár (1991) in studying the infectious diseases caused by Calyptospora in fish species.

Morphological analysis revealed several groups of spherical oocysts, each containing four piriform sporocysts (Figure 1c), within which sporozoites and sporodiuim with lateral projections were found (Figure 1b). Similar findings were reported previously by Azevedo et al. (1993) in C. lepidota, parasitized by C. spinosa. These findings are expected for the genus Calyptospora, which was originally shown to infect fish species by Overstreet et al. (1984).

Measurements showed that the mean diameter of oocysts was 20.8 µm, and the mean length and width of sporocysts were 8.9 and 4.15 µm, respectively. The biometric data obtained from sporulated oocysts were similar to those described by Fournie et al. (1985) regarding C. empristica, Duszynski et al. (1979) for C. funduli, Cheung et al. (1986) for C. serralalmi, Békési and Molnár (1991) for C. tucumanresis, Azevedo et al. (1993) for C. spinosa, Bonar et al. (2006) for Calyptospora sp. and Albuquerque and Brasil-Sato (2010) for Calyptospora sp.

Table 1 shows the comparative biometric data regarding sporulated oocyst size and shape, and sporocyst length and
width, of the *Calyptospora* species described in the literature. A new morphological and structural description of *C. serrasalmi* revealed mean oocyst diameter of 25.4 µm (CASAL et al., 2007). Although the mean oocyst size found in the present study is smaller than that reported by Casal et al. (2007), it is similar to that described for *C. spinosa* by Azevedo et al. (1993). Analyses of shape and size of spocysts revealed they were similar to those reported for *C. serrasalmi* by Cheung et al. (1986) and *Calyptospora* sp. by Bonar et al. (2006), both studying Brazilian fishes.

The morphological and biometrical characteristics of the oocysts and sporocysts observed by light and Normaski microscopy, suggest that they belong to species of the genus *Calyptospora* since coccidia oocysts of this taxonomic category are spherical and of similar size; and each contain four sporocysts. This finding corroborates the evidence reported by Azevedo et al. (1993), who noted the morphological similarity between sporocysts of *C. fundulea, C. empristica, C. serrasalmi*, and *C. tucunarensis*, also observed in this study.

**Conclusion**

This study extend the occurrence of *Calyptospora* sp. for a new Neotropical host, the piramutaba *B. vaillantii*.

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**References**


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**Table 1. Comparative measurements of sporulated oocysts and sporocysts of the genus *Calyptospora***

<table>
<thead>
<tr>
<th>Species</th>
<th>Origen</th>
<th>Oocyst diameter (µm)</th>
<th>Form</th>
<th>Sporocyst (µm)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>C. empristica</em></td>
<td>USA</td>
<td>19.6-24.5</td>
<td>Elliptical</td>
<td>7.0-9.5</td>
<td>Fournie et al. (1985)</td>
</tr>
<tr>
<td><em>C. fundulea</em></td>
<td>USA</td>
<td>20.0-31.0</td>
<td>Ovoid</td>
<td>9.0-11.0</td>
<td>Duszynski et al. (1979)</td>
</tr>
<tr>
<td><em>C. serrasalmi</em></td>
<td>Brazil</td>
<td>22.0-25.0</td>
<td>Piriform</td>
<td>10.0-11.5</td>
<td>Cheung et al. (1986)</td>
</tr>
<tr>
<td><em>C. tucunarensis</em></td>
<td>Brazil</td>
<td>23.0-26.0</td>
<td>Racket, Elliptical</td>
<td>7.2-9.1</td>
<td>Békési and Molnár (1991)</td>
</tr>
<tr>
<td><em>C. spinosa</em></td>
<td>Brazil</td>
<td>21.1-23.4</td>
<td>Elliptical</td>
<td>8.9-9.5</td>
<td>Azevedo et al. (1993)</td>
</tr>
<tr>
<td><em>Calyptospora</em> sp.</td>
<td>Brazil</td>
<td>16.0-22.0</td>
<td>Piriform</td>
<td>8.0-10.0</td>
<td>Bonar et al. (2006)</td>
</tr>
<tr>
<td><em>Calyptospora</em> sp.</td>
<td>Brazil</td>
<td>24.5</td>
<td>-</td>
<td>11.5</td>
<td>Albuquerque and Brasil-Sato (2010)</td>
</tr>
<tr>
<td><em>Calyptospora</em> sp.</td>
<td>Brazil</td>
<td>20.8</td>
<td>Piriform</td>
<td>8.9</td>
<td>Current study</td>
</tr>
</tbody>
</table>

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