

Trematodes of Fishes from the Euphrates River at Al-Musaib City, Mid Iraq

Furhan Thumad Mhaisen¹, Abdul-Razzak Labi Al-Rubaie², Bashar Abdul-Hussain Al-Sa'adi²

¹Tegnervägen 6B, Katrineholm, Sweden

²Department of Biological Control Technology, Al-Musaib Technical College, Al-Furat Al-Awsat Technical University, Al-Musaib, Iraq

Email address

mhaisenft@yahoo.co.uk (F. T. Mhaisen)

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Abstract

A total of 472 fish specimens belonging to 24 species from the Euphrates River at Al-Musaib city, mid Iraq were inspected for parasites during the period from July 2006 till the end of June 2007. Seven adult trematode species were recorded from the intestine of ten species of these fishes. These trematodes were *Aspidogaster limacoides* from five fish species (*Alburnus caeruleus*, *Cyprinion kais*, *Cyprinus carpio*, *Luciobarbus xanthopterus* and *Mystus pelusius*), *Pseudozoogonoides subaequiporus* from *Glyptothorax steindachneri*, *Azygia lucii* from *Sihurus triostegus*, *Asymphylogora demeli* from three fish species (*Carasobarbus luteus*, *Arabibarbus grypus* and *C. kais*), *Asymphylogora markewitschi* from three fish species (*A. grypus*, *C. kais* and *Alburnus sellal*), *Asymphylostrema macracetabulum* from four fish species (*C. luteus*, *A. grypus*, *C. kais* and *C. carpio*) and *Orientocreadium pseudobagri* from *G. steindachneri*. Apart from *A. limacoides* and *O. pseudobagri*, all the remaining five trematode species are reported here for the first time in Iraq. Description and measurements of these newly recorded trematodes are given and their slides were deposited in the Iraq Natural History Research Center and Museum, University of Baghdad. In addition, three new host records in Iraq were reported for two species of these trematodes. Number of fish hosts reported for these trematodes fluctuated from one host in case of three trematode species to a maximum of five hosts in case of *A. limacoides*. Among the inspected fishes, number of trematode species fluctuated from a minimum of one trematode species in five fish species to a maximum of four trematode species in case of *C. kais*, while 14 fish species showed no any trematode infection.

Keywords

Trematoda, Freshwater Fishes, Euphrates River, Al-Musaib City, Babylon Province, Iraq

1. Introduction

The trematodes, which are commonly referred to as flukes, comprise two subclasses: Aspidogastrea and Digenea. Members of the Aspidogastrea include a small group, composed of species parasitic in molluscs, fishes and chelonians are characterized with ventral holdfast (attachment organ) which covers most of ventral surface of body and subdivided by arrangement of loculi (called alveoli or rugae) or, rarely, into longitudinal rows of separate suckers. The Digenea are a much larger group, the vast majority of which use molluscs as primary hosts and vertebrates as final hosts and characterized with their ventral attachment organ as a sucker which not normally covering more than half of ventral surface of body and not subdivided into alveoli (Gibson, 2002).

The vast majority of trematodes are endoparasitic flat

worms with non segmented bodies, closed digestive systems, oral and ventral suckers and indirect life cycles. As adults, trematodes live inside various vertebrates and spend their larval stages in intermediate hosts, mainly snails but also in some fishes (Olsen, 1974). Adult trematodes of fishes usually live in the digestive systems of their hosts but few live in the circulatory systems (Kirk, 2012). Some trematodes live as larvae (metacercariae) in fish eyes (Karvonen, 2012), gills and skin and responsible for important fish diseases such as worm cataract, yellow grub and black spot disease (Amlacher, 1970; Duijn, 1973). Some trematodes are known to be transmissible to humans through the consumption of fishes, crustaceans or molluscs (Adams *et al.*, 1997) and they can infect humans that eat metacercaria- infected fishes if such fishes are not well cooked or are not heavily salted (Noga, 2010).

Among parasitological investigations achieved on trematodes of fishes from Euphrates River within the Iraqi territory are those of Mhaisen *et al.* (1997), Asmar *et al.*

(1999), Al-Jadoaa (2002), Al-Saadi (2007), Al-Alusi (2011), Al-Karboly (2012) and Al-Salmany (2015). The present article was aimed to contribute on the trematodes of fishes from the Euphrates River at Al-Musaib city as no previous study was done on fishes of this area.

2. Materials and Methods

During the period from July 2006 till the end of June 2007, fish specimens were collected from the Euphrates River at Al-Musaib city (32°47'N, 44°17'E), mid Iraq. They were caught with the aid of a cast net and were directly transported to the laboratory where they were measured, weighed and sexed. Fishes were freshly examined for parasites (Amlacher, 1970). Prevalence of infection was calculated (Margolis *et al.*, 1982). Parasite identification was done according to Bykhovskaya-Pavlovskaya *et al.* (1962).

Names and authorities of the concerned trematodes were checked in accordance with some electronic sites (ITIS, 2015; PESI, 2015; WoRMS, 2015) as well as with some related references (Dvorjadkin and Besprozvanykh, 1985; Bray and Gibson, 1986, Sobecka *et al.*, 2004; Alves *et al.*, 2015).

The valid scientific names of the studied fishes were based on Froese and Pauly (2015). Such names are similar to those reported by Eschmeyer (2015), except for both *Barbus grypus* and *Tilapia zillii* which were considered as synonyms of *Arabibarbus grypus* and *Coptodon zillii*, respectively by the latter reference.

3. Results and Discussion

During the period of this investigation, a total of 472 fish specimens belonging to 24 species and eight families were inspected for parasites. The updated scientific names of these fishes as well as their examined numbers are demonstrated below according to their respective families.

Family Cyprinidae

- 16 *Alburnus caeruleus* Heckel, 1843
- 10 *Alburnus orontis* Sauvage, 1882
- 24 *Alburnus sellal* Heckel, 1843
- 9 *Arabibarbus grypus* (Heckel, 1843)
- 12 *Barbus barbulus* Heckel, 1847
- 2 *Capoeta damascina* (Valenciennes, 1842)
- 77 *Carasobarbus luteus* (Heckel, 1843)
- 4 *Carassius carassius* (Linnaeus, 1758)
- 3 *Chondrostoma regium* (Heckel, 1843)
- 2 *Ctenopharyngodon idella* (Valenciennes, 1844)
- 60 *Cyprinion kais* Heckel, 1843
- 15 *Cyprinion macrostomum* Heckel, 1843
- 7 *Cyprinus carpio* Linnaeus, 1758
- 22 *Garra rufa* (Heckel, 1843)
- 33 *Leuciscus vorax* (Heckel, 1843)
- 11 *Luciobarbus xanthopterus* Heckel, 1843
- 2 *Mesopotamichthys sharpeyi* (Günther, 1874)

Family Bagridae

- 18 *Mystus pelusius* (Solander, 1794)

Family Siluridae

- 5 *Silurus triostegus* Heckel, 1843
- Family Sisoridae
- 13 *Glyptothorax steindachneri* (Pietschmann, 1913)
- Family Heteropneustidae
- 12 *Heteropneustes fossilis* (Bloch, 1794)
- Family Cichlidae
- 29 *Coptodon zillii* (Gervais, 1848)
- Family Mugilidae
- 48 *Liza abu* (Heckel, 1843)
- Family Mastacembelidae
- 38 *Mastacembelus mastacembelus* (Banks & Solander, 1794)

The inspection of these fishes revealed the occurrence of seven species of trematodes which belong to two subclasses, two orders and six families (WoRMS, 2015) as demonstrated below.

Class Trematoda

Subclass Aspidogastrea

Order Aspidogastrida

Family Aspidogastridae

Aspidogaster limacoides Diesing, 1835

Subclass Digenea

Order Plagiorchiida

Family Zoogonidae

Pseudozoogonoides subaequiporus (Odhner, 1911)

Family Azygiidae

Azygia lucii (Müller, 1776)

Family Lissorchiidae

Asymphylogora demeli Markowski, 1935

Asymphylogora markewitschi Kulakowskaja, 1947

Family Monorchiidae

Asymphylostrema macracetabulum (Belous, 1953)

Family Orientocreadiidae

Orientocreadium pseudobagri Yamaguti, 1954

The following is a brief description of these trematodes.

3.1. *Aspidogaster limacoides* Diesing, 1835

This parasite was recorded from the intestine of *Alburnus caeruleus*, *Cyprinion kais*, *Cyprinus carpio*, *Luciobarbus xanthopterus* and *Mystus pelusius* with an incidence of 6.3%, 6.7%, 14.3%, 9.1% and 22.2%, respectively. The first report of this parasite in Iraq was from the intestine of *L. vorax* (reported as *Aspius vorax*), *L. xanthopterus* (reported as *Barbus xanthopterus*) and *M. sharpeyi* (reported as *Barbus sharpeyi*) from Al-Tharthar Reservoir (Hussien and Mahdi, 1986). Later on, it was reported from nine other hosts in mid Iraq which did not include *A. caeruleus* and *C. kais* (Mhaisen, 2015). So, *A. caeruleus* and *C. kais* of this study represent two new host records for this parasite in Iraq.

Members of the genus *Aspidogaster* are characterized with the absence of head lobes, possessing of adhesive disc, bearing four longitudinal rows of alveoli, presence of a single testis and a cirrus sac (Rohde, 2002). A recent checklist of the subclass Aspidogastrea (Alves *et al.*, 2015) showed that among the 61 species of this subclass, 12 species belong to the genus *Aspidogaster* of which *A. limacoides* infects 35 fish

species all over the World.

3.2. *Pseudozoogonoides subaequiporus* (Odhner, 1911)

This parasite was recorded from the intestine of *Glyptothorax steindachneri* with an incidence of 30.8%. This is the first occurrence of this parasite in Iraq.

P. subaequiporus has a spinous body, 0.8 mm long x 0.34 mm wide. Ventral sucker (acetabulum) 0.15 mm in diameter, which is approximately equal to the oral sucker. Intestinal caeca reach approximately middle of the acetabulum. Each of the two postacetabular testes lies on the lateral side of the parasite with 0.1 mm long x 0.55 mm wide. The cirrus sac occupies the entire space between the acetabulum and the intestinal bifurcation, with 0.15 mm long x 0.07 mm wide. Cirrus is armed with 8-10 spines. The postacetabular ovary is 0.06 mm in diameter. Post ovarian vitellarial follicles are 0.05 mm long x 0.03 mm wide. Egg diameter is 0.046 mm.

The above description of *P. subaequiporus* agrees with that of *Diptherostomum microacetabulum* Shulman-Albova, 1952 given by Bykhovskaya-Pavlovskaya *et al.* (1962). According to Bray and Gibson (1986), *D. microacetabulum* and *P. microacetabulum* are synonyms of *P. subaequiporus*. The family Zoogonidae includes 14 genera and 128 species among which two valid species belong to the genus *Pseudozoogonoides* (WoRMS, 2015). It is appropriate to indicate here that *P. microacetabulum* is considered within the family Allocreadiidae by ITIS (2015). Microphotograph of this parasite was documented in the student's thesis (Al-Sa'adi, 2007) and voucher specimen was deposited in the Iraq Natural History Research Center and Museum, University of Baghdad (serial number INHM-TRC 13).

3.3. *Azygia lucii* (Müller, 1776)

This parasite was recorded from the intestine of *Silurus triostegus* with an incidence of 80%. This is the first occurrence of this parasite in Iraq.

A. lucii has an elongated aspinous body, 21 mm long x 1.9 mm wide. Oral sucker is 1.3 times as large as the ventral sucker. The elongated pharynx has a length to width ratio of 1.7. The two more or less similar testes are 0.06 mm long x 0.04 mm wide, with the posterior one lies at about quarter of body length away from the posterior extremity. The ovary lies posterior to the ventral sucker at a distance of about 0.3 of body length. Eggs are 0.045 x 0.022 mm.

The above description of *A. lucii* agrees with that given by Bykhovskaya-Pavlovskaya *et al.* (1962). The family Azygiidae includes four valid genera and 42 species among which 24 valid species belong to the genus *Azygia* (WoRMS, 2015). Both ITIS (2015) and PESI (2015) also considered the genus *Azygia* within the family Azygiidae. Microphotograph of this parasite was documented in the student's thesis (Al-Sa'adi, 2007) and voucher specimen was deposited in the Iraq Natural History Research Center and Museum, University of Baghdad (serial number INHM-TRC 14).

3.4. *Asymphylogora demeli* Markowski, 1935

This parasite was recorded from the intestine of *Arabibarbus grypus*, *Carasobarbus luteus* and *C. kais* with an incidence of 22.2%, 13% and 1.7%, respectively. This is the first occurrence of this parasite in Iraq.

A. demeli has a spinous body, 0.59 mm long x 0.31 mm wide. Oral sucker diameter is 0.11 mm against 0.13 mm for the ventral sucker. The elongated pharynx is 0.6 mm long. The testis lies in the middle of the posterior half of the body and measures 0.01 x 0.08 mm. Cirrus sac lies at level of middle of the ventral sucker, 0.11 x 0.04 mm. The rounded to oval pretesticular ovary is 0.08 x 0.07 mm. Vitellaria extend in the posterior half of the body. Eggs are 0.025 x 0.12 mm.

The above description of *A. demeli* agrees with that given by Bykhovskaya-Pavlovskaya *et al.* (1962). The family Lissorchiidae includes one genus (*Asymphylogora*) which includes seven valid species (WoRMS, 2015). It is appropriate to indicate here that *A. demeli* is considered within the family Lissorchiidae by ITIS (2015) but within the family Monorchiidae by PESI (2015). Microphotograph of this parasite was documented in the student's thesis (Al-Sa'adi, 2007) and voucher specimen was deposited in the Iraq Natural History Research Center and Museum, University of Baghdad (serial number INHM-TRC 15).

3.5. *Asymphylogora markewitschi* Kulakowskaja, 1947

This parasite was recorded from the intestine of *Alburnus sellal*, *A. grypus* and *C. kais* with an incidence of 4.3%, 11.1%, and 1.7%, respectively. This is the first occurrence of this parasite in Iraq.

A. markewitschi has aspinous body, 1.2 mm long x 0.45 mm wide. Oral sucker diameter is 0.16 mm against 0.18 mm for the ventral sucker. The pharynx is 0.09 x 0.13 mm long. The testis lies in the posterior half of the body and measures 0.41 x 0.17 mm. Cirrus sac lies behind the ventral sucker, 0.25 x 0.05 mm. The rounded or oval pretesticular ovary lies in the anterior part of the second half of the body and measures 0.18 x 0.04 mm. Vitellaria extend from level of posterior margin of ventral sucker to the anterior margin of testis. Eggs are 0.024 x 0.16 mm.

Sobecka *et al.* (2004) showed that *A. markewitschi* occurred in the intestine of ide, *Leuciscus idus* in Lake Dąbie of Poland during spring with an intensity varied from 4-70 specimens.

The above description of *A. markewitschi* agrees with that of Bykhovskaya-Pavlovskaya *et al.* (1962). Microphotograph of this parasite was documented in the student's thesis (Al-Sa'adi, 2007) and voucher specimen was deposited in the Iraq Natural History Research Center and Museum, University of Baghdad (serial number INHM-TRC 17).

3.6. *Asymphylostrema macracetabulum* (Belous, 1953)

This parasite was recorded from the intestine of *A. grypus*, *C. luteus*, *C. kais* and *C. carpio* with an incidence of infection of 22.2%, 16.9%, 18.3% and 14.3%, respectively.

A. macracetabulum has a spinous body, 2.5 mm long x 1.0 mm wide. Oral sucker is 0.48 x 0.42 mm. Ventral sucker is markedly larger than the oral one, 0.78 mm. The pharynx is 0.15 x 0.12 mm. The testes lie in the middle of the posterior half of the body and measure 0.60 x 0.26 mm. Cirrus sac lies under the ventral sucker, 0.44 x 0.16 mm. The ovary lies behind the anterior edge of the ventral sucker with a diameter of 0.22 mm. Vitellaria lie at the level of the posterior part of the ventral sucker. Eggs are 0.032 x 0.13 mm.

The above description of *A. macracetabulum* agrees with that of *Asymphyiodora macracetabulum* reported by Bykhovskaya-Pavlovskaya *et al.* (1962). Dvorjadkin and Besprozvanykh (1985) considered *Asymphyiodora macracetabulum* as a synonym of *Asymphylorema macracetabulum*. Microphotograph of this parasite was documented in the student's thesis (Al-Sa'adi, 2007) and voucher specimen was deposited in the Iraq Natural History Research Center and Museum, University of Baghdad (serial number INHM-TRC 16) under the name *Asymphyiodora macracetabulum*. It is appropriate to mention here that after the present record of this parasite during July 2006 till the end of June 2007, *Asymphyiodora macracetabulum* was reported from *Mastacembelus mastacembelus* from Greater Zab River at Iski Kalak town, west of Erbil city, Kurdistan region, Iraq (Bashê, 2008; Bashê and Abdullah, 2010).

3.7. *Orientocreadium pseudobagri* Yamaguti, 1934

This parasite was recorded from the intestine of *G. steindachneri* with an incidence of 7.7%. The first report of this parasite in Iraq was from the intestine of *M. sharpeyi* and *S. triostegus* (reported as *Parasilurus triostegus*) from Al-Hammar Marsh, Basrah, south of Iraq (Al-Daraji, 1986). Later on, it was reported from seven other hosts from Basrah only which did not include *G. steindachneri* (Mhaisen, 2015). So, *G. steindachneri* of this study represents a new host record for this parasite in Iraq.

4. Conclusions

To conclude on the trematode infections of fishes from the Euphrates River at Al-Musaib city, only seven adult trematode species were detected from the intestine of ten fish species while 14 fish species (*A. orontis*, *B. barbulus*, *C. damascina*, *C. carassius*, *C. regium*, *C. zillii*, *C. idella*, *C. macrostomum*, *G. rufa*, *L. vorax*, *M. sharpeyi*, *H. fossilis*, *L. abu* and *M. mastacembelus*) showed no any trematode infection. No any metacercarial stages of *Clinostomum* spp. and *Diplostomum* spp. were reported in the present investigation although such metacercariae are known to infect some fish species in the Euphrates River (Mhaisen *et al.*, 1997; Asmar *et al.*, 1999; Al-Jadoa'a, 2002; Al-Salmay, 2015). In some piscivorous birds in Iraq, adult *Clinostomum* spp. and *Diplostomum* spp. were documented (Mhaisen *et al.*, 1990; Al-Hadithi and Mustafa, 1991; Al-Mayah, 1994; Al-Awadi *et al.*, 2010; Al-Salim and Ali, 2010).

In connection with fish richness with the studied trematodes,

five fish species (*A. caeruleus*, *A. sellal*, *L. xanthopterus*, *M. pelusius* and *S. triostegus*) harbored only one trematode species each, three fish species (*C. luteus*, *C. carpio* and *G. steindachneri*) harbored two trematode species each, *A. grypus* harbored three trematode species and *C. kais* harbored four trematode species. Such richness is quite low when compared with the monogenean infections of the same fishes from the same area (Mhaisen *et al.*, 2015) as 36 monogenean species were recorded from 19 fish species in the latter study.

Number of fish hosts reported for these seven trematode species was one host in case of three trematode species (*P. subaequiporus*, *A. lucii* and *O. pseudobagri*), three hosts for both *A. demeli* and *A. markewitschi*, four hosts in case of *A. macracetabulum* and five hosts in case of *A. limacoides*.

The present investigation also revealed the record of three new fish hosts for two of the previously known trematodes from Iraq. These were both *A. caeruleus* and *C. kais* for *A. limacoides* as well as *G. steindachneri* for *O. pseudobagri*.

As the values in 88.2% of the percentage incidence of infection of seven fish species with different trematode infections of the present study were less than 22.2%, the percentage of infection in most fishes was generally very light. The only high percentage incidence (80%) was recorded in case of the infection of *S. triostegus* with *A. lucii*.

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