

## Checklists of the Species of *Myxobolus* Bütschli, 1882 (Cnidaria: Myxozoa: Myxobolidae) from Fishes of Iraq

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**Abstract:** Surveying 123 references concerning the occurrence of species of the genus *Myxobolus* infecting fishes of Iraq, till the end of 2019, showed the occurrence of 97 *Myxobolus* species as well as some unidentified *Myxobolus* species from 43 valid fish species. These *Myxobolus* species were reported from three marine fish species and 40 freshwater fish species of Iraq. Among the infected fishes with these *Myxobolus* species, the cyprinid fish *Carasobarbus luteus* was infected with the highest number of parasite species (63 species), followed by infection of the cyprinid fish *Arabibarbus grypus* with 39 species, while 17 fish species were infected with only one *Myxobolus* species each. Among the *Myxobolus* species of fishes of Iraq, *M. pfeifferi* was reported from 35 fish host species, followed by *M. oviformis* which infected 22 fish species, while 42 *Myxobolus* species were reported from one fish host species each.

**Keywords:** Cnidaria, Myxozoa, Myxobolidae, *Myxobolus*, Fishes, Iraq

### Introduction

*Myxobolus* Bütschli, 1882 is the most specious genus within the phylum Myxozoa (Eiras et al., 2014; Rocha et al., 2019). This genus contains over 700 described species (Hallett & Bartholomew, 2012). According to Roberts & Janovy (2009), *Myxobolus* species (some of which were formerly placed in a now defunct genus *Myxosoma*) have ovoid or teardrop-shaped spores with a distinct sutural line and two polar capsules (Figure 1). Although, some genetic and biological traits were used in myxozoan classification (Guo et al., 2018), but morphologically, myxozoan taxonomy is still based on the structure of the spore stages, principally on number of shell valves, spore shape and position of the polar capsules (Feist & Longshaw, 2006).

The myxozoans infect fins, skin, gills, operculum, buccal cavity, nasal chamber, eye ball, gall bladder, liver, spleen, kidneys, heart and wall of the alimentary canal of freshwater fishes (Kaur, 2014). Many, if not all of the freshwater fish-pathogenic myxozoans, have an indirect life cycle that involves asexual reproduction in the vertebrate (fish) host and sexual reproduction in an invertebrate host (Roberts &

Janovy, 2009; Noga, 2010). Although most myxozoans cause little harm, a few have become recognized as serious pathogens, especially in aquaculture situations (Feist & Longshaw, 2006). Some species are of economic importance because they are pathogenic to food and sport fishes (Roberts & Janovy, 2009).

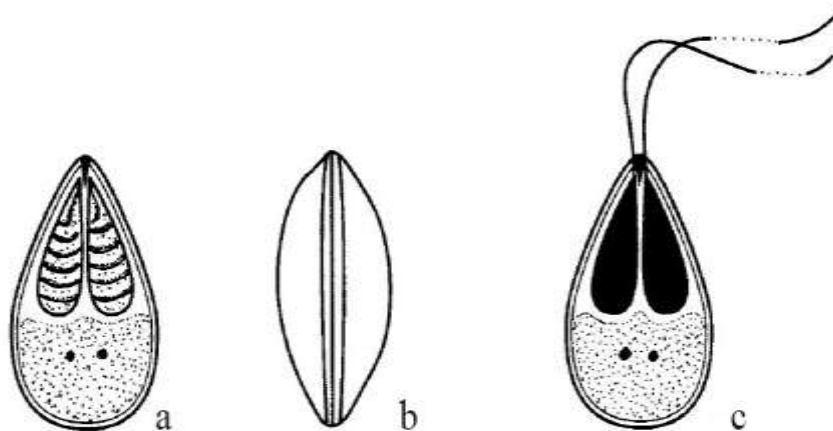


Figure 1: Spores of *Myxobolus calcariferum*- a: in valvular view, b: in sutural view and c: in valvular view with extruded polar filaments (After Basu & Halder, 2003).

Members of Myxozoa were formerly placed in class Cnidosporidea of subphylum Sporozoa because they form spores. Furthermore, Sporozoa is no longer considered a valid taxonomic group and hence Myxozoans are not protozoans at all but are now included in phylum Cnidaria, although their position within this phylum is still a matter of discussion (Roberts & Janovy, 2009). In this aspect, Okamura et al. (2015) led to early proposals that myxozoans should not be classified as Protozoa but as Metazoa. Fiala et al. (2015) considered the Myxozoa as an unranked subphylum of the phylum Cnidaria and Chang et al. (2015) confirmed that myxozoans are cnidarians. According to GBIF (2020), *Myxobolus* belongs to the family Myxobolidae, order Bivalvulida, class Myxosporea, phylum Myxozoa of the kingdom Animalia, while WoRMS (2020) placed this genus within the class Myxozoa of the phylum Cnidaria.

In Iraq, the first list of parasites of fishes (Mhaisen, 1980) indicated that the first fish parasitological survey achieved by Herzog (1969) had recorded three identified *Myxobolus* species: *M. muelleri*, *M. multiplicatus* (reported as *Myxosoma multiplicata*) and *M. oviformis* in addition to unidentified *Myxobolus* species from five freshwater fishes. Fattohy (1975) reported *M. pfeifferi* from *Acanthobrama marmid*. After that many surveys were achieved in different inland waters of Iraq, fish ponds and farms, marine habitat and inspection of some fishes from local fish markets. Results of such works showed the record of many additional *Myxobolus* species.

The present article is aimed to revise all such records on *Myxobolus* species of fishes of Iraq and update data on them and on their host species in Iraq. This article

is a continuation of previous checklists of some parasites of fishes of Iraq, such as those of acanthocephalan species (Mhaisen, 2002), *Gyrodactylus* species (Mhaisen & Abdul-Ameer, 2013), diplozoid species (Mhaisen & Abdul-Ameer, 2014) and *Dactylogyrus* species (Mhaisen & Abdul-Ameer, 2019) as well as checklists of parasites of fishes from some provinces of Iraq, such as Salah Al-Deen province (Mhaisen et al., 2018), Al-Anbar province (Mhaisen et al., 2017b), Babylon province (Mhaisen & Al-Rubaie, 2016b, 2018), Al-Najaf Al-Ashraf province (Mhaisen & Al-Rubaie, 2016a), Al-Diwaniyah province (Mhaisen et al., 2019), Thi-Qar province (Mhaisen, 2019) and Basrah province (Mhaisen et al., 2013a, b, c; Ali et al., 2014; Mhaisen et al., 2014; Khamees et al., 2015; Mhaisen et al., 2016) as well as some regions of Iraq such as Kurdistan (Mhaisen & Abdullah, 2016, 2017) and Basrah marshy area (Mhaisen et al., 2017a).

### Sources and Methods

A total of 123 references (79 research papers, 31 unpublished M. Sc. theses, nine unpublished Ph. D. theses and four conference abstracts) dealing with records of *Myxobolus* species of fishes of Iraq were used to prepare the present article. Data from such references were gathered to provide parasite-fish list and fish-parasite list. For fishes, the scientific names were reported as they appeared in their original references but then they were checked with an account on freshwater fishes of Iraq (Coad, 2010). Fish valid scientific names and their authorities were corrected according to well-known specialized electronic site (Fricke et al., 2020). For each alphabetically listed *Myxobolus* species, fish host species are also alphabetically arranged together with their synonyms (if any) and references. Some notes on these parasites will be included when applicable. The layout of all higher taxa (Phylum, class, order and family) of *Myxobolus* followed WoRMS (2020).

### Results and Discussion

#### Surveys Achieved on *Myxobolus* Species from Fishes of Iraq

The available literature concerning the occurrence of *Myxobolus* species on/ in fishes of Iraq indicated that such parasites are distributed in marine and freshwater fishes in different water bodies. The records of such parasites can be grouped into eight major categories according to localities of collection of the infected fishes. These are:

- 1- Tigris river at Nineveh province (Fattohy, 1975; Kasim et al., 1977; Rahemo & Ami, 1993; Al-Niaemi, 1997; Rahemo, 1997; Rahemo & Al-Kallak, 1998; Rahemo & Al-Neemi, 1999; Rahemo & Al-Niaemi, 2001; Al-Jawda et al., 2003; Mustafa, 2005; Mustafa et al., 2006; Zangana, 2008; Rahemo, 2011), Salah Al-Din province (Abdul-Ameer, 1989; Al-Jawda et al., 2000; Al-Nasiri, 2008; Al-Nasiri & Mhaisen, 2009; Al-Nasiri, 2013) and Baghdad province (Ali et al., 1987b; Balasem et al., 1993; Adday et al., 1999; Asmar et al., 2003; Mansor et al., 2012; Al-Jawda & Asmar, 2013, 2014; Atwan, 2016; Rasheed, 2016; Hammood, 2017; Hendi, 2017; Bdair, 2018; Abbas, 2019; Abbas & Abdul-Ameer, 2019; Abdul-Ameer & Atwan, 2019; Hameed, 2019; Hameed &

- Abdul-Ameer, 2019; Mansoor, 2019; Sheyaa, 2019), as well as some tributaries of Tigris river which included Greater Zab river (Rashed & Hussain, 1988; Ali, 1989; Abdullah, 2002; Abdullah & Mhaisen, 2005, 2009; Shwani, 2009; Abdullah & Shwani, 2010), Lesser Zab river (Rashid et al., 1989; Abdullah, 2002; Abdullah & Mhaisen, 2005, 2009), Bahdinan river at Erbil province (Bilal, 2006; Bilal & Abdullah, 2008) and Diyala river (Ali et al., 1987a; Al-Shaikh et al., 1995; Balasem et al., 2001; Mhaisen et al., 2002; Al-Rubaie et al., 2003; Al-Saadi & Mohammed, 2017; Mohammed, 2017).
- 2- Euphrates river and its branches at Al-Anbar province (Mhaisen et al., 1997; Al-Salmany, 2015), Babylon province (Al-Sa'adi, 2007; Al-Zubaidy, 2007; Hussain, 2007; Mhaisen et al., 2015; Al-Musawi, 2016), Al-Diwaniah province (Al-Jadoaa, 2002; Al-Waaly, 2005), Al-Najaf Al-Ashraf province (Al-Awadi, 2003), Thi Qar province (Rahemo & Al-Abbadie, 1994; Al-Abbadie, 2006) and Al-Muthanna province (Al-Asadiy, 2019; Al-Helli, 2019).
  - 3- Shatt Al-Arab river (Al-Salim, 1986, 1989a, b, 1992) and its branches which included Mehaijeran creek (Khamees, 1983; Mhaisen et al., 1986), Garmat Ali river (Jori, 1998; Abdul-Rahman, 1999; Al-Dosary, 1999; Al-Niaeem, 2002, 2006a, b; Al-Janae'e, 2010) and Al-Salihiya river (Al-Janae'e, 2010).
  - 4- Some lakes, depressions and marshes: These included surveys from two lakes in Sulaimaniya province: Darbandikhan lake (Abdullah, 2013; Abdullah & Abdullah, 2013, 2015) and Dokan lake (Abdullah, 1990, 1997; Abdullah & Rasheed, 2004), two lakes in Al-Anbar province: Al-Qadisiya dam lake (Asmar et al., 1999; Balasem et al., 2003) and Hemrin dam lake in Diyala province (Balasem et al., 2000), Bahr Al-Najaf depression in Al-Najaf Al-Ashraf province (Al-Awadi, 1997; Al-Awadi et al., 2010) and Al-Hammar marsh in Basrah province (Al-Daraji, 1986; Al-Daraji & Al-Salim, 1990; Bannai et al., 2005; Jori, 2006; Abbas, 2007; Jori, 2007).
  - 5- Some drainage networks at Baghdad province (Balasem et al., 2002a, b; Asmar et al., 2003; Mhaisen et al., 2003), Babylon province (Al-Musawi, 2016) and Al-Diwaniyah province (Al-Waaly, 2005; Al-Jadoaa, 2008).
  - 6- Fish ponds and farms which included some at Erbil province (Abdullah, 2004), Baghdad province (Mhaisen et al., 1993, 1995; Mohammad-Ali et al., 1999; Al-Nasiri, 2000; Salih et al., 2000; Asmar et al., 2001; Al-Nasiri et al., 2003; Asmar et al., 2004), Babylon province (Mhaisen et al., 1989; Mhaisen & Abul-Eis, 1991; Al-Zubaidy, 1998; Asmar et al., 2001; Al-Jadoaa, 2002; Hussain et al., 2011a, b; Al-Musawi, 2016; Jawdhira et al., 2017) and Basrah province (Al-Daraji et al., 1999; Eassa et al., 2014; Al-Nowfal, 2017; Al-Nowfal et al., 2018) in addition to some floating cages at Euphrates river at Al-Mussayab city (Jawdhira et al., 2017).
  - 7- Fish markets at Erbil province (Abdullah, 2000).
  - 8- Khor Al-Zubair estuary, northwest Arab Gulf (Mhaisen & Al-Maliki, 1996).

It is reliable to state here that most records done by Herzog (1969) cannot be categorized to any of the above localities of collection as he mentioned no location for most of the infected fishes in his collections.

Surveying literature concerning *Myxobolus* species from fishes of Iraq showed the infection of 43 valid fish species with 97 *Myxobolus* species as well as some unidentified species of *Myxobolus*. The layout of higher taxa and scientific names as well as the full authority of the valid fish host species together with their orders and families, based on Fricke et al. (2020), are shown in the following systematic account.

## Class Actinopteri

### Order Cypriniformes

#### Family Cyprinidae

- Arabibarbus grypus* (Heckel 1843)
- Barbus lacerta* Heckel, 1843
- Barbus rajanorum* Heckel, 1843<sup>1</sup>
- Capoeta aculeata* (Valenciennes, 1844)
- Capoeta damascina* (Valenciennes, 1842)
- Capoeta trutta* (Heckel, 1843)
- Capoeta umbla* (Heckel, 1843)
- Capoeta* sp.
- Carasobarbus luteus* (Heckel, 1843)
- Carassius auratus* (Linnaeus, 1758)
- Carassius carassius* (Linnaeus, 1758)
- Cyprinion kais* Heckel, 1843
- Cyprinion macrostomum* Heckel, 1843<sup>2</sup>
- Cyprinus carpio* Linnaeus, 1758
- Garra rufa* (Heckel, 1843)
- Luciobarbus barbulus* (Heckel, 1847)
- Luciobarbus esocinus* Heckel, 1843
- Luciobarbus subquincunciatus* (Günther, 1868)
- Luciobarbus xanthopterus* Heckel, 1843
- Mesopotamichthys sharpeyi* (Günther, 1874)

#### Family Xenocyprididae<sup>3</sup>

- Ctenopharyngodon idella* (Valenciennes, 1844)
- Hypophthalmichthys molitrix* (Valenciennes, 1844)

#### Family Leuciscidae

- Acanthobrama centisquama* Heckel, 1843<sup>4</sup>
- Acanthobrama marmid* Heckel, 1843
- Alburnus caeruleus* Heckel, 1843
- Alburnus orontis* Sauvage, 1882<sup>5</sup>
- Alburnus sellal* Heckel, 1843
- Chondrostoma regium* (Heckel, 1843)
- Leuciscus vorax* (Heckel, 1843)
- Squalius cephalus* (Linnaeus, 1758)
- Squalius lepidus* Heckel, 1843
- Squalius spurius* Heckel, 1843<sup>6</sup>

- Order Siluriformes  
 Family Bagridae  
*Mystus pelusius* (Solander, 1794)  
 Family Siluridae  
*Silurus glanis* Linnaeus, 1758  
*Silurus triostegus* Heckel, 1843  
 Family Heteropneustidae  
*Heteropneustes fossilis* (Bloch, 1794)  
 Order Gobiiformes  
 Family Gobiidae  
*Periophthalmus waltoni* Koumans, 1941  
 Order Synbranchiformes  
 Family Mastacembelidae  
*Mastacembelus mastacembelus* (Banks & Solander, 1794)  
 Order Cichliformes  
 Family Cichlidae  
*Coptodon zillii* (Gervais, 1848)  
 Order Cyprinodontiformes  
 Family Aphaniidae  
*Aphanius stoliczkanus* (Day, 1872)  
 Order Mugiliformes  
 Family Mugilidae  
*Planiliza abu* (Heckel, 1843)  
*Planiliza subviridis* (Valenciennes, 1836)  
 Order Perciformes  
 Family Sparidae  
*Acanthopagrus arabicus* Iwatsuki, 2013

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<sup>1</sup> *Barbus rajanorum* is considered as a hybrid between *Barbus pectoralis* Heckel, 1843 and *Capoeta damascina* (Valenciennes, 1842) according to Coad (2010) and Fricke et al. (2020). Dr. Jörg Freyhof (Personal communication through Dr. Atheer H. Ali) also indicated that this fish is a hybrid in the Kweik in Syria.

<sup>2</sup> According to Coad (2010), the specific name of this fish was originally spelt as *macrostomus*, but correctly *macrostomum*. Fricke et al. (2020) spelled its specific name as *macrostomus*, but as *macrostomum* in Froese & Pauly (2019), WoRMS (2020) as well as in all concerned Iraqi references within this article. The specific name *macrostomum* was also ascertained by Dr. Jörg Freyhof (Personal communication).

<sup>3</sup> It is appropriate to mention here that all references so far concerning the occurrence of *Myxobolus* species in Iraq referred to both the grass carp *C. idella* and the silver carp *H. molitrix* as belonging to the family Cyprinidae. However, Tan & Armbruster (2018) in their phylogenetic classification of genera of the order Cypriniformes placed both these species within the family Xeno-

- cyprinidae. This is also followed by Fricke et al. (2020) but not yet by Froese & Pauly (2019).
- <sup>4</sup> According to Froese & Pauly (2019), *Acanthobrama centisquama* is native only in Syria and Turkey. Fricke et al. (2020) stated that this fish is distributed in the Orontes river basin. Coad (2010) showed no occurrence of this fish in Iraq. Jörg Freyhof (personal communication) indicated that this fish is extinct, found in Orontes in Turkey, and subfossil in Syria.
- <sup>5</sup> According to Froese & Pauly (2019), *Alburnus orontis* is native only in Syria and Turkey. Jörg Freyhof (personal communication) indicated that this fish is endemic to Orontes in Turkey. Coad (2010) showed no occurrence of this fish in Iraq.
- <sup>6</sup> According to Froese & Pauly (2019), *Squalius spurius* is native to Syria and Turkey. Coad (2010) listed only two species of *Squalius* (*S. cephalus* and *S. lepidus*) in Iraq. Jörg Freyhof (personal communication), indicated that this fish is a hybrid between *Alburnus* and *Squalius*.

### ***Myxobolus*-Host List**

Reviewing references concerning the occurrence of *Myxobolus* species so far recorded from fishes of Iraq demonstrated the record of 97 *Myxobolus* species. *Myxobolus* names and their authorities are checked mainly with GBIF (2020). When no information on any *Myxobolus* species or its authority is available in GBIF (2020), three synopses (Eiras et al., 2005, 2014; Vidal et al., 2017) as well as some other literature were applied for this purpose. These parasites are alphabetically arranged. Under each *Myxobolus* species, alphabetical listing of each valid fish host species (and synonyms when applicable) will be included with all concerned references. References on records of each host species infected with each *Myxobolus* species are chronologically arranged, but references of the same year are alphabetically arranged. The reference of the first record in Iraq of any *Myxobolus* species is underlined. In order to economise space, site of infection with these *Myxobolus* species will not be demonstrated here due to the infection of different external and internal fish organs with *Myxobolus* species (Kaur, 2014). Again, in order to economise space, locality of infected fishes will not be given here and it can be detected from the subtitle “Surveys Achieved on *Myxobolus* Species from Fishes of Iraq” in the Results and Discussion of this article.

The following is an alphabetical listing of all *Myxobolus* species so far recorded from fish species of Iraq with their concerned hosts and references.

1- *Myxobolus acutus* (Fujita, 1912) Landsberg & Lom, 1991 was reported from *Carasobarbus luteus* (as *Barbus luteus*) by Mhaisen et al. (2002), *Cyprinion macrostomum* by Abdul-Ameer (1989) and *Luciobarbus xanthopterus* (as *Barbus xanthopterus*) by Balasem et al. (2003). In all these three records, this parasite was given as *Myxosoma acuta* Fujita, 1912 which is considered as a synonym of *Myxobolus acutus* according to Landsberg & Lom (1991).

2- *Myxobolus adeli* Yurakhno & Ovcharenko, 2014 was recorded from *C. luteus* by Hameed (2019) and Hameed & Abdul-Ameer (2019).

3- *Myxobolus alburni* Donec, 1984 was recorded from *M. sharpeyi* by Sheyaa (2019).

4- *Myxobolus alienus* Konovalov, 1967 was reported from *C. regium* by Al-Salmany (2015).

5- *Myxobolus amurensis* Akhmerov, 1960 was reported from *A. grypus* by Sheyaa (2019), *C. luteus* by Hameed (2019), *L. esocinus* by Hendi (2017), *P. abu* by Hammood (2017) and *S. lepidus* by Abdullah (2013) and Abdullah & Abdullah (2013, 2015).

6- *Myxobolus bizerti* Bahri & Marques, 1996 was reported from *P. abu* by Atwan (2016) and Abdul-Ameer & Atwan (2019).

7- *Myxobolus bliccae* Donec & Toziyakova in Shulman, 1984 was reported from *C. luteus* by Mansoor (2019) who wrongly stated the authority as Donec, 1962 and *C. macrostomum* by Al-Salmany (2015) who spelled the authority as Donec & Toziyakova in Shulman, 1984.

8- *Myxobolus bouixi* Fomena, Folefack & Tang, 2007 was reported from *C. luteus* by Hameed (2019).

9- *Myxobolus bramae* Reuss, 1906 was reported from *A. marmid* by Hendi (2017), *A. grypus* by Bdair (2018), Mansoor (2019) and Sheyaa (2019), *C. luteus* (also as *B. luteus*) by Balasem et al. (2002b), Al-Jawda & Asmar (2013, 2014), Al-Salmany (2015), Bdair (2018) and Mansoor (2019), *C. auratus* by Bdair (2018), *C. carassius* by Al-Jawda & Asmar (2014), *L. xanthopterus* (as *B. xanthopterus*) by Asmar et al. (1999), Balasem et al. (2003) and Abbas (2019), *M. sharpeyi* (as *Barbus sharpeyi*) by Balasem et al. (2003), *P. abu* (as *Liza abu*) by Al-Jawda & Asmar (2013, 2014) and from unidentified host by Mansor et al. (2012).

10- *Myxobolus branchialis* (Markewitsch, 1932) Landsberg & Lom, 1991 was reported from *A. grypus* by Sheyaa (2019), *C. regium* by Atwan (2016) and *P. abu* by Atwan (2016) and Abdul-Ameer & Atwan (2019). It is appropriate to mention here that Atwan (2016) had misspelled the authority of this parasite as Markevich instead of Markewitsch.

11- *Myxobolus branchilateralis* Molnár, Eszterbauer, Marton, Székely & Eiras, 2012 was recorded from *C. luteus* by Hameed (2019) and Hameed & Abdul-Ameer (2019).

12- *Myxobolus branchiophilus* Abdel-Ghaffar, El-Toukhy, Al-Quraishy, Al-Rasheid, Abdel-Baki, Hegazy & Bashtar, 2008 was recorded from *A. grypus* by Hameed (2019).

13- *Myxobolus buckei* Longshaw, Frear & Feist, 2003 was recorded from *A. grypus* by Abbas (2019) and Abbas & Abdul-Ameer (2019).

14- *Myxobolus bulbocordis* Masoumian, Baska & Molnár, 1996 was recorded from *C. luteus* by Mansoor (2019) and from both *C. regium* and *M. sharpeyi* (as *B. sharpeyi*) by Abdullah (2002) and Abdullah & Mhaisen (2005).

15- *Myxobolus calcariferum* Basu & Haldar, 2003 was recorded from *M. sharpeyi* by Sheyaa (2019).



16- *Myxobolus carassii* Klokachewa, 1914 was recorded from both *A. grypus* and *L. esocinus* by Hendi (2017) who misspelled the authority as Klokacheva instead of Klokachewa.

17- *Myxobolus caudatus* Ali, Al-Rasheid, Sakran, Abdel-Baki & Abdel-Ghaffar, 2002 was recorded from *A. grypus* by Abbas (2019) and Abbas & Abdul-Ameer (2019).

18- *Myxobolus chondrostomi* Donec, 1962 was recorded from *A. grypus* (as *Barbus grypus*) by Al-Nasiri (2008), *C. luteus* by Rasheed (2016) and Mansoor (2019) and *M. sharpeyi* by Hameed (2019).

19- *Myxobolus chuatsi* (Dogiel & Akhmerov in Akhmerov, 1960) Landsberg & Lom, 1991 was recorded from both *C. macrostomum* and *L. barbulus* (reported as *Barbus barbulus*) by Atwan (2016) and *P. abu* by Atwan (2016) and Abdul-Ameer & Atwan (2019).

20- *Myxobolus cyprini* Doflein, 1898 was recorded from unidentified host by Mansor et al. (2012) who reported no authority for this parasite.

21- *Myxobolus cyprinicola* Reuss, 1906 was recorded from *A. caeruleus* by Bdair (2018), *A. grypus* (also as *B. grypus*) by Al-Nasiri (2008), Atwan (2016) and Bdair (2018), *Capoeta* sp. (as *Varicorhinus* sp.) by Al-Nasiri (2008), *C. luteus* by Al-Jawda & Asmar (2013, 2014), Atwan (2016), Bdair (2018) and Mansoor (2019), *C. auratus* by Bdair (2018), *C. carassius* by Mansor et al. (2012) and Al-Jawda & Asmar (2014), *C. regium* by Mansor et al. (2012), Al-Jawda & Asmar (2014) and Bdair (2018), *C. macrostomum* by Al-Jawda & Asmar (2013), *C. carpio* by Abdullah (1997, 2002), Abdullah & Mhaisen (2005) and Al-Jawda & Asmar (2013), *L. barbulus* by Sheyaa (2019), *L. xanthopterus* by Atwan (2016) and Bdair (2018), *P. abu* (also as *L. abu*) by Al-Jawda & Asmar (2013, 2014) and Atwan (2016) and *S. triostegus* by Abbas (2007) as well as from unidentified host by Mansor et al. (2012).

22- *Myxobolus dermatobius* (Ishii, 1915) Landsberg & Lom, 1991 was recorded from *C. luteus* by Atwan (2016) and Mohammed (2017), *C. regium* by Atwan (2016) and *P. abu* by Atwan (2016) and Abdul-Ameer & Atwan (2019). It is appropriate to mention here that Mohammed (2017) had erroneously reported the year of authority as 1916 instead of 1915.

23- *Myxobolus dispar* Thélohan, 1895 was recorded from *A. grypus* (as *B. grypus*) by Adday et al. (1999), Balasem et al. (2000), Salih et al. (2000), Mhaisen et al. (2002), Al-Jawda et al. (2003) and Balasem et al. (2003), *C. trutta* by Bdair (2018), *C. luteus* (also reported as *B. luteus*) by Al-Nasiri (2000), Balasem et al. (2002b), Asmar et al. (2003), Mhaisen et al. (2003), Al-Jawda & Asmar (2013), Rasheed (2016) and Bdair (2018), *C. carassius* by Mohammad-Ali et al. (1999) and Al-Jawda & Asmar (2013, 2014), *C. regium* by Abdul-Ameer (1989), Adday et al. (1999) and Al-Jawda et al. (2000), *C. carpio* by Mohammad-Ali et al. (1999), *L. vorax* (reported as *Aspius vorax*) by Al-Jawda et al. (2000), *L. barbulus* (reported as *B. barbulus*) by Al-Jawda et al. (2000), *L. subquincunciatus* (as *Barbus subquincunciatus*) by Al-Jawda et al. (2003), *L. xanthopterus* (also as *B. xanthopterus*) by Asmar et al. (1999), Balasem et al. (2003) and Bdair (2018), *M.*

*sharpeyi* (as *B. sharpeyi*) by Al-Jawda et al. (2000), *P. abu* (as *L. abu*) by Asmar et al. (1999), Balasem et al. (2002a, 2003), Mhaisen et al. (2003) and Al-Jawda & Asmar (2013) and *S. triostegus* by Asmar et al. (2003).

24- *Myxobolus diversus* Nie & Li, 1973 was recorded from *P. subviridis* (as *Liza subviridis*) by Jori (2007).

25- *Myxobolus dogieli* Bykhovskaya-Pavlovskaya & Bykhovski, 1940 was recorded from *A. grypus* (as *B. grypus*) by Al-Jawda et al. (2000), Balasem et al. (2000), Al-Jawda et al. (2003), Balasem et al. (2003) and Sheyaa (2019), *C. luteus* (also as *B. luteus*) by Balasem et al. (2000) and Al-Jawda & Asmar (2013, 2014), *C. carassius* by Al-Jawda & Asmar (2013), *C. macrostomum* by Balasem et al. (2000), *C. carpio* by Al-Rubaie et al. (2003), *G. rufa* by Balasem et al. (2003), *L. xanthopterus* (as *B. xanthopterus*) by Asmar et al. (1999), Balasem et al. (2003) and Hussain (2007), *P. abu* (as *L. abu*) by Abdul-Ameer (1989), Adday et al. (1999), Asmar et al. (1999), Mohammad-Ali et al. (1999), Salih et al. (2000), Asmar et al. (2001), Al-Jawda et al. (2003), Al-Rubaie et al. (2003), Asmar et al. (2003), Balasem et al. (2003), Mhaisen et al. (2003) and Al-Jawda & Asmar (2013) and *S. triostegus* by Al-Rubaie et al. (2003).

26- *Myxobolus drjagini* (Akhmerov, 1954) Landsberg & Lom, 1991 was recorded from both *A. marmid* and *A. grypus* by Bdair (2018), *C. luteus* (also reported as *B. luteus*) by Balasem et al. (2002b), Al-Jawda & Asmar (2013, 2014), Rasheed (2016), Mohammed (2017), Bdair (2018), Al-Helli (2019), Hameed (2019) and Mansoor (2019) who reported the authority as Akhmerov, 1954 without brackets, *C. carassius* by Al-Jawda & Asmar (2013), *C. regium* by Al-Jawda & Asmar (2014), *C. macrostomum* by Al-Jawda & Asmar (2013), *L. barbulus* (as *B. barbulus*) by Atwan (2016), *L. xanthopterus* by Bdair (2018) and *P. abu* (as *L. abu*) by Al-Jawda & Asmar (2013, 2014) as well as from unidentified host by Mansoor et al. (2012).

27- *Myxobolus ellipsoides* Thélohan, 1892 was recorded from *C. luteus* (also as *B. luteus*) by Al-Nasiri (2008), Al-Salmany (2015), Hendi (2017) and Mansoor (2019), *C. macrostomum* by Al-Jadoaa (2002), *L. xanthopterus* by Atwan (2016) and *M. sharpeyi* by Sheyaa (2019).

28- *Myxobolus episquamalis* Egusa, Maeno & Sorimachi, 1990 was recorded from *P. abu* by Hammood (2017).

29- *Myxobolus erythrophthalmi* Molnár, Eszterbauer, Marton, Cech & Székely, 2009 was recorded from *C. regium* by Abbas (2019).

30- *Myxobolus exgiuus* Thélohan, 1895 was recorded from *A. grypus* by Sheyaa (2019) and *C. luteus* by Atwan (2016) and Hameed (2019).

31- *Myxobolus fahmii* Ali, Al-Rasheid, Sakran, Abdel-Baki & Abdel-Ghaffar, 2002 was recorded from *C. luteus* by Abbas (2019) and Hameed (2019).

32- *Myxobolus feisti* Molnár, Cech, Székely, 2008 was recorded from *C. luteus* by Mansoor (2019) who erroneously stated the authority as Molnár, Gábor & Székely instead of Molnár, Cech & Székely.

33- *Myxobolus follius* Shulman, 1962 was recorded from *C. aculeata* by Al-Salmany (2015) who spelled the authority as Shulman and *C. luteus* by

Mohammed (2017) who misspelled the specific name as *folius* and the authority as Shul'man.

34- *Myxobolus gigi* (Fujita, 1927) Shulman, 1962 was recorded from *C. luteus* by Mansoor (2019) who erroneously stated the authority as Fujita, 1927 without brackets.

35- *Myxobolus gobiorum* Donec, 1984 was recorded from *L. xanthopterus* by Abbas (2019).

36- *Myxobolus ichkeulensis* Bahri & Marques, 1996 was recorded from *A. grypus* by Abbas (2019).

37- *Myxobolus impressus* Miroshnichenko, 1980 was recorded from *C. luteus* by Hameed (2019) and Mansoor (2019) and *C. regium* by Hameed (2019). It is reliable to state here that Mansoor (2019) claimed that the first record of this parasite in Iraq was by her, but in fact the first record was by Hameed (2019).

38- *Myxobolus improvisus* Izyumova in Shulman, 1966 was recorded from *L. xanthopterus* by Mansoor (2019) who misspelled the authority as Isjumova instead of Izyumova.

39- *Myxobolus infundibulatus* Donec & Kulakovskaya, in Shulman, 1962 was recorded from *M. sharpeyi* by Hameed (2019).

40- *Myxobolus intrachondrealis* Molnár, 2000 was recorded from both *A. grypus* and *C. luteus* by Hendi (2017) and from *C. carpio* by Bannai et al. (2005) who gave no authority for this parasite.

41- *Myxobolus iranicus* Molnár, Masoumian & Abbasi, 1996 was recorded from both *B. lacerta* and *C. luteus* (as *B. luteus*) by Abdullah (2002) and Abdullah & Mhaisen (2005) and from *S. glanis* by Al-Niaeemi (1997), Rahemo & Al-Neemi (1999) and Rahemo & Al-Niaeemi (2001).

42- *Myxobolus karelicus* Petrushevski, 1940 was recorded from *A. grypus* by Sheyaa (2019) and *P. abu* (as *L. abu*) by Al-Nasiri (2008).

43- *Myxobolus karuni* Masoumian, Baska & Molnár, 1994 was recorded from *A. marmid* by Hendi (2017), *A. grypus* (also as *B. grypus*) by Abdullah (2002), Abdullah & Mhaisen (2005), Al-Nasiri (2013), Hendi (2017) and Al-Helli (2019), *C. luteus* by Hendi (2017) and Hameed (2019), *C. regium* by Hendi (2017) and Abbas (2019) and *L. vorax* by Hendi (2017).

44- *Myxobolus koi* Kudo, 1919 was recorded from *A. grypus* (as *B. grypus*) by Al-Jawda et al. (2003), *C. luteus* (also reported as *B. luteus*) by Al-Nasiri (2000), Balasem et al. (2002b), Al-Nasiri (2008), Al-Jawda & Asmar (2013, 2014), Bdair (2018) and Mansoor (2019), *L. xanthopterus* (as *B. xanthopterus*) by Balasem et al. (2002b), *S. glanis* by Al-Niaeemi (1997), Rahemo & Al-Neemi (1999) and Rahemo & Al-Niaeemi (2001) and *S. triostegus* by Adday et al. (1999) as well as from unidentified host by Mansoor et al. (2012). It is appropriate to mention here that Bdair (2018) erroneously reported the year of authority as 1920 instead of 1919.

45- *Myxobolus krokhini* Konovalov & Shulman in Shulman, 1966 was recorded from *A. grypus* by Abbas (2019) and Abbas & Abdul-Ameer (2019) who both misspelled the specific name as *khrokhini* instead of *krokhini* and misspelled Shulman as Schulman.

46- *Myxobolus kubanicus* Bykhovskaya-Pavlovskaya & Bykhovski, 1940 was recorded from four fish species: *A. grypus*, *C. luteus*, *L. barbulus* (as *B. barbulus*) and *L. xanthopterus* by Atwan (2016) as well as *M. sharpeyi* by Sheyaa (2019). The specific name was misspelled as *kubanicum* instead of *kubanicus* by Atwan (2016) and Sheyaa (2019).

47- *Myxobolus lobatus* (Nemeczek, 1911) Landsberg & Lom, 1991 was recorded from *C. luteus* by Al-Saadi & Mohammed (2017), Mohammed (2017), Hameed (2019), Mansoor (2019) and Sheyaa (2019). The authority of this parasite was erroneously given as Dogiel, 1934 by Mansoor (2019).

48- *Myxobolus lomi* Donec & Kulakovskaya in Shulman, 1962 was recorded from *C. luteus* by Mansoor (2019) who misspelled the authority Kulakovskaya as Kulakowskaja with no mention to Shulman in the authority.

49- *Myxobolus lussi* Akhmerov, 1960 was recorded from both *A. grypus* and *L. barbulus* by Sheyaa (2019).

50- *Myxobolus macrocapsularis* Reuss, 1906 was recorded from *A. marmid* by Bdair (2018), *A. grypus* by Bdair (2018) and Sheyaa (2019), *C. luteus* (also reported as *B. luteus*) by Al-Nasiri (2008), Al-Jawda & Asmar (2013, 2014), Atwan (2016), Bdair (2018), Hameed (2019), Mansoor (2019) and Sheyaa (2019), *C. macrostomum* by Atwan (2016), *L. barbulus* (as *B. barbulus*) by Abdullah (1997), *M. sharpeyi* by Hameed (2019) and *P. abu* (as *L. abu*) by Al-Jawda & Asmar (2013) and Al-Salmany (2015) as well as from unidentified host by Mansoor et al. (2012) who misspelled the specific name as *macrocapsulari* instead of *macrocapsularis*.

51- *Myxobolus magnus* Awerinzev, 1913 was recorded from *C. luteus* by Hameed (2019) who misspelled the authority as Awerinzew instead of Awerinzev.

52- *Myxobolus mesopotamiae* Molnár, Masoumian & Abbasi, 1996 was recorded from *C. luteus* (as *B. luteus*) by Abdullah (2002) and Abdullah & Mhaisen (2005), *P. abu* (as *L. abu*) by Al-Jawda & Asmar (2013) and *S. triostegus* by Jori (2006).

53- *Myxobolus minutus* Nemeczek, 1911 was recorded from *C. kais* by Sheyaa (2019).

54- *Myxobolus molnari* Baska & Masoumian, 1996 was recorded from *L. esocinus* (as *Barbus esocinus*) by Abdullah (2002) and Abdullah & Mhaisen (2005) and from both *L. xanthopterus* and *M. sharpeyi* by Mansoor (2019).

55- *Myxobolus muelleri* Bütschli, 1882 was recorded from *A. grypus* (also as *B. grypus*) by Al-Nasiri & Mhaisen (2009) and Atwan (2016), *Capoeta* sp. (as *Varicorhinus* sp.) by Al-Nasiri (2008), *C. luteus* (also as *B. luteus*) by Al-Nasiri (2000), Atwan (2016), Hendi (2017), Abbas (2019) and Mansoor (2019), *C. carassius* by Al-Jawda & Asmar (2013), *C. regium* by Al-Jawda & Asmar (2014) and Atwan (2016), *C. kais* by Abbas (2019), *C. macrostomum* by Atwan (2016) and Abbas (2019), *C. carpio* by Al-Zubaidy (1998), *L. barbulus* (as *B. barbulus*) by Atwan (2016), *L. xanthopterus* (as *B. xanthopterus*) by Herzog (1969) and Hendi (2017) and *P. abu* (also as *L. abu*) by Al-Nasiri (2000), Al-Nasiri et al. (2003), Al-Nasiri (2008), Al-Jawda & Asmar (2013), Atwan (2016) and Hammood (2017) as

well as from unidentified host by Mansor et al. (2012). The authority was spelled as *mülleri* by some of the above-mentioned references and as *muelleri* by others, while some stated no authority.

56- *Myxobolus multiplicatus* (Reuss, 1906) Grinham & Cone, 1990 was recorded from both *A. grypus* (as *B. grypus*) and *M. sharpeyi* (as *B. sharpeyi*) by Herzog (1969) who reported this species as *Myxosoma multiplicata*. According to Landsberg & Lom (1991), *Myxosoma multiplicata* is a synonym of *Myxobolus multiplicatus*.

57- *Myxobolus musajevi* Kandilov, 1963 was recorded from *C. luteus* by Hameed (2019) and Mansoor (2019). Again, it is reliable to state here that Mansoor (2019) claimed that the first record of this parasite in Iraq was by her, but in fact the first record was by Hameed (2019) as Hameed discussed her thesis on 12<sup>th</sup> Dec. 2019 while Mansoor discussed her thesis on 30<sup>th</sup> Dec. 2019.

58- *Myxobolus musculi* Keysselitz, 1908 was recorded from *A. grypus* by Mansoor, (2019) and Sheyaa (2019), *C. luteus* by Al-Jawda & Asmar (2013), Al-Salmany (2015), Mohammed (2017) and Mansoor (2019), *C. regium* by Al-Nasiri (2013) and Abbas (2019), *C. macrostomum* by Al-Nasiri (2013) and Al-Salmany (2015), *C. carpio* by Al-Jawda & Asmar (2013), *G. rufa* by Abbas (2019), *L. vorax* by Bdair (2018), *M. sharpeyi* by Sheyaa (2019), *P. abu* (as *L. abu*) by Al-Jawda & Asmar (2013) and *S. triostegus* by Al-Jawda & Asmar (2013). This species is not incorporated into Eiras et al. (2005) and GBIF (2020), but it is found in Landsberg & Lom (1991) and Rocha et al. (2019).

59- *Myxobolus naffari* Abdel Ghaffar, Ibrahiem, Bashtar & Ali, 1998 was recorded by Sheyaa (2019) from *A. grypus*, *C. regium* and *C. macrostomum*.

60- *Myxobolus nemacheili* Weiser, 1949 was recorded from *A. sellal* (as *Alburnus capito*) by Balasem et al. (2002b), *A. grypus* (as *B. grypus*) by Mhaisen et al. (1997), Salih et al. (2000) and Al-Nasiri (2008), *C. luteus* (also as *B. luteus*) by Mhaisen et al. (2003) and Al-Jawda & Asmar (2013), *L. vorax* (as *A. vorax*) by Mhaisen et al. (1997), *L. esocinus* (as *B. esocinus*) by Mohammad-Ali et al. (1999), *L. xanthopterus* (also as *B. xanthopterus*) by Salih et al. (2000), Balasem et al. (2003), Bdair (2018) and Al-Helli (2019), *M. sharpeyi* (as *B. sharpeyi*) by Asmar et al. (2004) and *P. abu* (as *L. abu*) by Abdul-Ameer (1989), Adday et al. (1999), Asmar et al. (1999), Mohammad-Ali et al. (1999), Salih et al. (2000), Balasem et al. (2002a, b, 2003) and Al-Nasiri (2008).

61- *Myxobolus niei* Shulman, 1962 was recorded from *A. grypus* by Sheyaa (2019), *C. luteus* by Mohammed (2017) and Hameed (2019) and *P. abu* by Atwan (2016) and Abdul-Ameer & Atwan (2019). The authority was spelled as Shul'man by all above-mentioned references for this parasite.

62- *Myxobolus obesus* Gurley, 1893 was recorded from *L. vorax* by Sheyaa (2019).

63- *Myxobolus obpyriformis* Shulman, 1962 was recorded from both *C. luteus* and *C. zillii* by Sheyaa (2019) who reported the authority once as Schulman and once as Shul'man.

64- *Myxobolus orientalis* Shulman, 1962 was recorded from *A. grypus* (also as *B. grypus*) by Al-Nasiri (2008) and Bdair (2018) and *C. luteus* by Al-Salmany (2015), Mohammed (2017) and Bdair (2018). The authority was spelled as Shulman by all above-named references for this parasite, except Al-Nasiri (2008) who reported no authority.

65- *Myxobolus oviformis* Thélohan, 1892 was recorded from *A. marmid* by Al-Jawda et al. (2003) and Bdair (2018), *A. caeruleus* by Asmar et al. (1999) and Mhaisen et al. (2002), *A. grypus* (also as *B. grypus*) by Herzog (1969), Mhaisen et al. (1997), Adday et al. (1999), Al-Jawda et al. (2000), Balasem et al. (2000), Salih et al. (2000), Mhaisen et al. (2002), Al-Jawda et al. (2003), Balasem et al. (2003), Hendi (2017), Bdair (2018) and Sheyaa (2019), *C. damascina* (as *Barbus belayewi*) by Al-Jawda et al. (2000), *C. trutta* (as *Varicorhinus trutta*) by Al-Jawda et al. (2000), *C. luteus* (also as *B. luteus*) by Abdul-Rahman (1999)\*, Asmar et al. (1999), Mohammad-Ali et al. (1999), Al-Jawda et al. (2000), Al-Nasiri (2000)\*, Salih et al. (2000), Balasem et al. (2001, 2002a, b), Mhaisen et al. (2002), Al-Jawda et al. (2003), Balasem et al. (2003), Mhaisen et al. (2003), Al-Sa'adi (2007)\*, Al-Zubaidy (2007), Al-Jawda & Asmar (2013)\*, Al-Nasiri (2013), Al-Jawda & Asmar (2014)\*, Mhaisen et al. (2015)\*, Hendi (2017), Mohammed (2017), Bdair (2018) and Mansoor (2019)\*, *C. auratus* by Bdair (2018), *C. carassius* by Abdul-Rahman (1999)\*, Mohammad-Ali et al. (1999), Mhaisen et al. (2003), Mansor et al. (2012) and Al-Jawda & Asmar (2013)\*, *C. regium* by Balasem et al. (1993)\*, Adday et al. (1999), Al-Jawdat et al. (2000), Mansor et al. (2012), Al-Jawda & Asmar (2014)\* and Bdair (2018), *C. macrostomum* by Balasem et al. (2000), *C. carpio* by Al-Zubaidy (1998)\*, Abdul-Rahman (1999)\*, Asmar et al. (1999), Mhaisen et al. (2002), Al-Zubaidy (2007), Hussain et al. (2011a, b) and Al-Jawda & Asmar (2013)\*, *L. vorax* (as *A. vorax*) by Herzog (1969), Mhaisen et al. (1997), Abdul-Rahman (1999)\*, Al-Jawda et al. (2000), Abdullah (2002)\* and Abdullah & Mhaisen (2005)\*, *L. barbulus* (as *B. barbulus*) by Al-Jawda et al. (2000, 2003) and Sheyaa (2019), *L. esocinus* (as *B. esocinus*) by Herzog (1969), Adday et al. (1999), Mohammad-Ali et al. (1999) and Al-Jawda et al. (2003), *L. subquincunciatus* (as *B. subquincunciatus*) by Al-Jawda et al. (2003), *L. xanthopterus* (also as *B. xanthopterus*) by Balasem et al. (1993)\*, Al-Shaikh et al. (1995), Mhaisen et al. (1997), Adday et al. (1999), Asmar et al. (1999), Mhaisen et al. (2002), Balasem et al. (2003) and Bdair (2018), *M. sharpeyi* (also as *B. sharpeyi*) by Herzog (1969), Al-Salim (1989a), Al-Jawda et al. (2000), Mhaisen et al. (2002) and Sheyaa (2019), *P. abu* (also as *L. abu*) by Balasem et al. (1993)\*, Al-Shaikh et al. (1995), Abdul-Rahman (1999)\*, Adday et al. (1999), Mohammad-Ali et al. (1999), Al-Jawda et al. (2000), Al-Nasiri (2000)\*, Salih et al. (2000), Balasem et al. (2001, 2002a, b), Mhaisen et al. (2002), Al-Jawda et al. (2003), Al-Nasiri et al. (2003)\*, Al-Rubaei et al. (2003), Asmar et al. (2003), Balasem et al. (2003), Mhaisen et al. (2003), Al-Zubaidy (2007), Al-Jawda & Asmar (2013, 2014)\*, Al-Musawi (2016)\* and Bdair (2018), *P. subviridis* (as *L. subviridis*) by Abdul-Rahman (1999)\*, *S. triostegus* by Al-Jawda & Asmar (2013)\* and *S. lepidus* (as *Leuciscus lepidus*) by Al-Jawda et al. (2000) as well as from unidentified host by Mansor et al. (2012). The year of

authority was misapplied as 1882 instead of 1892 in the above-mentioned references with an asterisk.

66- *Myxobolus paludinosus* Reed, Basson, & Van As, 2002 was recorded from *C. luteus* by Hameed (2019) and Hameed & Abdul-Ameer (2019) and *C. regium* by Hameed (2019).

67- *Myxobolus parvus* Shulman, 1962 was recorded from *A. grypus* by Mansoor (2019), *C. luteus* (also as *B. luteus*) by Al-Jawda & Asmar (2013, 2014), Bdair (2018), Hameed (2019) and Mansoor (2019), *C. carassius* by Al-Jawda & Asmar (2014), *C. regium* by Al-Jawda & Asmar (2014), *C. carpio* by Abdullah (1997, 2002), Abdullah & Mhaisen (2005) and Al-Jawda & Asmar (2013), *L. xanthopterus* (also as *B. xanthopterus*) by Al-Nasiri (2008), Bdair (2018) and Mansoor (2019), *M. sharpeyi* by Sheyaa (2019), *P. abu* (also as *L. abu*) by Al-Jawda & Asmar (2013, 2014) and Mansoor (2019) and *S. triostegus* by Al-Jawda & Asmar (2013) as well as from unidentified host by Mansoor et al. (2012). The authority of this parasite was spelled as Shul'man in all above-mentioned references except for Abdullah (1997) who spelled it as Schulman and both Al-Nasiri (2008) and Mansoor et al. (2012) who gave no authority.

68- *Myxobolus permagnus* Wegener, 1910 was recorded from *C. luteus* by Al-Saadi & Mohammed (2017), Mohammed (2017) and Hameed (2019).

69- *Myxobolus persicus* Masoumian, Baska & Molnár, 1994 was recorded from *A. grypus* (as *B. grypus*) by Abdullah (2002), Abdullah & Mhaisen (2005) and Mansoor (2019), *C. luteus* (as *B. luteus*) by Al-Nasiri (2013) and Mansoor (2019) and *C. macrostomum* by Abdullah (2002) and Abdullah & Mhaisen (2005).

70- *Myxobolus pethericii* Fomena, Folefack & Tang, 2007 was recorded from *C. luteus* by Hameed (2019).

71- *Myxobolus pfeifferi* Thélohan, 1895 was recorded from *A. centisquama* by Balasem et al. (2003), *A. marmid* by Fattohy (1975), Kasim et al. (1977), Rahemo (1997), Abdullah (2002), Al-Jawda et al. (2003), Abdullah & Mhaisen (2005, 2009), Rahemo (2011) and Bdair (2018), *A. arabicus* (as *Acanthopagrus latus*) by Al-Janae'e (2010), *A. caeruleus* by Asmar et al. (1999) and Balasem et al. (2002b, 2003), *A. orontis* by Al-Sa'adi (2007) and Mhaisen et al. (2015), *A. sellal* (as *A. capito*, *A. mosulensis* and *Chalcalburnus sellal*) by Rahemo & Ami (1993), Abdul-Rahman (1999) and Balasem et al. (2002b), *A. stoliczkanus* (as *Aphanius dispar*) by Al-Awadi (2003), *A. grypus* (also as *B. grypus* and *Tor grypus*) by Ali et al. (1987a), Ali (1989), Rashid et al. (1989), Mhaisen et al. (1997), Mohammad-Ali et al. (1999), Al-Jawda et al. (2000), Balasem et al. (2000), Salih et al. (2000), Al-Awadi (2003), Balasem et al. (2003), Al-Abbadie (2006), Al-Sa'adi (2007), Al-Zubaidy (2007), Zangana (2008), Mhaisen et al. (2015), Atwan (2016) and Bdair (2018), *C. damascina* (as *B. belayewi*) by Balasem et al. (1993), Al-Jawda et al. (2000, 2003) and Mhaisen et al. (2015), *C. umbla* (as *Varicorhinus umbla*) by Abdullah (2002), Abdullah & Mhaisen (2005), Bilal (2006) and Bilal & Abdullah (2008), *C. luteus* (also as *B. luteus*) by Khamees (1983), Al-Daraji (1986), Al-Salim (1986), Mhaisen et al. (1986), Ali et al. (1987a), Ali (1989), Abdullah (1990), Al-Daraji & Al-Salim (1990), Al-Awadi (1997), Rahemo & Al-Kallak (1998), Abdul-

Rahman (1999), Abdullah (2000), Al-Jawda et al. (2000), Al-Nasiri (2000), Salih et al. (2000), Balasem et al. (2001, 2002a, b), Mhaisen et al. (2002), Al-Awadi (2003), Al-Jawda et al. (2003), Al-Rubaie et al. (2003), Asmar et al. (2003), Balasem et al. (2003), Mhaisen et al. (2003), Al-Waaly (2005), Al-Sa'adi (2007), Al-Zubaidy (2007), Al-Awadi et al. (2010), Abdullah (2013), Abdullah & Abdullah (2013), Al-Jawda & Asmar (2013, 2014), Abdullah & Abdullah (2015), Mhaisen et al. (2015), Rasheed (2016), Bdair (2018) and Hameed (2019), *C. auratus* by Al-Jawda & Asmar (2013) and Bdair (2018), *C. carassius* by Abdul-Rahman (1999) and Al-Jawda & Asmar (2013), *C. regium* by Ali et al. (1987a), Balasem et al. (1993), Mhaisen et al. (1995, 1997, 2002) and Bdair (2018), *C. idella* by Abdul-Rahman (1999) and Al-Jadoaa (2002), *C. kais* by Balasem et al. (2002b), Al-Sa'adi (2007) and Mhaisen et al. (2015), *C. macrostomum* by Ali et al. (1987b), Abdul-Ameer (1989), Ali (1989), Rashid et al. (1989), Abdullah (1990), Al-Sa'adi (2007), Abdullah (2013), Abdullah & Abdullah (2013), Al-Jawda & Asmar (2013), Abdullah & Abdullah (2015), Al-Salmany (2015) and Mhaisen et al. (2015), *C. carpio* by Ali et al. (1987a), Abdullah (1990), Mhaisen & Abul-Eis (1991), Mhaisen et al. (1993), Al-Zubaidy (1998), Abdul-Rahman (1999), Asmar et al. (1999), Mohammad-Ali et al. (1999), Abdullah (2000), Al-Jadoaa (2002), Asmar et al. (2003), Balasem et al. (2003), Al-Zubaidy (2007), Hussain et al. (2011a), Al-Jawda & Asmar (2013) and Eassa et al. (2014), *H. fossilis* by Balasem et al. (1993) and Abdul-Rahman (1999), *H. molitrix* by Al-Zubaidy (1998) and Al-Jadoaa (2002), *L. vorax* (also as *A. vorax*) by Al-Daraji (1986), Ali et al. (1987a), Al-Daraji & Al-Salim (1990), Mhaisen et al. (1997), Abdul-Rahman (1999), Al-Jawda et al. (2000), Al-Abbadie (2006) and Bdair (2018), *L. barbulus* (as *B. barbulus*) by Ali (1989), Abdullah (1990), Al-Jawda et al. (2000, 2003) and Al-Sa'adi (2007), *L. esocinus* (as *B. esocinus*) by Rashed & Hussain (1988), Ali (1989), Rashid et al. (1989), Abdullah (2002) and Al-Jawda et al. (2003), *L. xanthopterus* (also as *B. xanthopterus*) by Ali et al. (1987a, b), Abdullah (1990), Balasem et al. (1993), Mhaisen et al. (1997), Salih et al. (2000), Al-Jadoaa (2002), Al-Awadi (2003), Balasem et al. (2003), Al-Abbadie (2006), Al-Sa'adi (2007), Mhaisen et al. (2015), Atwan (2016) and Bdair (2018), *M. mastacembelus* by Abdul-Rahman (1999) and Balasem et al. (2002b), *M. sharpeyi* (also as *B. sharpeyi*) by Al-Daraji (1986), Rashed & Hussain (1988), Al-Daraji & Al-Salim (1990), Mhaisen et al. (1997), Abdul-Rahman (1999), Al-Jawda et al. (2000), Salih et al. (2000), Al-Jadoaa (2002), Mhaisen et al. (2002), Al-Awadi (2003), Al-Rubaie et al. (2003), Balasem et al. (2003), Al-Abbadie (2006), Al-Sa'adi (2007) and Mhaisen et al. (2015), *M. pelusius* by Balasem et al. (2002b) and Al-Jawda & Asmar (2013), *P. waltoni* by Mhaisen & Al-Maliki (1996), *P. abu* (also as *L. abu*) by Khamees (1983), Al-Daraji (1986), Mhaisen et al. (1986), Ali et al. (1987a), Al-Salim (1989b), Mhaisen et al. (1989), Al-Daraji & Al-Salim (1990), Balasem et al. (1993), Rahemo & Al-Abbadie (1994), Al-Shaikh et al. (1995), Mhaisen et al. (1995), Al-Awadi (1997), Jori (1998), Abdul-Rahman (1999), Asmar et al. (1999), Mohammad-Ali et al. (1999), Salih et al. (2000), Balasem et al. (2001), Al-Niaeem (2002), Balasem et al. (2002b), Mhaisen et al. (2002), Al-Awadi (2003), Balasem et al. (2003), Mhaisen et



al. (2003), Mustafa (2005), Al-Abbadie (2006), Al-Niaeem (2006a, b), Mustafa et al. (2006), Al-Sa'adi (2007), Al-Zubaidy (2007), Al-Jadoaa (2008), Al-Awadi et al. (2010), Al-Janae'e (2010), Al-Jawda & Asmar (2013, 2014), Mhaisen et al. (2015), Al-Musawi (2016) and Atwan (2016), *P. subviridis* (as *L. subviridis*) by Al-Salim (1992) and Abdul-Rahman (1999), *S. triostegus* (also as *Parasilurus triostegus*) by Al-Daraji (1986), Al-Daraji & Al-Salim (1990), Abdul-Rahman (1999), Jori (2006), Abbas (2007) and Al-Jawda & Asmar (2013, 2014), *S. cephalus* (as *Leuciscus cephalus*) by Ali (1989), *S. lepidus* (as *L. lepidus*) by Al-Jawda et al. (2000) and *S. spurius* (as *Leuciscus spurius*) by Ali (1989) as well as from unidentified host by Mansor et al. (2012).

72- *Myxobolus phylloides* Shulman, 1962 was recorded from *C. luteus* by Mansoor (2019) who misspelled the authority once as Schulman and once as Shul'man.

73- *Myxobolus poljanski* Shulman, 1962 was recorded from *A. grypus* (as *B. grypus*) by Abdullah (1990, 2002), Abdullah & Rasheed (2004) and Abdullah & Mhaisen (2005), *C. luteus* (also as *B. luteus*) by Balasem et al. (2000), Al-Jawda & Asmar (2013, 2014), Mansoor (2019) and Sheyaa (2019), *C. regium* by Al-Jawda & Asmar (2014), *C. macrostomum* by Balasem et al. (2000), *L. xanthopterus* by Bdair (2018) and *S. triostegus* by Shwani (2009) and Abdullah & Shwani (2010) as well as from unidentified host by Mansor et al. (2012). The authority of this parasite was spelled as Shul'man in all the above-mentioned references except for Mansoor (2019) who spelled it once as Schulman and once as Shul'man. Abdullah (1990) and Abdullah & Rasheed (2004) spelled it as Shulman, while Balasem et al. (2000) gave no authority.

74- *Myxobolus problematicus* Shulman, 1962 was recorded from *A. grypus* by Sheyaa (2019), *C. luteus* by Rasheed (2016) and Hameed (2019) and *M. sharpeyi* by Hameed (2019) and Sheyaa (2019). The authority of this parasite was spelled as Shul'man by all the above-named three references.

75- *Myxobolus pseudodispar* Gorbunova, 1936 was recorded from *A. marmid* by Al-Nasiri (2000), *C. luteus* (also as *B. luteus*) by Al-Nasiri (2000), Al-Salmany (2015), Rasheed (2016) and Mansoor (2019), *C. regium* by Al-Nasiri (2008) and *M. sharpeyi* by Mansoor (2019).

76- *Myxobolus pseudorasbora* (Hoshina, 1952) Landsberg & Lom, 1991 was recorded from *C. luteus* by Hameed (2019).

77- *Myxobolus punctatus* Chaudhuri & Chakravarty, 1970 was recorded from *C. carpio* by Al-Daraji et al. (1999) who misapplied the authority as Raychandhuri & Chakravarty, 1970 instead of Chaudhuri & Chakravarty, 1970.

78- *Myxobolus rotundatus* Akhmerov, 1956 was recorded from *C. luteus* by Hameed (2019) and Sheyaa (2019) and *M. sharpeyi* by Sheyaa (2019).

79- *Myxobolus rotundus* Nemeček, 1911 was recorded from both *L. xanthopterus* and *P. abu* by Atwan (2016) as well as *S. lepidus* (as *L. lepidus*) by Abdullah (1997, 2002) and Abdullah & Mhaisen (2005).

80- *Myxobolus sanagaensis* Benoît, Sorel & Abraham, 2017 was recorded from *C. luteus* by Hameed (2019) and Hameed & Abdul-Ameer (2019). In both

references, it was stated that this parasite is similar in its description and measurements to that of Benoît et al. (2017) which was described as a new species from Cameroon from *Barbus callipterus* (a synonym of *Enteromius callipterus* according to Fricke et al., 2020).

81- *Myxobolus sandrae* Reuss, 1906 was recorded from *L. xanthopterus* (as *B. xanthopterus*) by Al-Nasiri (2008) and *P. abu* (also as *L. abu*) by Abdullah (1997) and Al-Helli (2019). Al-Nasiri (2008) mentioned no authority for this parasite in her article.

82- *Myxobolus saugati* Kaur & Singh, 2011 was recorded from *L. barbulus* by Abbas (2019).

83- *Myxobolus schulmani* Donec, 1962 was recorded from *A. grypus* (as *B. grypus*) by Al-Nasiri (2008), *C. luteus* by Bdair (2018) and Mansoor (2019) and *C. regium* by Al-Salmany (2015). It is reliable to state here that Al-Nasiri (2008) mentioned no authority for this parasite.

84- *Myxobolus sclerii* Kaur & Singh, 2010 was recorded from *G. rufa* by Abbas (2019) who misapplied the year of authority as 2011 instead of 2010.

85- *Myxobolus shadgani* Molnár, Masoumian & Abbasi, 1996 was recorded from *B. rajanorum* by Abdullah (2002) and Abdullah & Mhaisen (2005), *C. luteus* by Mansoor (2019) and *L. barbulus* (as *B. barbulus*) by Abdullah (2002), Abdullah & Mhaisen (2005), Bilal (2006) and Bilal & Abdullah (2008).

86- *Myxobolus sharpeyi* Molnár, Masoumian & Abbasi, 1996 was recorded from *C. luteus* by Mansoor (2019) and from both *C. regium* and *M. sharpeyi* (as *B. sharpeyi*) by Abdullah (2002) and Abdullah & Mhaisen (2005).

87- *Myxobolus spatulatus* Dogiel & Bogolepova, 1957 was recorded from *C. luteus* by Al-Salmany (2015).

88- *Myxobolus sphaericus* (Fujita, 1924) Landsberg & Lom, 1991 was recorded from *A. marmid* by Bdair (2018), *A. caeruleus* by Balasem et al. (2003)\*, *A. grypus* (also as *B. grypus*) by Al-Nasiri (2008)\* and Bdair (2018), *C. luteus* by Al-Jawda & Asmar (2013, 2014) and Bdair (2018), *C. carassius* by Al-Jawda & Asmar (2014), *C. regium* by Abdul-Ameer (1989), Al-Jawda & Asmar (2014) and Bdair (2018), *C. macrostomum* by Al-Jawda & Asmar (2013), *L. vorax* by Bdair (2018), *L. esocinus* (as *B. esocinus*) by Abdullah (1990), *L. xanthopterus* (also as *B. xanthopterus*) by Asmar et al. (2003)\*, Balasem et al. (2003)\* and Bdair (2018), *M. sharpeyi* (as *B. sharpeyi*) by Al-Rubaie et al. (2003) and *P. abu* (also as *L. abu*) by Abdullah (1990), Adday et al. (1999), Mohammad-Ali et al. (1999)\*, Salih et al. (2000)\*, Balasem et al. (2002b), Al-Rubaie et al. (2003), Asmar et al. (2003)\*, Balasem et al. (2003)\*, Al-Jawda & Asmar (2013, 2014) and Bdair (2018) as well as from unidentified host by Mansor et al. (2012). This parasite was also reported as *Myxosoma sphaerica* by the above references marked with an asterisk.

89- *Myxobolus sphaerocapsularis* Shulman, 1962 was recorded from both *L. barbulus* (as *B. barbulus*) and *L. xanthopterus* by Atwan (2016) who misspelled the authority as Shul'man.

90- *Myxobolus sprostoni* Shulman, 1962 was recorded from *C. luteus* by Al-Saadi & Mohammed (2017), Mohammed (2017) and Mansoor (2019) and from

both *L. vorax* and *P. abu* by Al-Asadiy (2019). In all these four references, the authority was misspelled as Shul'man instead of Shulman.

91- *Myxobolus squamae* Keysselitz, 1908 was recorded from *C. luteus* by Sheyaa (2019), *C. carpio* by Atwan (2016) and Abbas (2019) and *L. xanthopterus* by Abbas (2019).

92- *Myxobolus suturalis* Shulman, 1962 was recorded from *C. luteus* by Mansoor (2019) who misspelled the authority once as Schulman and once as Shul'man.

93- *Myxobolus szekeli* Kaur & Singh, 2011 was recorded from *A. grypus* by Sheyaa (2019), *C. luteus* by Hameed (2019) and *C. kais* by Sheyaa (2019).

94- *Myxobolus talievi* Dogiel & Bogolepova, 1957 was recorded from *C. luteus* by Sheyaa (2019).

95- *Myxobolus tilapiae* Abolarin, 1974 was recorded from *L. xanthopterus* by Sheyaa (2019).

96- *Myxobolus uniporus* Fujita, 1927 was recorded from *C. luteus* by Sheyaa (2019).

97- *Myxobolus yini* Shulman, 1962 was recorded from *L. xanthopterus* by Mansoor (2019) who misspelled the authority once as Schulman and once as Shul'man.

Unidentified *Myxobolus* species were recorded from *A. grypus* (as *B. grypus*) by Herzog (1969) and Abdullah (2004), *C. macrostomum* by Abdullah (2004), *C. carpio* by Abdullah (2004), Al-Nowfal (2017), Jawdhira et al. (2017) and Al-Nowfal et al. (2018), both *Luciobarbus L. esocinus* (as *B. esocinus*) and *L. xanthopterus* (as *B. xanthopterus*) by Herzog (1969), *P. abu* (as *L. abu*) by Al-Dosary (1999) and Abdullah (2004) and *S. triostegus* by Jori (2006).

The *Myxobolus*-fish host list of Iraq is demonstrated in Table 1. *Myxobolus* species are alphabetically arranged. The valid fish host species are also alphabetically arranged for each *Myxobolus* species.

Table 1: *Myxobolus* species of Iraq with their valid fish host species.

1- <i>Myxobolus acutus</i>	<i>Carasobarbus luteus</i> , <i>Cyprinion macrostomum</i> , <i>Luciobarbus xanthopterus</i>
2- <i>M. adeli</i>	<i>Carasobarbus luteus</i>
3- <i>M. alburni</i>	<i>Mesopotamichthys sharpeyi</i>
4- <i>M. alienus</i>	<i>Chondrostoma regium</i>
5- <i>M. amurensis</i>	<i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Luciobarbus esocinus</i> , <i>Planiliza abu</i> , <i>Squalius lepidus</i>
6- <i>M. bizerti</i>	<i>Planiliza abu</i>
7- <i>M. bliccae</i>	<i>Carasobarbus luteus</i> , <i>Cyprinion macrostomum</i>
8- <i>M. bouixi</i>	<i>Carasobarbus luteus</i>
9- <i>M. bramae</i>	<i>Acanthobrama marmid</i> , <i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Carassius auratus</i> , <i>C. carassius</i> , <i>Luciobarbus xanthopterus</i> , <i>Mesopotamichthys sharpeyi</i> , <i>Planiliza abu</i> , unidentified host
10- <i>M. branchialis</i>	<i>Arabibarbus grypus</i> , <i>Chondrostoma regium</i> , <i>Planiliza abu</i>

Table 1, continued

11- <i>M. branchilateralis</i>	<i>Carasobarbus luteus</i>
12- <i>M. branchiophilus</i>	<i>Arabibarbuis grypus</i>
13- <i>M. buckei</i>	<i>Arabibarbuis grypus</i>
14- <i>M. bulbocordis</i>	<i>Carasobarbus luteus</i> , <i>Chondrostoma regium</i> , <i>Mesopotamichthys sharpeyi</i>
15- <i>M. calcariferum</i>	<i>Mesopotamichthys sharpeyi</i>
16- <i>M. carassii</i>	<i>Arabibarbuis grypus</i> , <i>Luciobarbus esocinus</i>
17- <i>M. caudatus</i>	<i>Arabibarbuis grypus</i>
18- <i>M. chondrostomi</i>	<i>Arabibarbuis grypus</i> , <i>Carasobarbus luteus</i> , <i>Mesopotamichthys sharpeyi</i>
19- <i>M. chuatsi</i>	<i>Cyprinion macrostomum</i> , <i>Luciobarbus barbuis</i> , <i>Planiliza abu</i>
20- <i>M. cyprini</i>	unidentified host
21- <i>M. cyprinicola</i>	<i>Alburnus caeruleus</i> , <i>Arabibarbuis grypus</i> , <i>Capoeta</i> sp., <i>Carasobarbus luteus</i> , <i>Carassius auratus</i> , <i>C. carassius</i> , <i>Chondrostoma regium</i> , <i>Cyprinion macrostomum</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus barbuis</i> , <i>L. xanthopterus</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i> , unidentified host
22- <i>M. dermatobius</i>	<i>Carasobarbus luteus</i> , <i>Chondrostoma regium</i> , <i>Planiliza abu</i>
23- <i>M. dispar</i>	<i>Arabibarbuis grypus</i> , <i>Capoeta trutta</i> , <i>Carasobarbus luteus</i> , <i>Carassius carassius</i> , <i>Chondrostoma regium</i> , <i>Cyprinus carpio</i> , <i>Leuciscus vorax</i> , <i>Luciobarbus barbuis</i> , <i>L. subquincunciatus</i> , <i>L. xanthopterus</i> , <i>Mesopotamichthys sharpeyi</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>
24- <i>M. diversus</i>	<i>Planiliza subviridis</i>
25- <i>M. dogieli</i>	<i>Arabibarbuis grypus</i> , <i>Carasobarbus luteus</i> , <i>Carassius carassius</i> , <i>Cyprinion macrostomum</i> , <i>Cyprinus carpio</i> , <i>Garra rufa</i> , <i>Luciobarbus xanthopterus</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>
26- <i>M. drjagini</i>	<i>Acanthobrama marmid</i> , <i>Arabibarbuis grypus</i> , <i>Carasobarbus luteus</i> , <i>Carassius carassius</i> , <i>Chondrostoma regium</i> , <i>Cyprinion macrostomum</i> , <i>Luciobarbus barbuis</i> , <i>L. xanthopterus</i> , <i>Planiliza abu</i> , unidentified host
27- <i>M. ellipsoides</i>	<i>Carasobarbus luteus</i> , <i>Cyprinion macrostomum</i> , <i>Luciobarbus xanthopterus</i> , <i>Mesopotamichthys sharpeyi</i>
28- <i>M. episquamalis</i>	<i>Planiliza abu</i>
29- <i>M. erythrophthalmi</i>	<i>Chondrostoma regium</i>
30- <i>M. exgiuus</i>	<i>Arabibarbuis grypus</i> , <i>Carasobarbus luteus</i>
31- <i>M. fahmii</i>	<i>Carasobarbus luteus</i>
32- <i>M. feisti</i>	<i>Carasobarbus luteus</i>
33- <i>M. follius</i>	<i>Capoeta aculeata</i> , <i>Carasobarbus luteus</i>
34- <i>M. gigi</i>	<i>Carasobarbus luteus</i>
35- <i>M. gobiorum</i>	<i>Luciobarbus xanthopterus</i>
36- <i>M. ichkeulensis</i>	<i>Arabibarbuis grypus</i>
37- <i>M. impressus</i>	<i>Carasobarbus luteus</i> , <i>Chondrostoma regium</i>

Table 1, continued

38- <i>M. improvisus</i>	<i>Luciobarbus xanthopterus</i>
39- <i>M. infundibulatus</i>	<i>Mesopotamichthys sharpeyi</i>
40- <i>M. intrachondrealis</i>	<i>Arabibarbus grypus, Carasobarbus luteus, Cyprinus carpio</i>
41- <i>M. iranicus</i>	<i>Barbus lacerta, Carasobarbus luteus, Silurus glanis</i>
42- <i>M. karelicus</i>	<i>Arabibarbus grypus, Planiliza abu</i>
43- <i>M. karuni</i>	<i>Acanthobrama marmid, Arabibarbus grypus, Carasobarbus luteus, Chondrostoma regium, Leuciscus vorax</i>
44- <i>M. koi</i>	<i>Arabibarbus grypus, Carasobarbus luteus, Luciobarbus xanthopterus, Silurus glanis, S. triostegus, unidentified host</i>
45- <i>M. krokhini</i>	<i>Arabibarbus grypus</i>
46- <i>M. kubanicus</i>	<i>Arabibarbus grypus, Carasobarbus luteus, Luciobarbus barbulus, L. xanthopterus, Mesopotamichthys sharpeyi</i>
47- <i>M. lobatus</i>	<i>Carasobarbus luteus</i>
48- <i>M. lomi</i>	<i>Carasobarbus luteus</i>
49- <i>M. lussi</i>	<i>Arabibarbus grypus, Luciobarbus barbulus</i>
50- <i>M. macrocapsularis</i>	<i>Acanthobrama marmid, Arabibarbus grypus, Carasobarbus luteus, Cyprinion macrostomum, Luciobarbus barbulus, Mesopotamichthys sharpeyi, Planiliza abu, unidentified host</i>
51- <i>M. magnus</i>	<i>Carasobarbus luteus</i>
52- <i>M. mesopotamiae</i>	<i>Carasobarbus luteus, Planiliza abu, Silurus triostegus</i>
53- <i>M. minutus</i>	<i>Cyprinion kais</i>
54- <i>M. molnari</i>	<i>Luciobarbus esocinus, L. xanthopterus, Mesopotamichthys sharpeyi</i>
55- <i>M. muelleri</i>	<i>Arabibarbus grypus, Capoeta sp., Carasobarbus luteus, Carassius carassius, Chondrostoma regium, Cyprinion kais, C. macrostomum, Cyprinus carpio, Luciobarbus barbulus, L. xanthopterus, Planiliza abu, unidentified host</i>
56- <i>M. multiplicatus</i>	<i>Arabibarbus grypus, Mesopotamichthys sharpeyi</i>
57- <i>M. musajevi</i>	<i>Carasobarbus luteus</i>
58- <i>M. musculi</i>	<i>Arabibarbus grypus, Carasobarbus luteus, Chondrostoma regium, Cyprinion macrostomum, Cyprinus carpio, Garra rufa, Leuciscus vorax, Mesopotamichthys sharpeyi, Planiliza abu, Silurus triostegus</i>
59- <i>M. naffari</i>	<i>Arabibarbus grypus, Chondrostoma regium, Cyprinion macrostomum</i>
60- <i>M. nemacheili</i>	<i>Alburnus sellal, Arabibarbus grypus, Carasobarbus luteus, Leuciscus vorax, Luciobarbus esocinus, L. xanthopterus, Mesopotamichthys sharpeyi, Planiliza abu</i>
61- <i>M. niei</i>	<i>Arabibarbus grypus, Carasobarbus luteus, Planiliza abu</i>
62- <i>M. obesus</i>	<i>Leuciscus vorax</i>
63- <i>M. obpyriformis</i>	<i>Carasobarbus luteus, Coptodon zillii</i>
64- <i>M. orientalis</i>	<i>Arabibarbus grypus, Carasobarbus luteus</i>

Table 1, continued

65- <i>M. oviformis</i>	<i>Acanthobrama marmid</i> , <i>Alburnus caeruleus</i> , <i>Arabibarbus grypus</i> , <i>Capoeta damascina</i> , <i>C. trutta</i> , <i>Carasobarbus luteus</i> , <i>Carassius auratus</i> , <i>C. carassius</i> , <i>Chondrostoma regium</i> , <i>Cyprinion macrostomum</i> , <i>Cyprinus carpio</i> , <i>Leuciscus vorax</i> , <i>Luciobarbus barbulus</i> , <i>L. esocinus</i> , <i>L. subquincunciatus</i> , <i>L. xanthopterus</i> , <i>Mesopotamichthys sharpeyi</i> , <i>Planiliza abu</i> , <i>P. subviridis</i> , <i>Silurus triostegus</i> , <i>Squalius lepidus</i> , unidentified host
66- <i>M. paludinosus</i>	<i>Carasobarbus luteus</i> , <i>Chondrostoma regium</i>
67- <i>M. parvus</i>	<i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Carassius carassius</i> , <i>Chondrostoma regium</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus xanthopterus</i> , <i>Mesopotamichthys sharpeyi</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i> , unidentified host
68- <i>M. permagnus</i>	<i>Carasobarbus luteus</i>
69- <i>M. persicus</i>	<i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Cyprinion macrostomum</i>
70- <i>M. pethericii</i>	<i>Carasobarbus luteus</i>
71- <i>M. pfeifferi</i>	<i>Acanthobrama centisquama</i> , <i>A. marmid</i> , <i>Acanthopagrus arabicus</i> , <i>Alburnus caeruleus</i> , <i>A. orontis</i> , <i>A. sellal</i> , <i>Aphanius stoliczkanus</i> , <i>Arabibarbus grypus</i> , <i>Capoeta damascina</i> , <i>C. umbla</i> , <i>Carasobarbus luteus</i> , <i>Carassius auratus</i> , <i>C. carassius</i> , <i>Chondrostoma regium</i> , <i>Ctenopharyngodon idella</i> , <i>Cyprinion kais</i> , <i>C. macrostomum</i> , <i>Cyprinus carpio</i> , <i>Heteropneustes fossilis</i> , <i>Hypophthalmichthys molitrix</i> , <i>Leuciscus vorax</i> , <i>Luciobarbus barbulus</i> , <i>L. esocinus</i> , <i>L. xanthopterus</i> , <i>Mastacembelus mastacembelus</i> , <i>Mesopotamichthys sharpeyi</i> , <i>Mystus pelusius</i> , <i>Periophthalmus waltoni</i> , <i>Planiliza abu</i> , <i>P. subviridis</i> , <i>Silurus triostegus</i> , <i>Squalius cephalus</i> , <i>S. lepidus</i> , <i>S. spurius</i> , unidentified host
72- <i>M. phylloides</i>	<i>Carasobarbus luteus</i>
73- <i>M. poljanski</i>	<i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Chondrostoma regium</i> , <i>Cyprinion macrostomum</i> , <i>Luciobarbus xanthopterus</i> , <i>Silurus triostegus</i> , unidentified host
74- <i>M. problematicus</i>	<i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Mesopotamichthys sharpeyi</i>
75- <i>M. pseudodispar</i>	<i>Acanthobrama marmid</i> , <i>Carasobarbus luteus</i> , <i>Chondrostoma regium</i> , <i>Mesopotamichthys sharpeyi</i>
76- <i>M. pseudorasbora</i>	<i>Carasobarbus luteus</i>
77- <i>M. punctatus</i>	<i>Cyprinus carpio</i>
78- <i>M. rotundatus</i>	<i>Carasobarbus luteus</i> , <i>Mesopotamichthys sharpeyi</i>
79- <i>M. rotundus</i>	<i>Luciobarbus xanthopterus</i> , <i>Planiliza abu</i> , <i>Squalius lepidus</i>
80- <i>M. sanagaensis</i>	<i>Carasobarbus luteus</i>
81- <i>M. sandrae</i>	<i>Luciobarbus xanthopterus</i> , <i>Planiliza abu</i>
82- <i>M. saugati</i>	<i>Luciobarbus barbulus</i>

Table 1, continued

83- <i>M. schulmani</i>	<i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Chondrostoma regium</i>
84- <i>M. sclerii</i>	<i>Garra rufa</i>
85- <i>M. shadgani</i>	<i>Barbus rajanorum</i> , <i>Carasobarbus luteus</i> , <i>Luciobarbus barbulus</i>
86- <i>M. sharpeyi</i>	<i>Carasobarbus luteus</i> , <i>Chondrostoma regium</i> , <i>Mesopotamichthys sharpeyi</i>
87- <i>M. spatulatus</i>	<i>Carasobarbus luteus</i>
88- <i>M. sphaericus</i>	<i>Acanthobrama marmid</i> , <i>Alburnus caeruleus</i> , <i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Carassius carassius</i> , <i>Chondrostoma regium</i> , <i>Cyprinion macrostomum</i> , <i>Leuciscus vorax</i> , <i>Luciobarbus esocinus</i> , <i>L. xanthopterus</i> , <i>Mesopotamichthys sharpeyi</i> , <i>Planiliza abu</i> , unidentified host
89- <i>M. sphaerocapsularis</i>	<i>Luciobarbus barbulus</i> , <i>L. xanthopterus</i>
90- <i>M. sprostoni</i>	<i>Carasobarbus luteus</i> , <i>Leuciscus vorax</i> , <i>Planiliza abu</i>
91- <i>M. squamae</i>	<i>Carasobarbus luteus</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus xanthopterus</i>
92- <i>M. suturalis</i>	<i>Carasobarbus luteus</i>
93- <i>M. szekeli</i>	<i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Cyprinion kais</i>
94- <i>M. talievi</i>	<i>Carasobarbus luteus</i>
95- <i>M. tilapiae</i>	<i>Luciobarbus xanthopterus</i>
96- <i>M. uniporus</i>	<i>Carasobarbus luteus</i>
97- <i>M. yini</i>	<i>Luciobarbus xanthopterus</i>
<i>Myxobolus</i> spp.	<i>Arabibarbus grypus</i> , <i>Cyprinion macrostomum</i> , <i>Cyprinus carpio</i> , <i>Luciobarbus esocinus</i> , <i>L. xanthopterus</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>

It is quite clear from the above table that 42.9% (42 out of 98) *Myxobolus* species infected only one host species each, out of 43 valid fish species which showed the infection with different *Myxobolus* species in Iraq. On the other hand, both *M. oviformis* and *M. pfeifferi* showed their infection to 22 and 35 fish host species, respectively. The above list of 97 *Myxobolus* species as well as unidentified *Myxobolus* species constitute 83.8% of the total species of the group Myxozoa in Iraq. Other species of this group include four *Chloromyxum* spp., one *Henneguya* species, one *Kudoa* species, six *Myxidium* species, two *Myxobilatus* species, four *Thelohanellus* species and one *Unicauda* species (Mhaisen, 2020) and hence, *Myxobolus* is considered as the most specious genus infecting fishes of Iraq.

### Host-*Myxobolus* List

Names of all fish host species of Iraq, infected with *Myxobolus* species (43 valid fish names and 24 synonyms in addition to some unidentified hosts) are alphabetically arranged in the following list. For each valid host species, *Myxobolus* species are alphabetically arranged. For fishes, the scientific names were reported

as they appeared in their original references but they were then checked with an account on freshwater fishes of Iraq (Coad, 2010) and fish valid scientific names were updated according to Fricke et al. (2020).

***Acanthobrama centisquama***

*Myxobolus pfeifferi*.

***Acanthobrama marmid***

*Myxobolus bramae*, *M. drjagini*, *M. karuni*, *M. macrocapsularis*, *M. oviformis*, *M. pfeifferi*, *M. pseudodispar*, *M. sphaericus*.

***Acanthopagrus arabicus* (reported as *Acanthopagrus latus*)**

*Myxobolus pfeifferi*.

***Acanthopagrus latus*: See *Acanthopagrus arabicus***

***Alburnus caeruleus***

*Myxobolus cyprinicola*, *M. oviformis*, *M. pfeifferi*, *M. sphaericus*.

***Alburnus capito*: See *Alburnus sellal***

***Alburnus mossulensis*: See *A. sellal***

***Alburnus orontis***

*Myxobolus pfeifferi*.

***Alburnus sellal* (reported as *Alburnus capito*, *A. mossulensis* and *Chalcalburnus sellal*)**

*Myxobolus nemacheili*, *M. pfeifferi*.

***Aphanius dispar*: See *Aphanius stoliczkanus***

***Aphanius stoliczkanus* (reported as *Aphanius dispar*)**

*Myxobolus pfeifferi*.

***Arabibarbus grypus* (also reported as *Barbus grypus* and *Tor grypus*)**

*Myxobolus amurensis*, *M. bramae*, *M. branchialis*, *M. branchiophilus*, *M. buckei*, *M. carassii*, *M. caudatus*, *M. chondrostomi*, *M. cyprinicola*, *M. dispar*, *M. dogieli*, *M. drjagini*, *M. exgiuus*, *M. ichkeulensis*, *M. intrachondrealis*, *M. karelicus*, *M. karuni*, *M. koi*, *M. krokhini*, *M. kubanicus*, *M. lussi*, *M. macrocapsularis*, *M. muelleri*, *M. multiplicatus*, *M. muscoli*, *M. naffari*, *M. nemacheili*, *M. niei*, *M. orientalis*, *M. oviformis*, *M. parvus*, *M. persicus*, *M. pfeifferi*, *M. poljanski*, *M. problematicus*, *M. schulmani*, *M. sphaericus*, *M. szekeli*, *Myxobolus* sp.

***Aspius vorax*: See *Leuciscus vorax***

***Barbus barbulus*: See *Luciobarbus barbulus***



***Barbus belayewi*: See *Capoeta damascina***

***Barbus esocinus*: See *Luciobarbus esocinus***

***Barbus grypus*: See *Arabibarbus grypus***

***Barbus lacerta***

*Myxobolus iranicus*.

***Barbus luteus*: See *Carasobarbus luteus***

***Barbus rajanorum***

*Myxobolus shadgani*.

***Barbus sharpeyi*: See *Mesopotamichthys sharpeyi***

***Barbus subquincunciatus*: See *Luciobarbus subquincunciatus***

***Barbus xanthopterus*: See *Luciobarbus xanthopterus***

***Capoeta aculeata***

*Myxobolus follius*.

***Capoeta damascina* (reported as *Barbus belayewi*)**

*Myxobolus oviformis*, *M. pfeifferi*.

***Capoeta* sp. (reported as *Varicorhinus* sp.)**

*Myxobolus cyprinicola*, *M. muelleri*.

***Capoeta trutta* (also reported as *Varicorhinus trutta*)**

*Myxobolus dispar*, *M. oviformis*.

***Capoeta umbla* (reported as *Varicorhinus umbla*)**

*Myxobolus pfeifferi*.

***Carasobarbus luteus* (also reported as *Barbus luteus*)**

*Myxobolus acutus*, *M. adeli*, *M. amurensis*, *M. bliccae*, *M. bouixi*, *M. bramae*, *M. branchilateralis*, *M. bulbocordis*, *M. chondrostomi*, *M. cyprinicola*, *M. dermatobius*, *M. dispar*, *M. dogieli*, *M. drjagini*, *M. ellipsoides*, *M. exgiuus*, *M. fahmii*, *M. feisti*, *M. follius*, *M. gigi*, *M. impressus*, *M. intrachondrealis*, *M. iranicus*, *M. karuni*, *M. koi*, *M. kubanicus*, *M. lobatus*, *M. lomi*, *M. macrocapsularis*, *M. magnus*, *M. mesopotamiae*, *M. muelleri*, *M. musajevi*, *M. musculi*, *M. nemacheili*, *M. niei*, *M. obpyriformis*, *M. orientalis*, *M. oviformis*, *M. paludinosus*, *M. parvus*, *M. permagnus*, *M. persicus*, *M. pethericii*, *M. pfeifferi*, *M. phylloides*, *M. poljanski*, *M. problematicus*, *M. pseudodispar*, *M. pseudorasboraе*, *M. rotundatus*, *M. sanagaensis*, *M. schulmani*, *M. shadgani*, *M. sharpeyi*, *M. spatulatus*, *M. sphaericus*, *M. sprostoni*, *M. squamae*, *M. suturalis*, *M. szekeli*, *M. talievi*, *M. uniporus*.

***Carassius auratus***

*Myxobolus bramae*, *M. cyprinicola*, *M. oviformis*, *M. pfeifferi*.

***Carassius carassius***

*Myxobolus bramae*, *M. cyprinicola*, *M. dispar*, *M. dogieli*, *M. drjagini*, *M. muelleri*, *M. oviformis*, *M. parvus*, *M. pfeifferi*, *M. sphaericus*.

***Chalcalburnus sellal*: See *Alburnus sellal***

***Chondrostoma regium***

*Myxobolus alienus*, *M. branchialis*, *M. bulbocordis*, *M. cyprinicola*, *M. dermatobius*, *M. dispar*, *M. drjagini*, *M. erythrophthalmi*, *M. impressus*, *M. karuni*, *M. muelleri*, *M. musculi*, *M. naffari*, *M. oviformis*, *M. paludinosus*, *M. parvus*, *M. pfeifferi*, *M. poljanski*, *M. pseudodispar*, *M. schulmani*, *M. sharpeyi*, *M. sphaericus*.

***Coptodon zillii***

*Myxobolus obpyriformis*.

***Ctenopharyngodon idella***

*Myxobolus pfeifferi*.

***Cyprinion kais***

*Myxobolus minutus*, *M. muelleri*, *M. pfeifferi*, *M. szekeli*.

***Cyprinion macrostomum***

*Myxobolus acutus*, *M. bliccae*, *M. chuatsi*, *M. cyprinicola*, *M. dogieli*, *M. drjagini*, *M. ellipsoides*, *M. macrocapsularis*, *M. muelleri*, *M. musculi*, *M. naffari*, *M. oviformis*, *M. persicus*, *M. pfeifferi*, *M. poljanski*, *M. sphaericus*, *Myxobolus* sp.

***Cyprinus carpio***

*Myxobolus cyprinicola*, *M. dispar*, *M. dogieli*, *M. intrachondrealis*, *M. muelleri*, *M. musculi*, *M. oviformis*, *M. parvus*, *M. pfeifferi*, *M. punctatus*, *M. squamae*, *Myxobolus* sp.

***Garra rufa***

*Myxobolus dogieli*, *M. musculi*, *M. sclerii*.

***Heteropneustes fossilis***

*Myxobolus pfeifferi*.

***Hypophthalmichthys molitrix***

*Myxobolus pfeifferi*.

***Leuciscus cephalus*: See *Squalius cephalus***

***Leuciscus lepidus*: See *Squalius lepidus***

***Leuciscus spurius*: See *Squalius spurius***

***Leuciscus vorax* (also reported as *Aspius vorax*)**

*Myxobolus dispar*, *M. karuni*, *M. musculi*, *M. nemacheili*, *M. obesus*, *M. oviformis*, *M. pfeifferi*, *M. sphaericus*, *M. sprostoni*.

***Liza abu*: See *Planiliza abu***

***Liza subviridis*: See *Planiliza subviridis***

***Luciobarbus barbulus* (also reported as *Barbus barbulus*)**

*Myxobolus chuatsi*, *M. cyprinicola*, *M. dispar*, *M. drjagini*, *M. kubanicus*, *M. lussi*, *M. macrocapsularis*, *M. muelleri*, *M. oviformis*, *M. pfeifferi*, *M. saugati*, *M. shadgani*, *M. sphaerocapsularis*.

***Luciobarbus esocinus* (also reported as *Barbus esocinus*)**

*Myxobolus amurensis*, *M. carassii*, *M. molnari*, *M. nemacheili*, *M. oviformis*, *M. pfeifferi*, *M. sphaericus*, *Myxobolus* sp.

***Luciobarbus subquincunciatus* (also reported as *Barbus subquincunciatus*)**

*Myxobolus dispar*, *M. oviformis*.

***Luciobarbus xanthopterus* (also reported as *Barbus xanthopterus*)**

*Myxobolus acutus*, *M. bramae*, *M. cyprinicola*, *M. dispar*, *M. dogieli*, *M. drjagini*, *M. ellipsoides*, *M. gobiorum*, *M. improvisus*, *M. koi*, *M. kubanicus*, *M. molnari*, *M. muelleri*, *M. nemacheili*, *M. oviformis*, *M. parvus*, *M. pfeifferi*, *M. poljanski*, *M. rotundus*, *M. sandrae*, *M. sphaericus*, *M. sphaerocapsularis*, *M. squamae*, *M. tilapiae*, *M. yini*, *Myxobolus* sp.

***Mastacembelus mastacembelus***

*Myxobolus pfeifferi*.

***Mesopotamichthys sharpeyi* (also reported as *Barbus sharpeyi*)**

*Myxobolus alburni*, *M. bramae*, *M. bulbocordis*, *M. calcariferum*, *M. chondrostomi*, *M. dispar*, *M. ellipsoides*, *M. infundibulatus*, *M. kubanicus*, *M. macrocapsularis*, *M. molnari*, *M. multiplicatus*, *M. musculi*, *M. nemacheili*, *M. oviformis*, *M. parvus*, *M. pfeifferi*, *M. problematicus*, *M. pseudodispar*, *M. rotundatus*, *M. sharpeyi*, *M. sphaericus*.

***Mystus pelusius***

*Myxobolus pfeifferi*.

***Parasilurus triostegus*: See *Silurus triostegus***

***Periophthalmus waltoni***

*Myxobolus pfeifferi*.

***Planiliza abu* (also reported as *Liza abu*)**

*Myxobolus amurensis*, *M. bizerti*, *M. bramae*, *M. branchialis*, *M. chuatsi*, *M. cyprinicola*, *M. dermatobius*, *M. dispar*, *M. dogieli*, *M. drjagini*, *M. episquamalis*, *M. karelicus*, *M. macrocapsularis*, *M. mesopotamiae*, *M. muelleri*, *M. musculi*, *M. nemacheili*, *M. niei*, *M. oviformis*, *M. parvus*, *M. pfeifferi*, *M. rotundus*, *M. sandrae*, *M. sphaericus*, *M. sprostoni*, *Myxobolus* sp.

***Planiliza subviridis* (reported as *Liza subviridis*)**

*Myxobolus diversus*, *M. oviformis*, *M. pfeifferi*.

***Silurus glanis***

*Myxobolus iranicus*, *M. koi*.

***Silurus triostegus* (also reported as *Parasilurus triostegus*)**

*Myxobolus cyprinicola*, *M. dispar*, *M. dogieli*, *M. koi*, *M. mesopotamiae*, *M. musculi*, *M. oviformis*, *M. parvus*, *M. pfeifferi*, *M. poljanski*, *Myxobolus* sp.

***Squalius cephalus* (reported as *Leuciscus cephalus*)**

*Myxobolus pfeifferi*.

***Squalius lepidus* (reported as *Leuciscus lepidus*)**

*Myxobolus amurensis*, *M. oviformis*, *M. pfeifferi*, *M. rotundus*.

***Squalius spurius* (reported as *Leuciscus spurius*)**

*Myxobolus pfeifferi*.

***Tor grypus*: See *Arabibarbus grypus***

**Unidentified hosts**

*Myxobolus bramae*, *M. cyprini*, *M. cyprinicola*, *M. drjagini*, *M. koi*, *M. macrocapsularis*, *M. muelleri*, *M. oviformis*, *M. parvus*, *M. pfeifferi*, *M. poljanski*, *M. sphaericus*.

***Varicorhinus trutta*: See *Capoeta trutta***

***Varicorhinus umbla*: See *Capoeta umbla***

***Varicorhinus* sp.: See *Capoeta* sp.**

The above list shows that 39.5% (17 out of 43) of the fish host species were infected with only one *Myxobolus* species. On the other hand, the highest number of *Myxobolus* species (63 species) were reported from *C. luteus* followed by *A. grypus* which was infected with 39 *Myxobolus* species.

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