

Isolation and Diagnosis of the Myxozoa Parasitizing in some Fish Species in Tigris River at Salah Al-Din Governorate, Iraq

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ABSTRACT

The currently study was achieved from February 2021 to end January 2022 to investigate the external and intestinal parasites in some fish species of Tigris river passing Tikrit city. During the period of this study, 580 fish were collected that belonged to seven families and 16 species. These fish are represented 45 *Acanthobrama marmid*, 40 *Alburnus sellal*, 30 *Arabibarbus grypus*, 65 *Carasobarbus luteus*, 55 *Chondrostoma regium*, 60 *Cyprinion kais*, 60 *Cyprinius carpio*, 50 *Leuciscus vorax*, 21 *Luciobarbus xanthopterus*, 14 *Squalius Lepidus*, 13 *Mystus pelusius*, 10 *Silurus triostegus*, 10 *Heteropneutes fossilis*, 12 *Mastacembelus mastacemblus*, 30 *Coptodon zilli* and 65 *Planiliza abu*.

This study diagnosis 12 species of *Myxobolus*: *M. bouixi*, *M. bramae*, *M. branchiophilus*, *M. cyprinicola*, *M. dispar*, *M. ellipsoides*, *M. infundibulatus*, *M. koi*, *M. magnus*, *M. molnari*, *M. musculi*, and *M. shaerica*.

Keywords- Myxozoa, fish parasite, Isolation, external parasites.

I. INTRODUCTION

The study of fish parasites in any aquatic systems is important because it directly binds to the importance of fishes, which are infected by these harmful organisms. Parasites are important, since they affect fish productivity via mortalities, reduce growth percentage, decrease the value of fish meat and rise fish susceptibility to more pathogenic agent. Since the word is about to get a lot more crowded, all food stuffs including fishes, become ever more worthy as they are considered a cheap source of animal protein (1).

Phylum myxozoa are protozoan parasites, and are very common in freshwater and marine fishes, divided into two class including: class Myxosporea which parasitize of vertebrates particularly fishes, often toxic imports for their host (2), and class Actinosporea which parasitize of invertebrates specially Oligochaetes and Polychaetes (3).

Myxosporidia are obligate parasites characterized by spores comprised of several cells arranged into 1 to 7 spore shell valves, 1 to 2 amoeboid infective germ cells, with 2 to 7 nematocyst like polar capsules, each of which contains a coiled extrude polar filament with an anchoring function (4). Around 64 genera, with approximately 2000–2500 species, have been described in hosts from tropical, temperate and polar regions (5).

Myxosporidia are carefully important group of parasites, which cause disease in a large variety of commercially important fishes, and are responsible for enormous losses of eggs, fries and fingerlings of freshwater fishes, and cause high mortality rates in farmed fish. Also, they cause production losses and some fishes do not have to be consent because they are disgusting and not considered to be suitable for human feeding (6).

II. MATERIAL AND METHODS

The samples of this study involves 580 fish were collected randomly from four various locations (Baji, Tikrit, Aoenat and Al-Tharthar lake) during the period from beginning of February 2021 to the end January 2022. Fish were caught randomly by using gillnets to get a live fish. Fish have been fetched weekly.

After getting to positive smears in infected fish (gills and skin), samples were taken for fixative alcohol 70%, while some other spores were fixed in absolute methanol for 2-8 minutes, and then staining them with Giemsa solution for about 25- 30 minutes in accordance (7). Spore dimensions were determined with the help of the computer program (Motic Image Plus) and images of spores recorded on videotape were transformed into digital camera images (8). Myxosporidia parasites were identified according to the following references: (9, 10, 11, 12, 13).

III. RESULTS AND DISCUSSION

Myxozoans are highly specialized cnidarian parasites, Spore spherical, ovoid, ellipsoid or pyriform in the front view, two polar capsules in anterior part. They have a polar filament coiled in spiral shape. Sporoplasm with iodophile vacuole.

Myxozoans are highly specialized metazoan parasites of aquatic hosts with a very wide host range. This diverse group of organisms is characterized by multicellular spores with polar capsules containing extrudable polar filaments. Interest in this group has intensified along with the development of aquaculture since many species cause serious disease outbreaks in farmed fish species, in both freshwater and marine environments. Different fish-parasitic myxosporidian is characterized by varying degrees of host specificity, while most Myxosporidian species are tissue-specific parasites, includes an intracellular stage and form spore within the cell. *Myxobolus* species develop in large plasmodia which on the surface or in organs such as gills, fins, skin, eyes, heart, muscles, gall-bladder, kidneys, spleen, liver, a wall of the intestine, urinary bladder, testis and Ovaries. The presence of myxosporidia was related to epithelial hyperplasia, the fusion of lamellae, hyperplasia of mucous cells, inflammation and other pathological changes (14).

12 species of this genus were recorded in this study:

3.1. *Myxobolus bouixi* Fomena, Folefack & Tang, 2007

This spore was recorded from gills of *C. regium* with a percentage of infection 10.90% (Table 1). spores were sub spherical, The inter capular process was absent. The polar capsules were ovoid and of equal size, occupying a nearly 1/3 of the spore length. length of spores 10.2-11.1 μm , width 9.9-10.0 μm , length of polar capsules 3.7-4.0 μm , and their width 2.7-3.0 μm (Figure 1).

First report of this parasite from Iraqi freshwater fish was from *C. luteus* from from Tigris River in Al-Kamirah region at north of Baghdad (15). This parasite of any fish species was not recorded later in Iraq (16). *C. regium* was considered a new host and represented as a second host in Iraq.

3.2. *Myxobolus bramae* Reuss, 1906

This parasite was isolated from gills and skin of *C. luteus* with a percentage of infection 7.69% (Table 1). Spore ellipsoid widely with two equal polar capsules, length of spores 11.2-13 μm , width 9.1-9.2 μm , length of polar capsules 4.2-5.5 μm , and their width 2.5-3.5 μm .

First report of this parasite from Iraqi freshwater fish was from *Luciobarbus xanthopterus* (reported as *B. xanthopterus*) from Al-Qadisiya Dam Lake, west of Baghdad (17). Later, it was recorded from eight other hosts (16) which included *C. luteus*. This host was the first time recorded in Salah Al-Din.

3.3. *Myxobolus branchiophilus* Abdel-Ghaffar, El-Toukhy, Al-Quraishy, Al-Rasheid, Abdel-Baki, Hegazy & Bashtar, 2008

This spore was recorded from gills of *C. luteus* with a percentage of infection 3.07% (Table 1). Spore pyriform, anterior end and posterior rounded. Polar capsules lamonian shape equal in size and occupy first half spore body. Length of spores 10.5-11.1 μm , width 6.2-6.4 μm , length of polar capsules 5.3- 5.5 μm and their width 1.6- 2.1 μm (Figure 2). This parasite was recorded for the first time in Iraq from gills of *A. grypus* from Tigris River in Al-Kamirah region at north of Baghdad (15). This parasite was not recorded from any host later in Iraq(16). It was considered a new host and represented as a second host in Iraq.

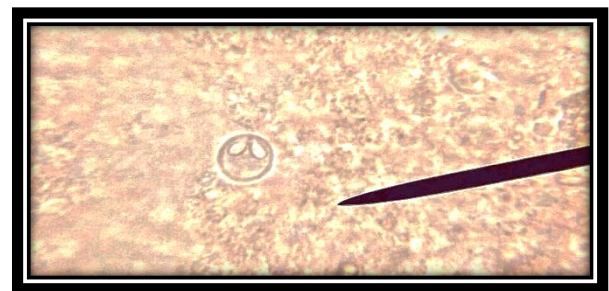


Figure 1: Spore of *M. bouixi* in gills (1000x).

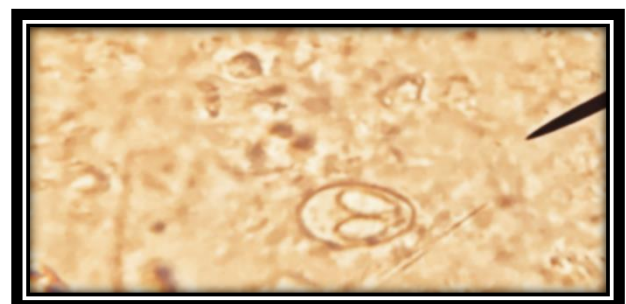


Figure 2: Spore of *M. branchiophilus* in gills (1000x).

3.4. *Myxobolus cyprinicola* Reuss, 1906

This type of *Myxobolus* was isolated from gills and intestine of *C. regium*, with a percentage of infection 7.27% (Table 1). Spores oval with short pyriform polar capsules. Length of spores 8.6- 12.0 μm , width 7.1- 8.4 μm , length of polar capsules 2.7-4.3 μm , their width 1.2 - 2.3 μm .

The spore of this parasite was recorded for the first time in Iraq from fins and gills of *C. carpio* from Dokan Lake (18). Then it was recorded from thirteen other hosts (16) which included *C. regium*. This host was the first time recorded in Salah Al-Din.

3.5. *Myxobolus dispar* Th elohan, 1895

This parasite was recorded from intestine of *C. regium*, with a percentage of infection 1.81% (Table 1). Spore ovate, with tapered and round anterior end. polar capsular pyriform. Small inter capsular process visible between them. Length of spore 10.5-11.5 μm , width 8-9.5. μm length of polar capsules 5-6, 2.5- 4.5 μm (Figure 3).

It was reported for the first time in Iraq of *C. regium* from Tigris River in Salah Al- Din (19). Also, it was recorded from twelve other hosts (16). It has been considered that second time recorded in Salah Al-Din

3.6. *Myxobolus ellipsoides* Th elohan, 1892

This spore was recorded from gills and skin of *P.abu* with a percentage of infection 12.30 % (Table 1). Spores elongated oval-extended, round at anterior pole, but narrow toward posterior end. Polar capsules pyriform occupy in first half of spore body. Length of spores 10.5-11.4 μm , width 8.3- 8.3 μm , length of polar capsules 4.2-4.3 μm and their width 2.2 μm .

This parasite was recorded for the first time in Iraq from gills, intestine, spleen and liver of *C. macrostomum* from Al-Diwania River in Al-Qadisiya province (20). Afterwards, it was reported from other four fish species in Iraq, *P. abu* was not involved from them . So, it has considered a new host in Iraq and recorded the first time in Salah Al Deen.

3.7. *Myxobolus infundibulatus* Donec & Kulakovskaya, in Shulman, 1962

This spore was recorded from gills of *P.abu* with a percentage of infection 15.38 % (Table 1). Spore oval, occasionally with tapering posterior end. Polar capsules pyriform. Length of spores 13.2-13.3 μm , width 12-12.4 μm , length of polar capsules 6.9- 7 μm , width 5.7- 5.6 μm (Figure 4).

It was reported for the first time in Iraq from gills of *M. sharpeyi* from Tigris River in Al-Kamirah region at north of Baghdad (15). This parasite was not recorded from any host later in Iraq(16). It was considered a new host in Iraq , represented as a second host and also considered the first time in Salah Al Deen.

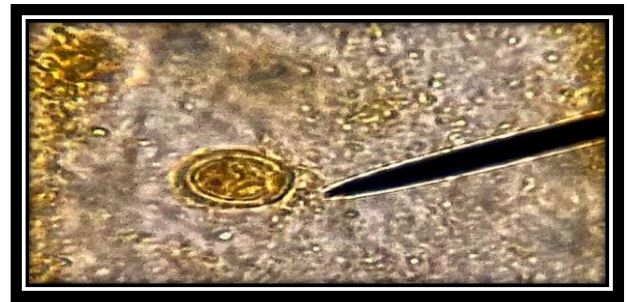


Figure 3: Spore *M. dispar* in intestine (1000x).

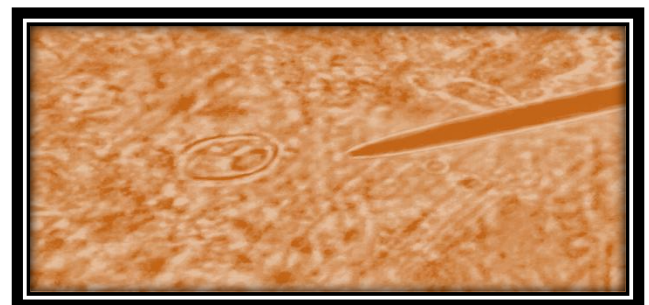


Figure 4: Spore *M. infundibulatus* in gills (1000x).

3.8. *Myxobolus koi* Kudo, 1919

This *Myxobolus* was isolated from gills and skin of *C. regium* with a percentage of infection 10.90 % (Table 1). Spore pyriform, large with equal pyriform polar capsules. Length of spore 11.5-12.1 μm , width 6.0-6.3 μm , length of polar capsules 4.3-5.2 μm , and their width 4.1 μm .

This species was recorded for the first time in Iraq from *Silrus glanis* from Tigris River at Mosul province (21). Then it was reported from other six fish species in Iraq, *C. regium* was not involved from them . So, it has considered a new host in Iraq, acted eighth host and recorded the first time in Salah Al Deen.

3.9. *Myxobolus magnus* Averintsev, 1913

This parasite was recorded from skin of *C. luteus*, with a percentage of infection 7.69% (Table 1). Spores oval, with slightly tapering but blunted anterior end, broad in sutural plane. ends of pyriform polar. Length of spore 10.1- 10.5 μm , width 8.1-8.5 μm , length of polar capsules 4.3- 4.9 μm (Figure 5).

It was reported for the first time in Iraq from gills of *C. luteus* from Tigris River in Al-Kamirah region at north of Baghdad (15). This parasite was not recorded from any host later in Iraq(16). It was considered a new host in Iraq and also considered the first time in Salah Al Deen.

3.10. *Myxobolus molnari* Baska and Masoumian, 1996

This spore was recorded from gills of *A. grypus*, with a percentage of infection 16.66% (Table 1). Spores spherical, rounded anterior and posterior pole, polar capsules pyriform, equal in size and occupy first half of spore cavity. Length of spores 6.5-6.9 μm , width 5.0-5.6 μm , length of polar capsules 2.5-3.6 μm and their width

1.9-2.1 µm. It was reported for the first time in Iraq from gills, skin and ovaries of *L. esocinus* from Lesser Zab River (22). After that two fish species have recorded not involving *A. grypus* (16.). It was considered a new host in Iraq, represented fourth host and also considered the first time in Salah Al Deen.

3.11. Myxobolus musculi Keysselitz, 1908

This spore was recorded from gills of *A. grypus* *C. regium*, with a percentage of infection 5.45% (Table 1). Spores ovate, rounded anterior end, polar capsules lamonian shape, unequal in size. Length of spores 9.1-11 µm, width 7.2-8.0 µm, length of large polar capsule 4.0-6.0 µm and that of smaller 3.5-5.0 µm, width of large polar capsule 3.6 µm and that of smaller 2.4 µm.

This parasite was recorded for the first time in Iraq from gills of both *C. regium* and *C. macrostomum* from Tigris River at Tikreet city (23). Afterwards, it was reported from other eight fish species in Iraq(16). In the currently study, this host was recorded the second time in Salah Al Deen.

3.12. Myxobolus shaerica Fujita, 1924

This spore was recorded from gills of *A. grypus*, with a percentage of infection 13.33% (Table 1). Spores round with conspicuous sutural ridge. Polar capsules approximated, converging at pointed ends to terminate in juxtaposition atv anterior pole. Length of spores 9-11 µm, width 9.5- 11 µm, length of polar capsule 5-5.5 µm.

The first record of this parasite in Iraq was from gills of *C. regium* (misspelled as *C. regius*) from Tigris river at Baiji city (19). Then it was reported from other fourteen fish species in Iraq(16). *A. grypus* was involved from them . So, it was recorded the first time in Salah Al Deen.

<i>M. bramae</i>	<i>C. luteus</i>	65	5	7.69	Gills-skin
<i>M. branchiophilus</i>	<i>C. luteus*</i>	65	2	3.07	Gills
<i>M. cyprinicola</i>	<i>C. regium</i>	55	4	7.27	Gills-intestine
<i>M. dispar</i>	<i>C. regium</i>	55	1	1.81	Intestine
<i>M. ellipsoidea</i>	<i>p. abusus*</i>	65	8	12.30	Gills-skin
<i>M. infundibulatus</i>	<i>p. abusus*</i>	65	10	15.38	Gills
<i>M. koi</i>	<i>C. regium*</i>	55	6	10.90	Gills
<i>M. magnus</i>	<i>C. luteus</i>	65	5	7.69	Skin
<i>M. molnari</i>	<i>A. grypus*</i>	30	5	16.66	Gills
<i>M. musculi</i>	<i>C. regium</i>	55	6	10.90	Gills
<i>M. shaerica</i>	<i>A. grypus</i>	30	4	13.33	Gills

*New host record in Iraq

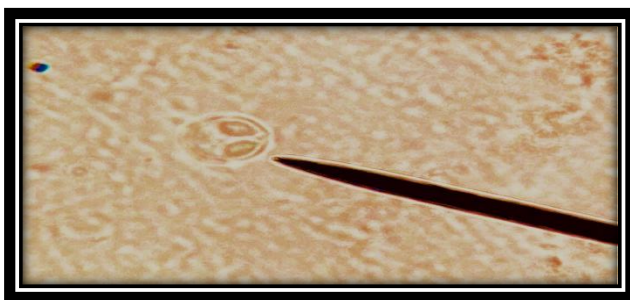


Figure 5: Spore of *M. magnus* in skin (1000x)

Table 1: Distribution of Myxosporidian parasites in different sites of infections and their prevalence on fish species of Tigris River at Tikrit city.

Parasite	Fish species	Fish no.		Prevalence %	Infection
		Total	Infection		
<i>M. bouixi</i>	<i>C. regium*</i>	55	6	10.90	Gills

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