

Description of Two New Myxosporean Species Parasitic in Freshwater Fishes from the Yangtze River in China

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Summary. Two new species of myxosporeans (Myxosporea: Myxidiidae), *Myxidium tuanfengensis* sp. n. and *Zschokkella saurogobionis* sp. n., parasitic in freshwater fishes collected from the Yangtze River of China are described in this paper. *M. tuanfengensis* was found in the liver parenchyma and intestine lumen of *Leptobotia taeniops* Sauvage, 1878, while *Z. saurogobionis* was found in the gall bladder of *Saurogobio dumerili* Bleeker, 1871. The diagnostic characters of *M. tuanfengensis* are: round or elliptical polysporous plasmodia averaging 118 µm in size; spore oval in frontal view with smooth surface and nearly spindle-shape in sutural view with slightly sinuous sutural ridge, averaging 19.5 x 9.75 x 8.9 µm in size; two large spherical polar capsules 6.8 µm in diameter, with polar filament wound in 4 to 5 coils. The diagnostic characters of *Z. saurogobionis* are: spore elliptical in both frontal and sutural view measuring 18.3 x 9.8 x 10.8 µm in size; fine sutural ridge in S-form, spore shell marked with 10 to 12 distinct lines paralleled with the sutural line; two spherical polar capsules, 6.7 µm in diameter, with polar filament in 5 coils.

Key words: fish parasite, myxosporean, Myxidiidae, *Myxidium tuanfengensis* sp. n., *Zschokkella saurogobionis* sp. n.

INTRODUCTION

Although the parasite fauna of the fresh water fishes in lower and middle branches of the Yangtze River of China have been described by many authors (Nie *et al.* 1999, 2000; Yao 2001), the protozoan parasites in fishes of these river stretches are still little known. Nevertheless, it is necessary to obtain data on protozoan infection in fish in order to recognize pathogenicity inflicted by many of them on commercial and aquarium fish as

described by Zhao and Song (2001). While re-examining samples of myxosporean parasitic in freshwater fishes collected at the town of Tuanfeng in Huanggang City, Hubei Province, China, two of them have been found to be new members of the family Myxidiidae. This paper describes the two new myxosporean species of the genera *Myxidium* and *Zschokkella*.

MATERIALS AND METHODS

The host fishes, *Leptobotia taeniops* Sauvage, 1878 and *Saurogobio dumerili* Bleeker, 1871, which kept in 10% buffered formalin, were collected from the branches water of Yangtze River at the town of Tuanfeng in Huanggang City, Hubei Province, China, during the investigations on the fauna of parasites from freshwater fishes of the

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Yangtze River in 1981-1985 (Hsieh 1988, Yu and Wu 1989). All body organs were examined and twenty spores of each myxosporean were measured with an eyepiece micrometer. Permanent preparations were fixed with absolute methanol and stained with Giemsa. Illustrations were drawn with the aid of camera Nikon FDX-35 and all the measurement are in micrometers (μm).

RESULTS AND DISCUSSION

Myxidium tuanfengensis sp. n. (Figs 1-5)

Diagnosis: round or elliptical polysporous plasmodia 118 (100-130) \pm 8.7 in diameter.

Trophozoites: polysporous plasmodia (Fig. 1).

Spore: spore oval in frontal view with smooth surface, both anterior and posterior ends rounded, nearly spindle in sutural view with the sutural ridge slightly sinuous; spores measure 19.5 (18.0-20.8) \pm 0.8 x 9.75 (9.1-10.4) \pm 0.6 x 8.9 (8.8-9.2) \pm 0.1 in size; two large spherical polar capsules with polar filament wounded in 4 to 5 coils; no iodophilous vacuole.

Host: *Leptobotia taeniops* Sauvage, 1878.

Prevalence: 6 of 12 fish examined was infected (50%).

Site of infection: liver parenchyma and intestine lumen.

Locality: Tuanfeng Town (30° 30' N, 111° 05' E) of the Huanggang City in Hubei province, China.

Date of sampling: June 1984.

Type specimens: syntypes on slide No. B018, deposited in the Laboratory of Fish Diseases, Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan, China.

Etymology: the name of this species has been derived from the sampling site, Tuanfeng Town.

Taxonomic affinities

Bütschli (1882) was the first to establish the genus *Myxidium*. Up to now, 69 species of the genus have been reported from freshwater fish in China (Chen and Ma 1998). Species of this genus share the following characters: spore spindle-shaped or close to spindle-shaped with polar capsules in both ends in front view; most species are coelozic and usually have straight sutural line.

In the light of the morphologically similar forms, the following species should be compared with our species: *Myxidium songtaoensis* Xiao et Feng, 1997; *M. macrocapsulare* Auerbach, 1910 and

M. tongrenensis Feng et Xiao, 1996. *M. songtaoensis* differs from our form in having elongated elliptical spores, smaller in length (12.0-16.0) and in width (6.9-7.5) as well as in having 6-7 striations parallel to the sutural ridge (Xiao and Feng 1997). *M. macrocapsulare* can be distinguished by possessing striations on shell surface and smaller spores (10.0-12.0 x 6.0) (Auerbach 1910a). *M. tongrenensis* appears distinctly different from our species in bearing 8-10 striations parallel to the sutural ridge and smaller spores (10.5-12.0 x 5.5-6.5) (Xiao and Feng 1997). Our new species is distinguished by the following features: (A) larger dimension of spores and (B) smooth shell surface. Furthermore, *Leptobotia taeniops* Sauvage, 1878 is a new host for myxosporeans in China according to the published articles (Table 1).

Zschokkella saurogobionis sp. n. (Figs 6-9)

Diagnosis: larger dimension of spores.

Trophozoites: not observed.

Spore: spore elliptical in both frontal and sutural view with 18.3 (17.2-19.2) \pm 1.0 x 9.8 (9.0-10.8) \pm 0.8 x 10.8 (10.2-11.5) \pm 0.6 in size; fine sutural ridge in S-form, stretching from one end to the other end, spore shells marked with 10 to 12 distinct striations parallel to the sutural line; two spherical polar capsules, 6.7 \pm 0.5 (6.2-7.2) in diameter, with polar filament in 5 coils; no iodophilous vacuole.

Host: *Saurogobio dumerili* Bleeker, 1871.

Prevalence: 9 of 10 fish examined was infected (90%).

Site of infection: gall bladder.

Locality: Tuanfeng Town (30° 30' N, 111° 05' E) of the Huanggang City in Hubei province, China.

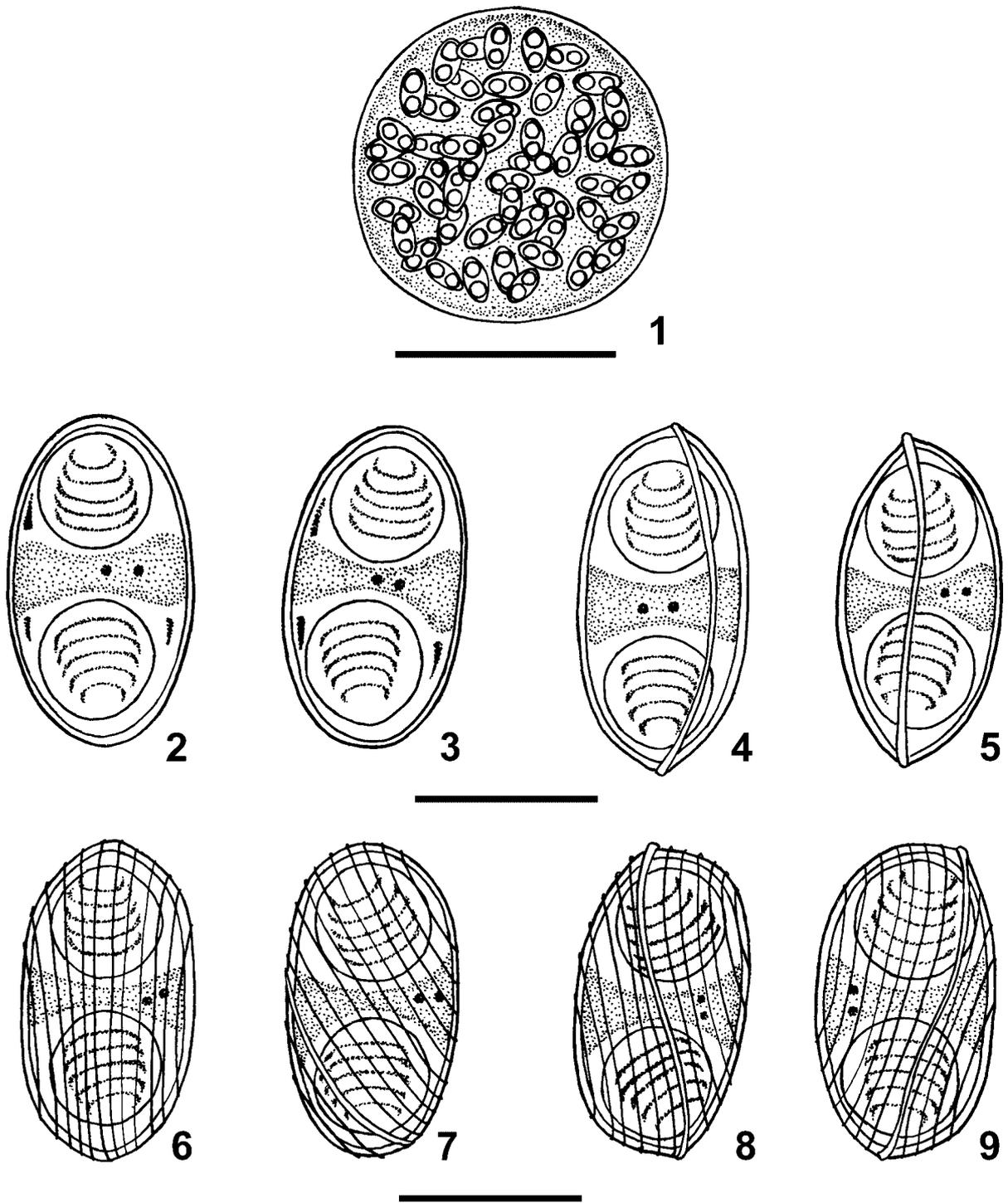
Date of sampling: June 1984.

Type specimens: syntypes on slide No. C009, deposited in the Laboratory of Fish Diseases, Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan, China.

Etymology: this species has been named after the fish host, *Saurogobio dumerili* Bleeker, 1871.

Taxonomic affinities

Auerbach (1910b) established the genus *Zschokkella* in which the spores were elliptical (or close to elliptical) or oval (or close to oval) with two round polar capsules and curved sutural line. Since then, 24 species were reported in China (Chen and Ma 1998). According to the spore shape, three species, *Zschokkella striata* Schulman, 1962; *Z. parasiluri* Fujita, 1927 and *Z. nova*



Figs 1-5. *Myxidium tuanfengensis* sp. n.: **1** - polysporous plasmodia; **2, 3** - mature spore in front view; **4, 5** - mature spore in sutural view. **Figs 6-9.** *Zschokkella saurogobionis* sp. n.: **6, 7** - mature spore in front view; **8, 9** - mature spore in sutural view. Scale bars 100 μm (1); 10 μm (2-9).

Table 1. Comparison of the related species of *Myxidium Bütschli, 1882* with *M. tuanfengensis* sp. n. D - diameter, L - length, T - thickness, W - width (all measurements in μm).

Species	Host	Infection locus	Shape of spore	Size of spore	Size of PC ^b	Striations on SS ^c	Data on source
<i>M. tuanfengensis</i> sp. n.	<i>Leptobotia taenitops</i>	Liver parenchyma and intestine lumen	Oval	L: 19.5 (18.0-20.8) \pm 0.8 ^a W: 9.75 (9.1-10.4) \pm 0.6 T: 8.9 (8.8-9.2) \pm 0.1	D: 6.8 (5.7-7.8) \pm 0.5	None	Present paper
<i>M. songtaoensis</i> Xiao et Feng, 1997	<i>Pseudorasbora parva</i>	Gall bladder	Elongated elliptical	L: 12.0-16.0 W: 6.9-7.5	L: 4.5-5.1 W: 4.5-5.0	6-7, parallel to the sutural ridge	Xiao and Feng 1997
<i>M. macrocapsulare</i> Auerbach, 1910	<i>Scardinius erythrophthalmus</i>	Gall bladder	Elongated elliptical	L: 10.0-12.0 W: 6.0	D: 3.0-4.0	Possessing	Auerbach 1910a
<i>M. tongrenensis</i> Feng et Xiao, 1996	<i>Gnathopogon argentatus</i>	Gall bladder	Close to spindle	L: 10.5-12.0 W: 5.5-6.5	L: 3.4-4.0 D: 3.2-4.0	8-10, parallel to the sutural ridge	Xiao and Feng 1997

^a Mean \pm SD (Min-Max); ^b polar capsule; ^c shell surface

Table 2. Comparison of the related species of *Zschokkella Auerbach, 1910* with *Z. saurogobionis* sp. n. D - diameter, L - length, T - thickness, W - width (all measurements in μm).

Species	Host	Infection locus	Shape of spore	Size of spore	Size of PC ^b	Striations on SS ^c	Data source
<i>Z. saurogobionis</i> sp. n.	<i>Saurogobio dumerili</i>	Gall bladder	Elliptical	L: 18.3 (17.2-19.2) \pm 1.0 ^a W: 9.8 (9.0-10.8) \pm 0.8 T: 10.8 (10.2-11.5) \pm 0.6	D: 6.7 (6.2-7.2) \pm 0.5	10-12, parallel to the sutural line	Present paper
<i>Z. striata</i> Schulman, 1962	<i>Pseudogobio rivularis</i>	Gall bladder	Elliptical	L: 12.9-14.0 W: 6.3-7.0	L: 4.2-5.6 W: 3.8-4.2	Possessing	Chen and Ma 1998
<i>Z. parasiluri</i> Fujita, 1927	<i>Parasilurus asotus</i>	Gall bladder	Elliptical	L: 11.94-14.0 W: 4.0-6.0	L: 3.7-5.0 W: 3.5-4.5	5-6, parallel to the sutural line	Chen and Ma 1998
<i>Z. nova</i> Klokecewa, 1914	<i>Carassius vulgaris</i>	Gall bladder	Pointed elliptical	L: 9.5-11.5 W: 6.5-7.0	D: 3.0-3.5	8-11, parallel to the sutural line	Klokecewa 1914

^a Mean \pm SD (Min-Max); ^b polar capsule; ^c shell surface

Klokachewa, 1914 should be compared with our new species. *Z. parasiluri* differs our species with distinctly fewer striations on the shell surface and smaller spores (11.94-14.0 x 4.0-6.0) while *Z. striata* differed our species from elliptical-shaped and smaller size of spores (12.9-14.0 x 6.3-7.0) (Chen and Ma 1998). *Z. nova* has pointed elliptical, smaller spores (9.5-11.5 x 6.5-7.0) and polar capsules (diameter: 3.0-3.5) when compared with our new species (Klokacewa 1914). In addition, the species mentioned above were obtained from different hosts and *Saurogobio dumerili* Bleeker, 1871 is a new host for *Zschokkella* in China (Table 2).

In view of the differences described in this paper, the two myxosporeans species are considered as new species when we consulted related published papers.

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