Henneguya schizodon n. sp. (Myxozoa, Myxobolidae), a parasite of the Amazonian teleost fish *Schizodon fasciatus* (Characiformes, Anostomidae)

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Summary:

A new histozoic species of myxosporean (*Henneguya schizodon* n. sp.) is described from the Amazon River teleost fish *Schizodon fasciatus* Spix & Agassiz, 1892 (Characiformes, Anostomidae). The plasmodia, which showed asynchronous development, were located in the kidney of the host. The spore body was ellipsoidal and was 13.1 (12-14) µm long by 3.3 (3-4) µm wide. The total length of the spore was 28.9 (27-30) µm, and each valve had a caudal process measuring 16.3 (15-17) µm. The polar capsules were 5.4 (5-6) µm long by 1.3 (1-1.5) µm wide, and each had a polar filament with 8-10 coils. The characteristics of the species were compared with nearly all the species described so far, including all the species reported from South American fishes. This comparison allows to consider the material as a new species, and the name *Henneguya schizodon* n. sp. is proposed.

KEY WORDS : *Henneguya schizodon* n. sp., Myxosporea, *Schizodon fasciatus*, fish, Amazon River, Brazil.

Résumé : Henneguya schizodon n. sp. (Myxozoa, Myxobolidae) parasite du poisson téléostéen de l'Amazone *Schizodon fasciatus* (Characiformes, Anastomidae)

*Une nouvelle espèce de myxosporidie (*Henneguya schizodon *n. sp.) est décrite chez* Schizodon fasciatus *Spix & Agassiz, 1892 (Characiformes, Anostomidae), poisson téléostéen de l'Amazone. Les plasmodes au développement asynchrone sont localisés dans le rein de l'hôte. La spore ellipsoïde mesure 13,1 (12-14) µm de long sur 3,3 (3-4) µm de large. Sa longueur totale atteint 28,9 (27-30) µm, chaque valve étant prolongée par une expansion caudale de 16,3 (15-17) µm. Les deux capsules polaires de 5,4 (5-6) µm de long sur 1,3 (1-1,5) µm de large contiennent un filament polaire à 8-10 tours de spires. Les caractéristiques de l'espèce ont été comparées à celles de la quasi totalité des autres espèces jusqu'ici décrites dont toutes celles rapportées chez les poissons sud-américains. Cette comparaison nous autorise à considérer notre matériel comme une nouvelle espèce que nous proposons de nommer* Henneguya schizodon *n. sp.*

MOTS CLÉS : Henneguya schizodon *n. sp.*, *Myxosporea*, Schizodon fasciatus, *poissons, Amazone, Brésil.*

INTRODUCTION

The genus *Henneguya* is the second largest within the Myxozoa. Eiras (2002) listed 146 species, and since then some more species were described. These parasites have a world-wide distribution and infect both freshwater and marine fish. For South American fishes relatively a few species are known, and all of them were described from Brazilian hosts (Vita *et al.*, 2003; Azevedo & Matos, 1995, 1996, 2002, 2003; Azevedo *et al.*, 1997; Barassa *et al.*, 2003; *Casal et al.*, 1997, 2003; Cordeiro *et al.*, 1984; Cordeiro & Gióia, 1987; Gióia & Cordeiro, 1987; Gióia *et al.*, 1986; Guimarães & Bergamin, 1933, 1934; Jakowska & Nigrelli, 1953; Kent & Hoffman, 1984; Martins & Souza, 1997; Nemeczek, 1926; Pinto, 1928; Rocha *et al.*, 1992) – for review see Gióia & Cordeiro, 1996, and Eiras, 2002. Some of the species described from Brazilian fish cannot be considered as *Henneguya* species because (i) the tail is unique, or (ii) the tail is not made of the same material as the shell valves as demonstrated by different staining properties. That is the case of *H. bergamini* (Guimarães, 1931), *H. cesarpintoi* (Guimarães, 1931), *H. fonsecai* (Guimarães, 1931), *H. iheringi* (Pinto, 1928) and *H. lutzi* (Cunha & Fonseca, 1918). In total, there are currently 24 species described for Brazilian fishes. This number is surprisingly low when compared with the high number of fish species in Brazilian rivers – about 8,000 species representing nearly 24 % of all fish species (Cellere *et al.*, 2002). Therefore, it is probable that a high number of myxozoan, as well as parasites belonging to other taxonomic groups, await for description.

In this paper we describe a new myxosporidian species, *Henneguya schizodon* n. sp. parasitizing the Amazonian teleost fish *Schizodon fasciatus* Spix & Agassiz, 1892 (Characiformes, Anostomidae).

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MATERIALS AND METHODS

Three specimens of *Schizodon fasciatus* were net-fished from the Amazon river, at Manaus, and transported to the laboratory. The specimens were thoroughly dissected under a compound microscope and all the organs were inspected for the presence of parasites. Measurements were made from fresh spores (30 specimens), and spores were observed under Nomarski differential interference-contrast. Infected organs were routinely processed for histology, and stained with Haemalumen and Eosin.

RESULTS

Two out of the three fish specimens were infected presenting in the kidney a high number of whitish, spherical plasmodia, measuring about 0.25-0.5 mm in diameter. The plasmodia could have a superficial location, or being embedded in the tissue.

Histologically it was observed that the plasmodia were surrounded by an homogeneous eosinophilic layer about 5 µm thick. The host tissue surrounding the plasmodia had a normal appearance. Development was asynchronous. The plasmodia contained different stages of generative cells and early sporogonic cells at the periphery, and immature and mature spores in the centre.

- Description of spores: mature fresh spores (Figs 1 and 2) had a spore wall thin and smooth, with symmetric valves, were ellipsoidal with total length 28.9 (27-30) µm, body length 13.1 (12-14) µm, body width 3.3 (3-4) µm, tail length 16.3 (15-17) µm. The two polar capsules, located in the anterior pole of the spore, were elongate, more or less cylindrical, presenting a round posterior extremity and tapered anterior extremity. They open close each other at the anterior end of the spores, were 5.4 (5-6) µm long by 1.3 (1-1.5) µm wide, and presented 8-10 coils in the polar filament, disposed obliquely to the axis of the polar capsule. The polar capsules were equal in size, but occasionally one of them was slightly shorter than the other. The tail bifurcates immediately after the end of the spore body.

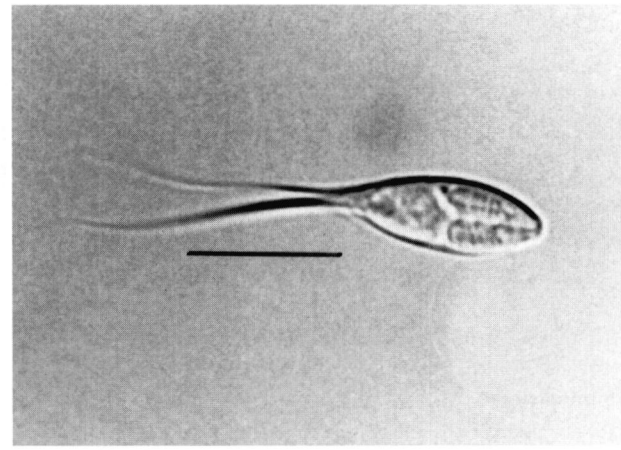

Fig. 2. – Spore of *Henneguya schizodon* n. sp. Bar = 10 µ.

- Host: teleost fish *Schizodon fasciatus* Spix & Agassiz, 1892.
- Locality: Amazon river, near Manaus, Brazil.
- Site of infection: kidney.
- Prevalence: two out of three fish were infected.
- Etimology: the specific name derives from the name of the host species.
- Specimens deposition: the syntipes are deposited at the "Coleção de Myxozoa do Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brasil", under the reference INPA-001, and in the Section of Animal Pathology from the Department of Zoology and Anthropology from the Faculty of Sciences of Porto, Portugal.

DISCUSSION

Our specimens conform with the characteristics of the genus *Henneguya* Thélohan, 1892. To identify the present species our material was first compared with the features of all the *Henneguya* species described from Brazilian fishes (Table I). The

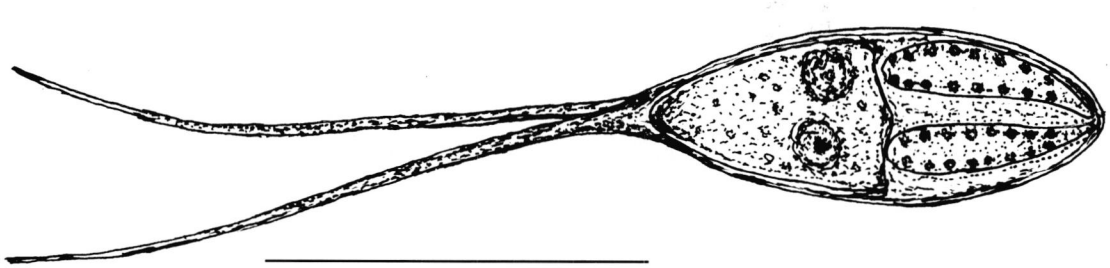

Fig. 1. – Schematic drawing of the spore of *Henneguya schizodon* n. sp. Bar = 10 µ.

	TL	BL	BW	TaL	LPC	WPC	NC	Host	Site of infection	Reference
H. adherens	32.3	12.4	5.8	20.5	3.1	1.2	3-4	*Acestrorhynchus falcatus*	Gills	Azevedo & Matos, 1995
H. amazonica	59.3	13.9	5.7	45.4	3.3	1.5	6	*Crenicichla lepidota*	Gills	Rocha *et al.*, 1992
H. artigasi	16.4	-	4.4	-	3.3	1.5	–	*Astyanax scabripinnis*	Gills	Gióia & Cordeiro, 1987
H. astyanax	47.8	15.2	5.7	32.6	5.0	1.5	8-9	*Astyanax keithi*	Gills	Vita *et al.*, 2003
H. curimata	35.4	16.6	6.2	19.1	6.5	1.2	10-11	*Curimata inormata*	Kidney	Azevedo & Matos, 2002
H. curvata	41.7	16.4	4.7	25.3	7.8	1.4	10-11	*Serrasalmus spilopleura*	Gills	Barassa *et al.*, 2003
H. electrica	35-39	11-13	6-8	24-27	5-7	2	–	*Electrophorus electricus*	Electric organs	Jakowska & Nigrelli, 1953
H. friderici	33.8	10.4	5.7	23.3	5.0	2.1	7-8	*Leporinus friderici*	Gills; sev. organs	Casal *et al.*, 2003
H. boimba	23.7	–	6.7	–	4.4	1.9	–	*Astyanax fasciatus*	Gills	Cordeiro & Gióia, 1987
H. intracornea	42.4	–	6.7	24.3	8.6	2.4	–	*Astyanax scabripinnis*	Eye (cornea)	Gióia *et al.*, 1986
H. leporini	28-33	13-15	5	15-18	5-8	–	–	*Leporinus mormyrops*	Urinary duct	Nemeczeck, 1926
H. malabarica	28.3	12.6	4.8	17.1	3.7	1.8	6-7	*Hoplias malabaricus*	Gills	Azevedo & Matos, 1996
H. occulta	36-46	16	8	20	8	–	–	*Loricaria* sp.	Gills	Nemeczeck, 1926
H. piaractus	52.5	12.7	3.6	41.2	6.7	1.2	8-9	*Piaractus mesopotamicus*	Gills	Martins & Souza, 1997
H. pilosa	54.2	21.1	5.9	33.1	7.4	1.2	11-12	*Serrasalmus altuvei*	Gills	Azevedo & Matos, 2003
H. pisciforme	20.4	–	6.1	10.7	4.3	1.7	–	*Hyphessobrycon anisitsi*	Gills	Cordeiro *et al.*, 1984
H. santae	21.0	9.6	5.3	11.2	2.5-3.5	–	–	*Tetragonopterus santae*	Gills	Guimarães & Bergamin, 1934
H. striolata	42.2	15.8	5.3	25.9	6.8	1.2	13-14	*Serrasalmus striolatus*	Gills	Casal *et al.*, 1997
H. testicularis	27.5	14.0	6.5	13.5	9.0	2	12-13	*Moenkhausia oligolepis*	Testes	Azevedo *et al.*, 1997
H. theca	48.0	24.8	3.5	23.2	11.1	1.4	–	*Eigemannia virescens*	Brain	Kent & Hoffman, 1984
H. travassosi	27.3	10.6	4.3	16.7	3.2-4.0	–	–	*Astyanax fasciatus*	Muscle	Guimarães & Bergamin, 1933
H. visceralis	22-24	11-12	5-6.5	11-12	6.5-8	2	–	*Electrophorus electricus*	Various	Jakowska & Nigrelli, 1953
H. wenyoni	21	11-12	5.2	10.8	3.7	1.5	–	*Tetragonopterus* sp.	Gills	Pinto, 1928
H. schizodon n. sp.	27-30	12-14	3-4	15-17	5-6	1-1.5	8-10	*Schizodon fasciatum*	Kidney	This study

Table I. – Features (measurements in µm) of the *Henneguya* species described from Brazilian fishes. TL, total length; BL, body length; BW, body width; TaL, length of the tail; LPC, length of the polar capsules; WPC, width of the polar capsules; NC, number of coils of the polar filament.

species *H. linearis* (*Myxobolus linearis Gurley*, 1893) Labbé, 1899 described from *Rhamdia sebae* and *Pseudoplatystoma fasciatum* was not considered once it is not sufficiently characterised and does not allow comparison with other species. Only four species have a total length similar to our material: *H. leporini* (Nemeczek, 1926), *H. malabarica* (Azevedo & Matos, 1996), *H. testicularis* (Azevedo *et al.*, 1997) and *H. travassosi* (Guimarães & Bergamin, 1933). *H. leporini* differs from our specimens because it has larger spores, as well as larger body length and body width, and longer polar capsules. *H. malabarica* differentiates by the quite smaller polar capsules, not attaining the minimum values observed in our material, which are always wider and present a smaller number of coils in the polar filament (6-7 instead of 8-10). Besides, it has a wider body. *H. testicularis* is quite different having larger body width, very much larger polar capsules, and higher number of coils in the polar filament (12-13 instead of 8-10). Finally, *H. travassosi* has a smaller body length, a larger body width and clearly smaller polar capsules. Therefore our material is different from all the species described from Brazil so far.

Our specimens were also compared with the spore characteristics of 146 species of *Henneguya*, including nearly all the known species (Eiras, 2002). The species presenting a total length similar to our specimens are *H. chrysichthyi* (Obiekezie & Enyenihi, 1988), *H. dini* (Kabré *et al.*, 1997) and *H. mbouensis* (Kpatcha *et al.*, 1997) all of them described from African hosts. *H. chrysichthyi* has larger body length (13.7-16 µm), larger body width (4.6-6.3 µm), larger polar capsules width (1.6-2.2 µm), and has a shorter tail (10-15 µm). *H. dini* has smaller body length (11-12 µm), the tail is considerably larger (16-20 µm) and the number of coils of the polar filament is smaller (5-8). *H. mbouensis* is clearly different by having a shorter body length (10-11 µm) and very much wider body (6.5-9 µm), shorter (3.5-5 µm) and larger (2-3.2 µm) polar capsules, a larger tail (20-22.5 µm), and the polar filament forms only 4-5 coils. Besides, *H. mbouensis* was described from a marine host (*Dentex canariensis*).

The comparison between the species shows that none of the above species are identical with that reported in the present study. Furthermore, all the other species listed by Eiras (2002), including nearly all the known species, are also quite different comparing with our observations.

Considering these data we believe that our material represents a new species and the name *Henneguya schizodon* n. sp. is proposed.

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