

## Recording of *Myxobolus gigi* (Fujita, 1927) Shulman, 1962 (Myxozoa: Myxobolidae) from Gills of the Common Carp *Cyprinus carpio* as a Second Host in Iraq

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**Abstract:** The Myxozoan parasite *Myxobolus gigi* (Fujita, 1927) Shulman, 1962 is recorded in the gills of the common carp *Cyprinus carpio* Linnaeus, 1758 as a new host in Iraq. The samples were caught from Al-Graiat region at the Tigris river in Baghdad city during the period from July 2015 to March 2016. The measurements and description of this external parasite in addition to its illustrations are given.

**Keywords:** Myxozoa, *Myxobolus gigi*, *Cyprinus carpio*, Tigris river, Baghdad, Iraq

### Introduction

Myxozoans are multicellular, microscopic, spore-forming metazoan parasites, exist as pseudocysts in tissues (histozoic) or between tissues (coelozoic). These pseudocysts which can be occur in various host epithelial tissues (fins, cartilages, muscles, gut, gallbladder, kidneys and brain), are in form of white to pale yellow pustules and can be seen on the affected parts of the body (Kaur & Singh, 2008-2009; Gupta & Kaur, 2017). These metazoan parasites which belong to the phylum Myxozoa according to Lom & Dykova (2006), are the plentiful and assorted group of parasites, infecting fishes, reptiles, amphibians as well as human beings (Boreham et al., 1998). There are approximately 2,200 nominal species of Myxozoans belonging to 64 genera and 17 families (Fiala et al., 2015). *Myxobolus* Bütschli, 1882 is the largest genus in Myxozoa, with 856 nominal species, infects firstly fishes, both freshwater and marine species, all over the world. (Eiras et al., 2005, 2014).

In Iraq, the first work on fish parasites was done by Herzog (1969) who studied 16 different species of fishes collected from different locations in Iraq and noticed 16 species of parasites, among them, he described the occurrence of three myxozoan parasites namely *Myxobolus muelleri*, *M. multiplicatus* (reported as *Myxosoma multiplicata*) and *M. oviformis*. After that several studies were carried

out, among which some reported new records of *Myxobolus* species in Iraq (Abdul-Ameer, 1989; Abdullah, 1990, 1997; Al-Zubaidy, 1998; Abdullah, 2002; Abdullah & Mhaisen, 2005; Al-Nasiri, 2008; Al-Salmany, 2015; Atwan, 2016; Rasheed, 2016; Al-Saadi & Mohammed, 2017; Hammood, 2017; Hendi, 2017; Mohammed, 2017; Bdair, 2018; Abbas, 2019; Abbas & Abdul-Ameer, 2019; Abdul-Ameer & Atwan, 2019; Hameed & Abdul-Ameer, 2019; Mansoor, 2019, Mansoor et al., 2020). A recent checklist of *Myxobolus* species infecting fishes of Iraq (Mhaisen & Al-Jawda, 2020) indicated that 97 species of this genus in addition to some unidentified species of the same genus are so far known from 43 valid fish species.

The myxozoan parasite *M. gigi* was firstly recorded in Iraq in the spleen of *Carasobarbus luteus* from Tigris river Baghdad city by Mansoor (2019) who erroneously reported its authority as Fujita, 1927 instead of (Fujita, 1927) Shulman, 1962. The present investigation describes the first record of an additional host for this parasite in Iraq from gills of *Cyprinus carpio*, to be considered as the second host, from Al-Graiat location at the Tigris river in Baghdad city.

### Materials and Methods

A total of 42 samples of the common carp *C. carpio* were caught weekly from Tigris river in Baghdad city near Al-Graiat location during the period from July 2015 to March 2016. Fish samples were brought alive to the laboratory of College of Education for Pure Science, University of Baghdad and examined for myxozoan infection. Fresh smears the external parts (gills and surface of the body) and all internal organs (intestine, gallbladder, kidneys and liver) of fishes were examined macroscopically for visible plasmodia (vegetative stages). When they were found, they were isolated and examined microscopically for the presence of spores. Fresh spores were isolated from tissue cysts, some spores were put into glycerol-gelatin to obtain permanent slides, while some other spores were examined, drawn and measured in live state. Spores were described and measured according to the guidelines of Lom & Arther (1989). Drawings were made by a camera Lucida. All measurements are given here in  $\mu\text{m}$  as: minimum-maximum (mean) values. The scientific name of the parasite was used according to Eiras et al. (2005). The information on the previous records of myxozoans of fishes of Iraq was obtained from the index-catalogue of parasites and disease agents of fishes of Iraq (Mhaisen, 2020).

### Results and Discussion

*Myxobolus gigi* was obtained from gills of *C. carpio* with a prevalence of 0.8% and a mean intensity of 2. The following is the description and measurements (in  $\mu\text{m}$ , based on five specimens) of this parasite.

### Plasmodia (Figure 1)

Plasmodia of this parasite are dark, small and oval to spherical cysts, mostly found between secondary lamellae of gills and measured 0.06-0.12 (0.09) mm in diameter.

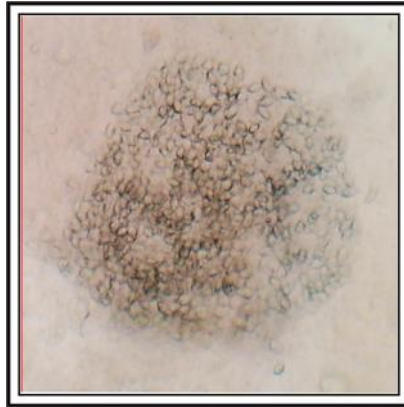


Figure 1: Photomicrograph of plasmodium of *Myxobolus gigi* (400x).

### Spore Description (Figure 2)

The spores are pyriform with acuminate anterior end. Length of spore 12.2-13.8 (13), width 6.2-7.4 (6.7), thickness 5. Sporoplasm agranular and homogenous taking most of the extracapsular area behind the two polar capsules. Polar capsules pyriform, unequal in size, located posteriorly from tip of spore, highly elongated, having a rounded posterior end, length of larger polar capsule 6.1-7.8 (6.95), diameter 2.6-3.2 (2.9), length of smaller polar capsule 4.9-6.3 (5.6) and diameter 2-2.6 (2.3). There is triangular shaped, small and conspicuous intercapsular process at the frontal tip of the spore.

The descriptions and measurements of the present *M. gigi* are in agreement with those mentioned by Bykhovskaya-Pavlovskaya et al. (1962) from kidneys of Chinese banded catfish (*Tachysurus fulvidraco*), Ussurian catfish (*Pelteobagrus ussuriensis*), Brazhnikov's (least) catfish (*Tachysurus brashnikowi*) and Amur catfish (*Silurus asotus*) in Amur river basin.

In Iraq, studies of fish parasites of *C. carpio* from diverse water bodies, so far, showed the existence of eleven species belonging to the genus *Myxobolus* (Mhaisen, 2020). The following is an alphabetically-arranged list of these species with the mention of only the first record from *C. carpio* in Iraq: *M. cyprinicola* (Abdullah, 1997), *M. dispar* (Mohammad-Ali et al., 1999), *M. dogieli* (Al-Rubaie et al., 2003), *M. gigi* (Mansoor, 2019), *M. intrachondrealis* (Bannai et al., 2005), *M. muelleri* (Al-Zubaidy, 1998), *M. musculi* (Al-Jawda & Asmar, 2013), *M. oviformis* (Al-Zubaidy, 1998), *M. parvus* (Abdullah, 1997), *M. pfeifferi* (Ali et al., 1987), *M. punctatus* (Al-Daraji et al., 1999) and *M. squamae* (Atwan, 2016).

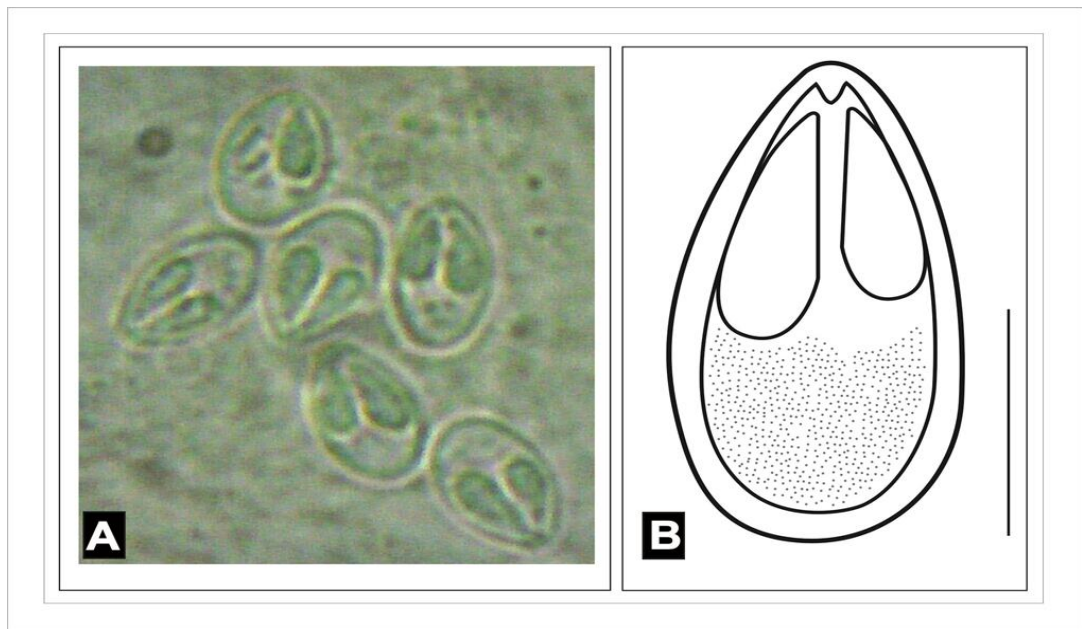


Figure 2: *Myxobolus gigi* from *Cyprinus carpio*. A: Photomicrograph (400x). B- Camera Lucida drawing (Scale bar = 7  $\mu$ m).

With the present record, *M. gigi* has now two host species in Iraq: *C. luteus* by Mansoor (2019) and Mansoor et al. (2020) and *C. carpio* of the present investigation. In this respect, it is so strange to read that Al-Mansoor (2019) recorded no any *Myxobolus* infection neither from *C. carpio* nor from *Coptodon zillii* (erroneously reported by its synonym *Tilapia zillii*) from four locations along Tigris river within Baghdad city, although she reported 31 different *Myxobolus* species from five other fish species from the same locations. Such negative *Myxobolus* infection indicated by Mansoor (2019) is contradictive with previous records of different *Myxobolus* species from *C. carpio* from Tigris river at Baghdad city alone (Al-Jawda & Asmar, 2013; Atwan, 2016; Abbas, 2019) as well as from other locations in Iraq (Abdullah, 1990, 1997; Ali et al., 1987; Mhaisen & Abul-Eis, 1991; Mhaisen et al., 1993; Al-Zubaidy, 1998; Abdul-Rahman, 1999; Al-Daraji et al., 1999; Asmar et al., 1999; Mohammad-Ali et al., 1999; Abdullah, 2000, 2002; Al-Jadoaa, 2002; Mhaisen et al., 2002; Al-Rubaie et al., 2003; Asmar et al., 2003; Balasem et al., 2003; Abdullah, 2004; Abdullah & Mhaisen, 2005; Bannai et al., 2005; Al-Zubaidy, 2007; Hussain et al., 2011a, b; Eassa et al., 2014; Al-Nowfal, 2017; Jawdhira et al., 2017; Al-Nowfal et al., 2018) in addition to the infection of *C. zillii* with one *Myxobolus* species from Tigris river at Baghdad city (Sheyaa, 2019). So, more surveys on fish parasites are needed to identify more new species and more new hosts and increase our knowledge on the parasitic fauna of fishes of Iraq.

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