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FIRST RECORD OF THREE OF *MYXOBOLUS* BÜTSCHLI, 1882 SPECIES (MYXOZOA: MYXOSPOREA) IN IRAQ FROM THE GILLS OF THE CYPRINID FISH *ARABIBARBUS GRYPUS* (HECKEL, 1843)

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Abstract

Sampling of *Arabibarbus grypus* (Heckel, 1843) specimens were collected from the Tigris River at Al-Taji Beach north of Baghdad Province during the period from July until November 2018. The examination of gills of these fishes showed the occurrence of three myxosporean species which were documented for the first time in Iraq. These included: *Myxobolus lussi* Akhmerov, 1960, *Myxobolus naffarri* Abdel Ghaffar, Ibrahiem, Bashtar & Ali, 1998 and *M. szekeli* Kaur & Singh, 2011. The description and measurements of these parasites were given as well as their illustrations.

Key words : Myxozoa, *Myxobolus*, *Arabibarbus grypus*, Tigris River, Baghdad.

Introduction

Myxosporeans are the common parasites of marine and freshwater fishes, considered to be one of the most abundant and diverse group of fish parasites infecting fishes, amphibians, reptiles as well as human beings (Boreham *et al.* 1998; Eiras *et al.*, 2010). Myxozoans are microscopic, multicellular, spore-forming occur as pseudocysts within (histozic) or in between tissues (coelozoic), these pseudocysts are in form of white to pale yellow pustules on the affected parts of the body and can be seen by the naked eyes in various host epithelial tissues such as scales, fins, gut, cartilage, gall-bladder muscles, kidney and brain (Gupta and Kaur, 2017; Kaur and Singh, 2009).

In Iraq, the first surveys on fish parasites from different Iraqi inland revealed the record of two myxosporean species namely *M. muelleri*, M. *multiplicatus* and *M. oviformis* (Herzog, 1969). Later on, several studies on parasites of fishes from different inland waters as well as some fish ponds and farms were carried out revealed the record of many of *Myxobolus* species reported for the first time in Iraq (Mhaisen, 2019). The followings are some of these parasite species which are chronologically arranged with their first records from freshwater fishes: *M. dogieli* and *M. nemachili* (Abdul-Ameer, 1989), *M. poljanski* (Abdullah, 1990), *M. karuni* and *M. persicus* (Abdullah, 2002), *M. drjagini* (Balasem *et al.*, 2002), *M. diversus* (Jori, 2007), *M. chondrostomi*, *M. karelicus*, *M. oreintalis* and *M. schulmani* (Al-Nasiri, 2008), *M. alienus* (AL-Salmany, 2015), *M. bizerti*, *M. branchialis*, *M. chuatsi* (Atwan, 2016), *M. episquamalis* (Hammood, 2017), *M. carassii* (Hendi, 2017), *M. permagnus* (Mohammed, 2017), *M. buckei*, *M. caudatus*, *M. erythrophthalmi*, *M. fahmii*, *M. gobiorum*, *M. ichkeulensis*, *M. khrokhini*, *M. saugati* and *M. sclerai* (Abbas, 2019).

The present investigation deals with the describes the first record of an additional three myxosporeans species for the first time in Iraq from gills of the *Arabibarbus grypus* (Heckel, 1843), from the Tigris River at Al-Taji Beach north of Baghdad Province.

Materials and Methods

A total of 18 specimens of *Arabibarbus grypus* were collected weekly from the Tigris River at Al-Taji Beach north of Baghdad Province (33° 27' 19' N, 44° 20' 58' E) during the period from July until November 2018. The fishes were transported alive to the laboratory and were

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identified according to Coad (2010) then freshly examined. Skin and gill smears, in addition of, internal organs smears (intestine, gallbladder, kidneys and liver) were macroscopically examined for myxosporean species. Vegetative structures (plasmodia) when found, were carefully removed, placed on a slide with drop of distilled water, ruptured and covered with cover slips and microscopically examined for the presence of spores. Fresh spores were isolated and examined, then drawn and measured in a live state. Part of the spores was placed into glycerol-gelatine on a slide under a cover slip. For permanent specimens, the spores were fixed in absolute methanol for two to eight minutes and then stained with Giemsa solution for about 25 to 30 minutes, then washed in tap water and dried (Saha and Bandyopadhyay, 2017).

Spores were described and measured according to the guidelines of Lome and Arther (1989). Scientific names of parasites were used according to Eiras *et al*. (2005, 2014). The ecological terms calculated according to Bush *et al.* (1997). Drawings were made with the aid of camera Lucida. All measurements are given in ìm as: minimum- maximum (mean) values. Updating the scientific name of fishes according to Froese & Pauly (2019). The information on the previous account records of myxozoans of fishes of Iraq were reviewed with the index-catalogue of parasites and disease agents of fishes of Iraq (Mhaisen, 2019) by a correspondence via e-mail.

Results and Discussion

The inspection of *Arabibarbus grypus* revealed their infection with three species of myxosporean species which belonging to the genus *Myxobolus* Bütschli, 1882. The following is a brief account on their description, measurements (in ìm based on five specimens for each species) and the prevalence of infection for these parasites which were recorded here for the first time in Iraq.

***Myxobolus lussi* Akhmerov, 1960**

This parasite was isolated from gills of *A. grypus* with a prevalence of 5.5 %. The following is an account on its description and measurements as shown in Fig. 1.

Spores elongatedly oval, slightly narrowing at anterior and posterior poles. Pyriform polar capsules relatively large, length of spore 11.2-11.8 (11.5), width 7.5-8.1 (7.8). Length of polar capsules 5.2-5.6 (5.4), width 2.2-2.6 (2.4). There is visible intercapsular process at the anterior apex of the spore.

***Myxobolus naffari* Abdel Ghaffar, Ibrahiem, Bashtar & Ali, 1998**

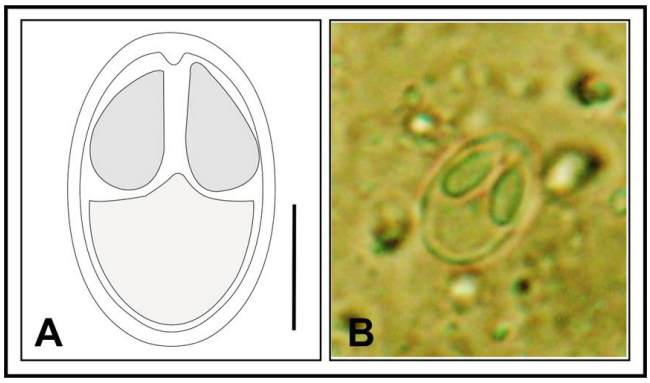

Fig. 1: *Myxobolus lussi*
A. Diagrammatic drawing of spore (Scale bar = 4.8 µm)
B. Photomicrograph of spore (400x)

This parasite was isolated from the gills of *A. grypus* with a prevalence of 5.5%. The following is an account on its description and measurements as shown in Fig. 2.

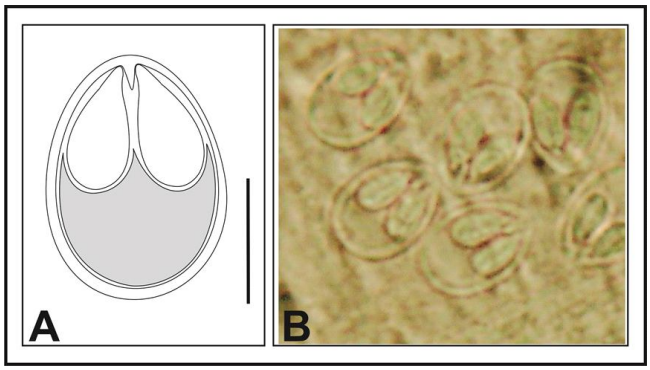

Fig. 2: *Myxobolus naffari*
A. Diagrammatic drawing of spore (Scale bar =5.8 µm)
B. Photomicrograph of spore (400x)

Spores were subspherical to elliptical in frontal view length of spore 11.2-11.8 (11.5), width 8.2-8.6 (8.4). Polar capsules were oval, equal in size and occupying nearly half of the spore length. Length of polar capsules 5.2-5.8 (5.5), width 2.8-3.6 (3.2). A small intercapsular process was present.

***Myxobolus szekeli* Kaur & Singh, 2011**

This parasite was isolated from the gills of *A. grypus* with a prevalence of 11.1%. The following is an account on its description and measurements as shown in Fig. 3.

The spores are elongatedly ovoidal in valvular view having tapering, bluntly pointed anterior end and rounded posterior end. Polar capsules are equal, tubular with blunt anterior and rounded posterior ends. Polar capsules and occupies nearly half of the spore body cavity, length of spore 8.4-9.0 (8.7), width 4.8-5.4 (5.1). Length of polar capsules 4.0-4.4 (4.2), width 1.5-1.7 (1.6). An intercapsular process is absent. Sporoplasm is a granular

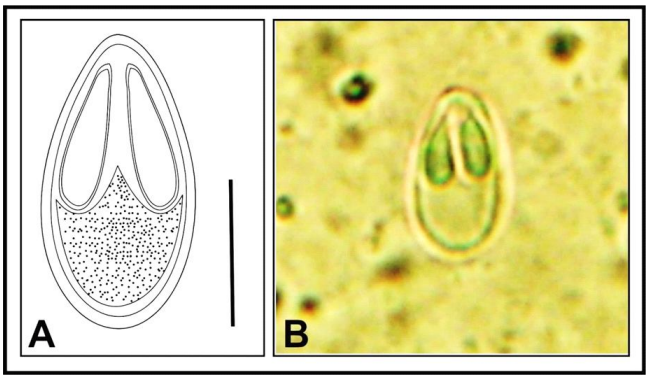

Fig. 3: *Myxobolus szekeli*

A. Diagrammatic drawing of spore (Scale bar = 4.4 μm)

B. Photomicrograph of spore (400x)

and homogenous occupying whole of the extracapsular space behind the polar capsules.

Discussion

The measurements of the present parasites *M. lussi* in agreement with those of the same of these parasites reported by Bykhovskaya-Pavlovskaya *et al*. (1962) from gills and fins of Amur long-whiskered and Amur common gudgeon from Amur River basin. The descriptions and measurements of the present *M. naffari* are showed agreement with those described by (Mohammed *et al*., 2002) from gills of *Labeo niloticus* from Nile river in Egypt. *M. szekeli* measurements in present study are likely be agreement with the same parasite reported by (Kaur & Singh, 2011) from internal wall of the stomach of *Wallago attu* from Harike wetland, Punjab, India.

Depending on to the index-catalogue of parasites and disease agents of fishes of Iraq (Mhaisen, 2019), the current records of *M. lussi*, *M. naffari* and *M. szekeli* appear as their first records in Iraq as no previous records were known for any of these parasites from fishes of Iraq.

In Iraq, surveys of fish parasites of *A. grypus* from different water bodies, revealed the presence 14 species belonging to the genus *Myxobolus* The following is an alphabetically-arranged list of these species with the mention of only the first record from *A. grypus* for each *Myxobolus* species in order to economize space and references: *M. buckei (*Abbas, 2019), *M. carassii* (Hendi, 2017), *M. caudatus* (Abbas, 2019), *M. chondrostomi* (Al-Nasiri, 2008), *M. karuni* (Abdullah, 2002), *M. khrokhini* (Abbas, 2019), *M. ichkeulensis*, (Abbas, 2019), *M. kubanicum* (Atwan, 2017), *M. orientalis* (Al-Nasiri, 2008), *M. oviformis* (Herzog, 1969), *M. persicus* (Abdullah, 2002), *M. poljanski* (Abdullah, 1990), *M. schulmani* (Al-Nasiri, 2008), and in addition to unspecified *Myxobolus sp*. (Herzog, 1969).

With the present record of three myxosporean species, number of *Myxobolus* species from *A. grypus* of Iraq so far reaches 17 species.

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