Two new species of Henneguya Thélohan, 1892 (Myxozoa, Myxobolidae), parasitic on the gills of Hoplosternum littorale (Callichthyidae) and Cyphocharax gilbert (Curimatidae) from the Guandu River, State of Rio de Janeiro, Brazil

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ABSTRACT

Two new species of Henneguya (Myxozoa) were described from specimens collected on the gills of Hoplosternum littorale (Hancock, 1828) (Callichthyidae) and Cyphocharax gilbert (Quoy and Gaimard, 1824) (Curimatidae), from Guandu River, State of Rio de Janeiro, Brazil. The species described were compared with the related species of the genus. The new species of Henneguya parasitic on H. littorale has cysts with synchronous development, the spore body was 14.6 (11.4-16.7) μm long by 6.5 (4.9-7.9) μm wide. The total length of the spore was 33.6 (27.3-38.1) μm and each valve had a caudal process measuring 19.0 (15.6-22.5) μm. The larger polar capsule was 4.4 (3.3-5.6) μm long by 2.0 (1.6-2.3) μm wide, the smaller polar capsule was 4.1 (3.3-5.3) μm long by 2.2 (1.5-2.8) μm wide. Each polar filament with 3-6 coils. The new species of Henneguya parasitic on C. gilbert has cysts with synchronous development, the spore body was 11.3 (7.7-13.4) μm long by 4.4 (2.9-6.3) μm wide. The total length of the spore was 35.1 (29.6-44.4) μm and each valve had a caudal process measuring 23.7 (20.8-31.5) μm. The larger polar capsule was 5.2 (4.2-6.3) μm by 1.9 (1.5-2.3) μm wide, the smaller polar capsule was 4.5 (3.4-5.2) μm long by 1.7 (1.3-2.2) μm wide. Each polar filament with 7-9 coils. The characteristics of these species were compared with all the species described so far.

Key words: Henneguya guanduensis n. sp., Henneguya cyphocharax n. sp., Guandu River, Myxozoa, Brazil.

INTRODUCTION

Currently, Myxozoa contain 52 genus, many of them are parasites of fish. Henneguya, is the second largest within Myxozoa and it contains about 150 described species. Eiras (2002) listed 146 species in Henneguya. Since then, more nine species were described parasitic Brazilian

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freshwater fishes\textsuperscript{3-11}. In total, there are currently 29 species described for Brazilian fishes\textsuperscript{12-17}. This number is surprisingly low when compared with the high number of fish species in Brazilian rivers\textsuperscript{6}. The importance of these species as pathogens of freshwater fish has been described by several authors\textsuperscript{18}. In 1997, occur the report of spores of \textit{Henneguya salminicola} in human stool specimens, but no exist evidence that these parasites are capable of causing disease in humans\textsuperscript{19}.

None species of \textit{Henneguya} was recorded from Guandu River, which is the most important source of water supply of the city of Rio de Janeiro and characterized as the fluvial system with the highest fish biodiversity in the Basin Hydrographic of the Bay of Sepetiba\textsuperscript{19}.

During a parasitological survey of fishes of Guandu River, were collected numerous cysts of Myxozoan on the gills of \textit{Hoplosternum littorale} and \textit{Cyphocharax gilbert}. In the present paper, two new species of \textit{Henneguya} are described and illustrated.

\section*{MATERIAL AND METHODS}

Between May 2004 to February 2005, were collected 100 specimens of \textit{H. littorale} and 60 specimens of \textit{C. gilbert} from the River Guandu (22°48'32"S, 43°37'35"W), State of Rio de Janeiro, Brazil. Once obtained, the fish were conditioned in boxes containing ice, to assure adequate conditions for the collection of the parasites and transport to laboratory. The fish were thoroughly dissected under a compound microscope and all the organs were inspected for the presence of parasites.

Thirty free spores from freshly prepared material obtained from different fish specimens were measured using a micrometer (Wild-PZO) 15X, coupled to a microscopy Leitz Wetzalar - Dialux 20 EB under 10X for the measurement of the cysts and it aims at of immersion (100 X) for measurement of the spores. The micrographs were took using Olympus BX-51 microscope with Phase Contrast 100X.

The characteristics used for the description of the new species are according to Lom and Arthur\textsuperscript{21}. The spores were treated with Lugol solution to determine the presence of iodoniphilous vacuoles in the sporoplasma. For the detailed observation, description and drawing of the species, the spores were stained with Giemsa, according an standard protocol\textsuperscript{22}.

The syntypes are deposited at the Coleção Helmintológica do Instituto Oswaldo Cruz (CHIOC), Rio de Janeiro, Brazil.

\section*{RESULTS}

\textit{Henneguya guanduensis} n. sp. (Figures 1 and 2)

Cysts polysporic 0.06-0.30 x 0.08-0.38 mm in diameter. Development was synchronous. Cysts in advanced stages contained only mature spores. Mature fresh spores surface smooth,
Two new species of *Henneguya* parasitic on the gills - V. D. Abdallah et al.

- Prevalence: 83 in 100 fishes were infected.
- Etymology: the specific name derives from the type locality.
- Syntypes: CHIOC N°.

**Henneguya cyphocharax n. sp. (Figures 3 and 4)**

Cysts polysporic 0.10-0.32 x 0.12-0.35 μm in diameter. Development was synchronous. Cysts in advanced stages contained only mature spores. Mature fresh spores surface smooth, symmetric valves. Total length 35.1 (29.6 - 44.4) μm, body length 11.3 (7.7 - 13.4) μm, body width 4.4 (2.9 - 6.3) μm, tail length 23.7 (20.8 - 31.5) μm. Distance from anterior extremity to polar capsule 1.2 (0.7-1.6) μm. Two polar

with symmetric valves. Total length 33.6 (27.3 - 38.1) μm, body length 14.6 (11.4 - 16.7) μm, body width 6.5 (4.9 - 7.9) μm, tail length 19.0 (15.6 - 22.5) μm. Distance from anterior extremity to polar capsule 1.5 (0.6-2.1) μm. Two polar capsules in the anterior pole of spore, unequal in size (_sizes_ ) and sporoplasm binucleate (binucleate) (--- = 10 μm).

- **Type host:** *Hoplosternum littorale*, Callichthyidae, “tamboatá”.
- **Type locality:** Guandu River, (22º48’32"S, 43º37’35"W), State of Rio de Janeiro, Brazil.
- **Site of infection:** Gills.

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**Figure 2.** Spore of *Henneguya guanduensis* n. sp. collected of gills of *Hoplosternum littorale* from Guandu River, State of Rio de Janeiro, Brazil; A- Tail open (open); B- Polar filament extrovert (open); C – Polar capsules, unequal in size (equal) and sporoplasm binucleate (open) (--- = 10 μm).

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**Figure 3.** Schematic drawing of spore of *Henneguya cyphocharax* n. sp.; A) polar capsules, B) polar filaments, C) nucleus, D) sporoplasm, E) vacuole and F) tail (--- = 10 μm).
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**Figure 4.** Spore of *Henneguya cyphocharax* n. sp. Collected of gills of *Cyphocharax gilbert* from Guandu River, State of Rio de Janeiro, Brazil; A- Polar capsules with polar filaments spiraled appearance (⇒); B- Sporoplasm with iodinophilous vacuole (⇒) and tail (⇒); C- Polar capsules, unequal in size (⇒) with filament extrovert (⇒) (≈ 10 μm).

Capsules in the anterior pole of spore, well unequal in size, elongate, anterior extremity tapered. Polar capsules near one of the other if leaning; Larger 5.2 (4.2 - 6.3) μm long, 1.9 (1.5 - 2.3) μm wide; smaller 4.5 (3.4 - 5.2) μm long, 1.7 (1.3-2.2) μm wide; 7 - 9 coils in the polar filament, perpendicularly, with spiraled appearance. Tail not bifurcated at the end of spore body. Iodinophilous vacuole present. Sporoplasm binucleate. Mucous envelope absent.

- **Type host:** *Cyphocharax gilbert*, Curimatidae, “sairú”.
- **Type locality:** Guandu River, (22°48’32”S, 43º37’35”W), State of Rio de Janeiro, Brazil.
- **Site of infection:** Gills.
- **Prevalence:** 51 in 60 fishes were infected.
- **Etymology:** the specific name derives from the name of the host species.
- **Syntypes:** CHIOC Nº.

**DISCUSSION**

*Henneguya guanduensis* n. sp. was first compared with the other *Henneguya* species described from Brazilian fishes. Only three species showed a general morphology and total length similar to *H. guanduensis* n. sp.: *H. adherens* Azevedo and Matos, 1995; *H. curimata* Azevedo and Matos, 2002 and *H. pellucida* Adriano, Arana and Cordeiro, 2005. *Henneguya adherens* described from *Acestrorhynchus falcatus* (Bloch, 1794) differ from *H. guanduensis* n. sp. because it has smaller length and width of polar capsules, smaller number of coils in the polar filament and asymmetry the valves. *Henneguya curimata* described from *Curimata inormata* Vári, 1989 is quite different from *H. guanduensis* n. sp. because it has the larger length and smaller width of polar capsules and higher number of coils in the polar filament. *Henneguya pellucida* described from *Piaractus mesopotamicus* differs from *H. guanduensis* n. sp. because it has smaller body length, larger tail and smaller body width (Table 1).

Our species was also compared with spore characteristics of 146 species of *Henneguya*, including listed by Eiras2. Only three species have morphology general and total length similar to *H. guanduensis* n. sp.: *H. laterocapsulata* Landsberg, 1987 in Israel, *H. mystusia* Sarkar 1985 in India and *H. nyongensis* Fomena and Bouix, 1996 in Cameroon. *Henneguya laterocapsulata* described from *Clarias lazer* Valenciennes, 1840 has smaller body width, larger length of polar capsules and larger size of cysts. *Henneguya mystusia* described from *Mystus* sp. differentiates by smaller body length and very much smaller body width, larger length and smaller width of polar capsules. Finally, *Henneguya nyongensis* described from *Marcusenius moorii* has smaller body length and smaller body width, larger tail and larger length of polar capsules (Table 1).

*Henneguya guanduensis* n. sp. was also compared with *H. amazonica*21 parasitizing the ovarian follicles from *Hoplosternum littorale*, but measurements are quite different compared with our species, showed larger tail length (45.4 μm), smaller length of polar capsules (3.3 μm) and smaller size of cysts (0.05 - 0.15).

The same comparison was accomplished to *Henneguya cyphocharax* n. sp. Only two species described from Brazilian fishes showed a general morphology and total length similar to *H. cyphocharax* n. sp.: *H. electrica* Jakowzka and Nigrelli, 1953 and *H. friderici* Casal, Matos and Azevedo 2003. *Henneguya electrica* described from *Electrophorus electricus* (Linnaeus, 1766)
### Table 1. Comparison of measurements (μm) from *Henneguya guanduensis* n. sp. with species from *Henneguya* more near morphologic

<table>
<thead>
<tr>
<th>Species</th>
<th>Total length</th>
<th>Body length</th>
<th>Tail length</th>
<th>Body width</th>
<th>Polar capsule</th>
<th>Number of polar capsules</th>
<th>Cyst site of infection</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(mm)</td>
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<td>(μm)</td>
<td>(μm)</td>
<td>in the polar</td>
<td>in the body of the polar</td>
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<tr>
<td><em>H. guanduensis</em> n. sp.</td>
<td>27.3-38.1</td>
<td>11.4-16.7</td>
<td>15.6-22.5</td>
<td>4.9-7.9</td>
<td>3.3-5.6</td>
<td>1.5-2.8</td>
<td>3-4</td>
<td>0.18x0.19 gills This study</td>
</tr>
<tr>
<td><em>H. adherens</em></td>
<td>32.3</td>
<td>12.4</td>
<td>20.5</td>
<td>5.8</td>
<td>3.1</td>
<td>1.2</td>
<td>3-4</td>
<td>0.2-0.3 gills Azevedo and Matos (1995)14</td>
</tr>
<tr>
<td><em>H. curimata</em></td>
<td>35.4</td>
<td>16.6</td>
<td>19.1</td>
<td>6.2</td>
<td>6.5</td>
<td>1.2</td>
<td>10-11</td>
<td>0.05-0.11 kidney Azevedo and Matos (2002)16</td>
</tr>
<tr>
<td><em>H. pellucida</em></td>
<td>33.3</td>
<td>11.4</td>
<td>24.1</td>
<td>4.1</td>
<td>4.0</td>
<td>1.6</td>
<td>-</td>
<td>0.5-3.0 gills Adriano et al. (2005)9</td>
</tr>
<tr>
<td><em>H. laterocapsulata</em></td>
<td>32.7</td>
<td>13.8-16.0</td>
<td>15.2-20.2</td>
<td>3.7-5.3</td>
<td>4.1-5.3</td>
<td>2.2-3.0</td>
<td>5-6</td>
<td>0.5-0.7 dermis Landsberg (1987)25</td>
</tr>
<tr>
<td><em>H. mystusia</em></td>
<td>32.3</td>
<td>12.0-15.0</td>
<td>17.0-25.0</td>
<td>3.0-4.0</td>
<td>5.0-6.0</td>
<td>1.0-1.3</td>
<td>-</td>
<td>0.1-0.2 gills Sarkar (1985)26</td>
</tr>
<tr>
<td><em>H. nyogensis</em></td>
<td>33.6</td>
<td>10.0-14.0</td>
<td>20.0-23.5</td>
<td>4.5-6.5</td>
<td>5.5-7.0</td>
<td>2.0-2.8</td>
<td>4-5.0-0.27</td>
<td>0.03-0.17 gills, muscle Fomena and Bouix (1996)17</td>
</tr>
</tbody>
</table>

### Table 2. Comparison of measurements (μm) from *Henneguya cyphocharax* n. sp. with species from *Henneguya* more near morphologic

<table>
<thead>
<tr>
<th>Species</th>
<th>Total length</th>
<th>Body length</th>
<th>Tail length</th>
<th>Body width</th>
<th>Polar capsule width</th>
<th>Number of polar capsules</th>
<th>Cyst site of infection</th>
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<td>(mm)</td>
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<td>(μm)</td>
<td>(μm)</td>
<td>in the polar</td>
<td>in the body of the polar</td>
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<tr>
<td><em>H. cyphocharax</em> n. sp.</td>
<td>29.6-44.4</td>
<td>7.7-13.420.8-31.5</td>
<td>2.9-6.3</td>
<td>3.4-6.3</td>
<td>1.3-2.3</td>
<td>7-9</td>
<td>0.21x0.23</td>
<td>gills This study</td>
</tr>
<tr>
<td><em>H. friderici</em></td>
<td>33.8</td>
<td>9.6-11.819.1-28.7</td>
<td>4.8-6.6</td>
<td>4.25-5.9</td>
<td>1.59-2.62</td>
<td>7-8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>H. australis</em></td>
<td>33.0</td>
<td>11-15</td>
<td>20.0</td>
<td>3-5</td>
<td>5-6</td>
<td>1-2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>H. shaharini</em></td>
<td>35.0</td>
<td>10.6-12.321.8-28.0</td>
<td>2.8-3.9</td>
<td>5.6-6.7</td>
<td>1.1-1.7</td>
<td>3-7</td>
<td>0.27x0.14</td>
<td>gills Shariff (1982)20</td>
</tr>
</tbody>
</table>

differs from *H. cyphocharax* n. sp. because it has larger body length, larger body width and smaller tail. *H. friderici* described from *L. friderici* differs from *H. cyphocharax* n. sp. because it has smaller length and larger body width, smaller number of coils of the polar filament and polar capsules in equal size (Table 2).

After the comparison with the spore characteristics of 146 species of *Henneguya*, listed by Eiras2, only two species had a morphology general and total length similar to *H. cyphocharax* n. sp.: *H. australis* Johnston and Bancroft, 1919 in Australia and *H. shaharini* Shariff, 1982 in Malaysia. *Henneguya australis* described from *Plectroplites ambiguus* Richar-
dson, 1845 has smaller tail length, smaller body width, larger body length and smaller length of polar capsules; Henneguya shaharini described from Oxyeleotris marmoratus (Bleeker, 1852) has very much smaller body width, larger length and smaller width of polar capsules and smaller number of coils of the polar filament (Table 2). Additionally H. cyphocharax n. sp. was compared with H. singhi Lalita-Kumari, 1969\(^2\) described in India from Notopterus osmanii Rahimullah and Das, 1991, due to the similarity of the general morphology and of some measured, in spite of the difference among the total length (51.3 $\mu$m), tail length (39.0 $\mu$m) and polar capsule length (5.7 $\mu$m), that healthy much larger than Henneguya cyphocharax n. sp.

Henneguya cyphocharax n. sp was also compared with H. garavelli Martins and Onaka, 2006 found parasitizing the gills from Cyphocharax nagelli, whose measures are quite different compared with our species, showed larger total length (46.6 $\mu$m), larger body length (13.6 $\mu$m), larger tail (33.0 $\mu$m) and larger length of polar capsules (5.4 $\mu$m).

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ANUNCIO

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