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Checklists of Fish Species Infected with *Ichthyophthirius multifiliis*, the Causative Agent of White Spot Disease, in Iraq

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Abstract

Reviewing literature concerning the occurrence of the causative agent of the white spot disease; *Ichthyophthirius multifiliis* as well as unidentified *Ichthyophthirius* species, infecting the skin, fins and gills of fishes in Iraq until the end of 2022, showed that 40 fish species are so far known as hosts for *I. multifiliis* and five fish species for *Ichthyophthirius* spp. The infected fishes were distributed in different localities of rivers of Iraq, their branches, some lakes, depressions, marshes, drainage networks, fish hatcheries and fish farms in addition to some fishes from fish markets and fish aquaria. These fishes included 24 endemic freshwater fishes, seven exotic freshwater fishes, one marine fish and seven aquarium fishes in addition to one unspecified aquarium fish species.

Keywords: White spot disease, *Ichthyophthirius multifiliis*, Fishes, Iraq.

Introduction

Ichthyophthirius multifilis Fouquet, 1876 belongs to the family Ichthyophthiriidae, order Hymenostomatida, Class Oligohymenophorea of the phylum Ciliophora (GBIF, 2023). It is often termed itch. Its scientific name literally translates as "the fish louse with many children".

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It is an obligate parasite that infects skin epithelia and gills of a spectrum of wild and cultivated fish species in most parts of the world (Dickerson, 2012).

It is a major problem for aquarists and commercial fish producers worldwide (Jørgensen, 2017). Native fishes usually die following infection, but fishes surviving sublethal parasite exposure become resistant to subsequent challenges (Dickerson and Clark, 1998). According to Li *et al.* (2022), *I. multifiliis* was found to infect more than 190 freshwater fish species and was distributed in 26 countries. In Iraq, this parasite was recorded from 40 fish species species (Mhaisen, 2023), while in Iran, it was isolated from 51 fish species from 57 different localities (Barzegar *et al.*, 2023). In Turkey, six wild freshwater fish spices, four cultured freshwater fish species and 14 aquarium fish species, infected with ich, were enlisted by Özer (2021).

Infection can be diagnosed by the occurrence of white dots on the skin. Fish try to get rid of the apparently itching parasites by scrubbing at stones etc. and their fins are kept compressed. If gills are highly infected, fish show apathy, do not feed, are seen in a lateral upside-down position, do not show escape reflexes and may die due to inflammation of the skin lesions within 4-5 days (Mehlhorn, 2008).

In the clinical examination of the sick fishes, Koyuncu (2022) observed that the Koi fish *Cyprinus rubrofuscus* (reported as *C. carpio*) in Mersin, Turkey move slowly in the corners of the pond and especially rub against the sides of the pond. Prior to the appearance of white spots, fish may show signs of irritation, flashing, weakness, loss of appetite and decreased activity (Francis-Floyd and Reed, 2009).

Jørgensen (2017) reviewed host immunity, vaccines and novel treatment to combat *I. multifiliis* and gave a selection of in vitro and in vivo tested substances for treating fishes infected with this parasite.

In connection with the life cycle of *I. multifiliis*, all stages are ciliated. The free-swimming theront penetrates through the mucus and invades the fish surface epithelia of the skin and gills. Upon entering its host, it transforms into the trophont, which feeds and grows up to 800-1000 μ in size. The parasite exits the fish as the mature tomont, which secretes a protective cyst and divides within it to form 500-1000 daughter cells (tomites). Tomites differentiate into invasive theronts, which bore through the cyst wall and enter the water (Dickerson, 2012).

Herzog (1969) was the first one in Iraq to detect *I. multifiliis* from the mugilid fish *Planiliza subviridis* (reported as *Mugil dussumieri*) from the Tigris River in Baghdad. After that, a total of 39 fish species were reported as hosts for this parasite in Iraq (Mhaisen, 2023).

The present article is designed to revise all records on *I. multifiliis* from fishes in Iraq. It is a continuation of some recent checklists on some groups of fish parasites of Iraq, which included those on *Dactylogyrus* species (Mhaisen and Abdul-Ameer, 2019a), ancylodiscoidid and ancyrocephalid species (Mhaisen and Abdul-Ameer, 2019b), *Trichodina* species (Mhaisen and Abdul-Ameer, 2020), *Myxobolus* species (Mhaisen and Al-Jawda, 2020), *Lernaea* species (Mhaisen and Abdul-Ameer, 2021a), *Contracaecum* species (Mhaisen and Abdul-Ameer, 2021b) and parasites of cage fishes of Iraq (Mhaisen, 2022).

Sources and Methods

To prepare the present article, a total of 126 references (80 published research papers, 30 unpublished M. Sc. theses, seven M. Technol. theses and nine unpublished Ph. D. theses) dealing with records on *I. multifiliis* from fishes of Iraq, both in fish farms and in natural water bodies were used. Data from such references were gathered to provide reliable information on the distribution of *I. multifiliis* from different fish species in Iraq.

Results and Discussion

The following is a list of the scientific names and the full authority of the infected fishes with *I. multifiliis* together with their orders and families, based on Fricke *et al.* (2023) and Froese and Pauly (2023).

Class Actinopteri[1]
Order Cypriniformes
Family Cyprinidae
Arabibarbus grypus (Heckel, 1843)
Capoeta trutta (Heckel, 1843)
Capoeta umbla (Heckel, 1843)
Carasobarbus luteus (Heckel, 1843)
Carassius auratus (Linnaeus, 1758)[e]
Carassius carassius (Linnaeus, 1758)[e]

Cyprinion kais Heckel, 1843
Cyprinion macrostomus Heckel, 1843
Cyprinus carpio Linnaeus, 1758[e]
Garra rufa (Heckel, 1843)
Luciobarbus barbulus (Heckel, 1847)
Luciobarbus esocinus Heckel, 1843
Luciobarbus xanthopterus Heckel, 1843
Mesopotamichthys sharpeyi (Günther, 1874)
Family Xenocyprididae
Ctenopharyngodon idella (Valenciennes, 1844)[e]
Hypophthalmichthys molitrix (Valenciennes, 1844)[e]
Family Leuciscidae
Acanthobrama marmid Heckel, 1843
Alburnus caeruleus Heckel, 1843
Alburnus orontis Sauvage, 1882[2]
Alburnus sellal Heckel, 1843
Chondrostoma regium (Heckel, 1843)
Leuciscus vorax (Heckel, 1843)
Squalius lepidus Heckel, 1843
Order Siluriformes
Family Loricariidae
Hypostomus plecostomus (Linnaeus, 1758)[a]
Family Bagridae
Mystus pelusius (Solander, 1794)
Family Sisoridae
Glyptothorax steindachneri (Pietschmann, 1913)
Family Siluridae
Silurus triostegus Heckel, 1843
Family Heteropneustidae
Heteropneustes fossilis (Bloch, 1794)[e]
Order Synbranchiformes
Family Mastacembelidae
Mastacembelus mastacembelus (Banks & Solander, 1794)
Order Anabantiformes
Family Osphronemidae
Trichopodus trichopterus (Pallas, 1770)[a]
Order Cichliformes
Family Cichlidae
Coptodon zillii (Gervais 1848)[e]
Pterophyllum scalare (Schultze, 1823)[a]
Order Cyprinodontiformes

Family Poeciliidae
Gambusia holbrooki Girard, 1859
Poecilia latipinna (Lesueur, 1821)[a]
Poecilia reticulata Peters, 1859[a]
Poecilia sphenops Valenciennes, 1846[a]
Xiphophorus helleri Heckel, 1848[a]
Order Mugiliformes
Family Mugilidae
Planiliza abu (Heckel, 1843)
Planiliza subviridis (Valenciennes, 1836)[m]

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[1] In addition to the above-listed fish species, unidentified pet fish was reported by Al-Tayyar (2005).
[2] According to Eschmeyer (2023) and Froese and Pauly (2023), *Alburnus orontis* is distributed only in Syria and Turkey.
The abbreviation a refers to aquarium fishes, e to exotic freshwater fishes and m for marine fishes, while the remaining are endemic freshwater fishes.

Surveys achieved on *I. multifiliis* from fishes of Iraq

The available literature concerning the occurrence of *I. multifiliis* from fishes of Iraq indicated that the distribution of this parasite in fishes in different water bodies as well as in fish ponds and farms can be grouped into eight major categories according to localities of collection of the infected fishes. These are:

1- Tigris River in Nineveh Province (Fattohy, 1975; Rahemo, 1997; Al-Jawda *et al.*, 2003; Zangana, 2008) and Baghdad Province (Ali *et al.*, 1987b; Balasem *et al.*, 1993; Mhaisen *et al.*, 1995; Adday *et al.*, 1999; Salih *et al.*, 2000; Atwan, 2016; Bdair, 2018) as well as some tributaries of Tigris River which included Greater Zab River (Abdullah, 2002; Abdullah and Mhaisen, 2006; Shwani, 2009; Abdullah and Shwani, 2010; Al-Marjan, 2016), Lesser Zab River (Abdullah, 2002; Abdullah and Mhaisen, 2006, Mama, 2012; Mama and Abdullah, 2012, 2013a) and Diyala River (Ali *et al.*, 1987a; Balasem *et al.*, 2001; Al-Rubaie *et al.*, 2003).

2- Euphrates River and its branches in Al-Anbar Province (Al-Salmany, 2015), Babylon Province (Al-Sa'adi, 2007; Al-Zubaidy, 2007; Hussain, 2007, 2008, 2009; Al-Sa'adi *et al.*, 2012; Mhaisen *et al.*, 2015, Jawdhira, 2019), Al-Diwaniah Province (Al-Jadoaa, 2002; Al-Waaly, 2005), Al-Najaf Al-Ashraf Province (Al-Awadi, 2003) and Al-Muthanna Province (Al-Asadiy, 2021).

3- Shatt Al-Arab River (Mhaisen, 1986; Eassa *et al.*, 2014) and some of its branches in Basrah Province, which included Garmat Ali River (Jori, 1998; Al-Dosary, 1999; Al-Saboonchi *et al.*, 2009; Kadhim, 2009) Al-Salihiya River (Al-Janae'e, 2010), Kuritrad River (Al-Saboonchi *et al.*, 2009) and Mehaijeran Creek (Khamees, 1983; Mhaisen *et al.*, 1986).

4- Some lakes, depressions and marshes: These included surveys from Darbandikhan Lake in Sulaimaniya Province (Abdullah, 2005; Abdullah, 2013, Abdullah and Abdullah, 2013, 2015a, b), Al-Qadisiya Dam Lake (Asmar *et al.*, 1999; Balasem *et al.*, 2003), Hemrin Dam Lake in Diyala Province (Balasem *et al.*, 2000), Al-Tharthar-Tigris Canal in Salah Al-Din Province (Khalifa, 1989), Al-Husainia Creek in Karbala Province (Al-Saadi, 2007; Al-Saadi *et al.*, 2010, 2011), Bahr Al-Najaf Depression in Al-Najaf Al-Ashraf Province (Al-Awadi, 1997; Al-Awadi *et al.*, 2010), Ibn-Najim Marsh in Al-Najaf Al-Ashraf Province (Al-Azebawe, 2010), Al-Dalmaj Marsh of Al-Diwaniyah Province (Al-Khenifsawy, 2022; Al-Khenifsawy and Al-Mayli, 2022) and Al-Hammar Marsh in Basrah Province (Al-Daraji, 1986; Al-Daraji and Al-Salim, 1990; Jori, 2006) as well as in Al-Mashab Marsh in Basrah Province (Abbas, 2007).

5- Some drainage networks in Baghdad Province (Balasem *et al.*, 2002; Mhaisen *et al.*, 2003), Babylon Province (Al-Musawi, 2016) and Al-Diwaniyah Province (Al-Waaly, 2005; Al-Jadoaa, 2008).

6- Fish hatcheries in Ainkawa of Erbil Province (Al-Marjan, 2007; Al-Marjan and Abdullah, 2009; Mama, 2012; Mama and Abdullah, 2012; 2013b), Wasit Province (Mhaisen and Abul-Eis, 1993) and Basrah Province (Al-Janae'e, 2017) as well as some fish aquaria at Erbil Province (Al-Marjan and Abdullah, 2016) and Al-Najaf Al-Ashraf Province (Naji, 2010).

7- Fish ponds and farms which included some in Dohuk Province (Sadiq, 2017), Erbil Province (Mustafa, 2016; Obaid *et al.*, 2021; Mala, 2022), Salah Al-Dean Province (Khalifa, 1989), Diyala Province (Mhaisen *et al.*, 1993a), Baghdad Province (Khalifa, 1982; Khalifa *et al.*, 1983; Khalifa, 1989; Al-Aubaidi, 1999; Al-Aubaidi *et al.*, 1999; Mohammad-Ali *et al.*, 1999; Sadek, 1999; Al-Nasiri, 2000; Al-Tamimi, 2001; Asmar *et al.*, 2001; Al-Nasiri *et al.*, 2003; Asmar *et al.*, 2004; Sadek *et al.*, 2006), Babylon Province (Ali *et al.*, 1988; Mhaisen and Abul-Eis, 1991; Mhaisen *et al.*, 1993b; Al-Zubaidy, 1998; Muhammed, 2000; Asmar *et al.*, 2001; Al-Jadoaa, 2002; Al-Zamily, 2002; Hussain, 2005; Al-Rubaie *et al.*, 2007;

Hussain *et al*., 2007; Al-Haider, 2008; Al-Rubaie, 2009; Hussain *et al*., 2011a, b, 2013; Hussain, 2017), Wasit Province (Ali *et al*., 1988; Mhaisen *et al*., 1993a), Thi Qar Province (Rasool, 2017) and Basrah Province (Mhaisen, 1986; Al-Daraji *et al*., 2002; Jassim, 2007; Ahmed and Ali, 2013; Rasool, 2017) in addition to some floating cages at Babylon Province (Al-Taei, 2013; Al-Turaihi, 2018; Hussein, 2018), Al-Najaf Al-Ashraf Province (Al-Salami, 2019), Thi-Qar Province (Al-Sahlany, 2019; Al-Sahlany *et al*., 2020) and Basrah Province (Eassa *et al*., 2014).

8- Fish markets in Erbil Province (Abdullah, 2000), Baghdad Province (Al-Zamily, 2002; Mansoor, 2009; Mansoor and Al-Shaikh, 2010) and Basrah Province (Mhaisen, 1986).

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. Al-Tayyar (2005) gave no name for an infected fish (see Picture 2 on page 192), which was also infected with *Tetrahymena pyriformis*. Al-Tayyar *et al*. (2011) gave no locality for the investigated fishpond.

Surveys achieved on unidentified *Ichthyophthirius* species from fishes of Iraq

The unidentified *Ichthyophthirius* spp., so far known from fishes of Iraq, were isolated from the following fish species: *C. carpio* from both Garmat Ali River and Kuritrad River, Basrah Province (Al-Saboonchi *et al*., 2009), both *M. sharpeyi* (reported as *Barbus sharpeyi*) and *S. triostegus* brought from Amara, Habbaniyah, Kut, Tharthar and rivers of Tigris and Euphrates (Shamsuddin *et al*., 1971), *M. pelusius* from Garmat Ali River, Basrah Province (Al-Dosary, 1999) and *P. abu* (reported as *L. abu*) from Shatt Al-Arab River (Sharma, 1977). as well as from the same fish species from aquacultures in Erbil Province (Obaid *et al*., 2021).

Ichthyophthirius multifiliis-host list

The following is a list of *I. multifiliis* so far recorded from fish species of Iraq with their concerned hosts and references. Fish's scientific names are alphabetically arranged and their synonymous names are given in parentheses, after the valid names, when reported by some references.

Acanthobrama marmid: Al-Nasiri (2000), Abdullah (2002, 2005), Abdullah and Mhaisen (2006).

Alburnus caeruleus: Mohammad-Ali *et al.* (1999), Al-Sa'adi (2007), Mhaisen *et al.* (2015).

Alburnus orontis: Al-Sa'adi (2007), Mhaisen *et al.* (2015).

Alburnus sellal (also reported as *Chalcalburnus sellal*): Al-Sa'adi (2007), Mhaisen *et al.* (2015).

Arabibarbus grypus (also reported as *Barbus grypus*): Khalifa (1982), Khalifa *et al.* (1983), Ali *et al.* (1987a), Mohammad-Ali *et al.* (1999), Balasem *et al.* (2000), Al-Sa'adi (2007), Abdullah (2013), Abdullah and Abdullah (2013, 2015a, b), Mhaisen *et al.* (2015), Bdair (2018).

Capoeta trutta (also reported as *Varicorhinus trutta*): Zangana (2008), Abdullah (2013), Abdullah and Abdullah (2013, 2015a, b).

Capoeta umbla (reported as *Varicorhinus umbla*): Abdullah (2002), Abdullah and Mhaisen (2006).

Carasobarbus luteus (also reported as *Barbus luteus*): Khamees (1983), Al-Daraji (1986), Mhaisen (1986), Mhaisen *et al.* (1986), Ali *et al.* (1987a), Al-Daraji and Al-Salim (1990), Al-Awadi (1997), Asmar *et al.* (1999), Abdullah (2000), Al-Nasiri (2000), Salih *et al.* (2000), Al-Jadoaa (2002), Balasem *et al.* (2002), Al-Awadi (2003), Al-Rubaie *et al.* (2003), Balasem *et al.* (2003), Asmar *et al.* (2004), Al-Waaly (2005), Al-Saadi (2007), Al-Sa'adi (2007), Al-Zubaidy (2007), Al-Awadi *et al.* (2010), Al-Azebawe (2010), Al-Saadi *et al.* (2010), Abdullah (2013), Abdullah and Abdullah (2013, 2015a, b), Mhaisen *et al.* (2015), Bdair (2018).

Carassius auratus: Asmar *et al.* (2004), Al-Janae'e (2010), Naji (2010), Al-Tayyar *et al.* (2011), Al-Marjan and Abdullah (2016), Bdair (2018).

Carassius carassius: Mohammad-Ali *et al.* (1999).

Chondrostomus regium: Ali *et al.* (1987a), Balasem *et al.* (1993), Mhaisen *et al.* (1995), Abdullah (2002, 2005), Abdullah and Mhaisen (2006), Al-Sa'adi (2007), Zangana (2008), Abdullah (2013), Abdullah and Abdullah (2013, 2015a, b), Mhaisen *et al.* (2015), Al-Marjan (2016), Atwan (2016).

Coptodon zillii (also reported as *Tilapia zillii*): Al-Sa'adi (2007), Al-Sa'adi *et al.* (2012), Mhaisen *et al.* (2015), Al-Khenifsawy (2022), Al-Khenifsawy and Al-Mayli (2022).

Ctenopharyngodon idella: Ali *et al.* (1988), Mhaisen and Abul-Eis (1993), Al-Zubaidy (1998), Mohammad-Ali *et al.* (1999), Muhammed (2000), Asmar *et al.* (2001), Al-Jadoaa (2002), Asmar *et al.* (2004), Jassim (2007), Hussain (2017).

Cyprinion kais: Al-Sa'adi (2007), Mhaisen *et al.* (2015).

Cyprinion macrostomus (also reported as *C. macrostomum*): Fattohy (1975), Rahemo (1997), Mohammad-Ali *et al.* (1999), Abdullah (2000), Salih *et al.* (2000), Abdullah (2002), Abdullah and Mhaisen (2006), Al-Sa'adi (2007), Mhaisen *et al.* (2015).

Cyprinus carpio: Khalifa (1982), Khalifa *et al.* (1983), Ali *et al.* (1988), Khalifa (1989), Mhaisen and Abul-Eis (1991), Balasem *et al.* (1993), Mhaisen and Abul-Eis (1993), Mhaisen *et al.* (1993a, b), Al-Zubaidy (1998), Al-Aubaidi (1999), Al-Aubaidi *et al.* (1999), Mohammad-Ali *et al.* (1999), Sadek (1999), Muhammed (2000), Salih *et al.* (2000), Al-Tamimi (2001), Asmar *et al.* (2001), Abdullah (2002), Al-Daraji *et al.* (2002), Al-Jadoaa (2002), Al-Zamily (2002), Al-Rubaie *et al.* (2003), Balasem *et al.* (2003), Asmar *et al.* (2004), Abdullah (2005), Hussain (2005), Abdullah and Mhaisen (2006), Sadek *et al.* (2006), Al-Marjan (2007), Al-Rubaie *et al.* (2007), Al-Zubaidy (2007), Hussain *et al.* (2007), Jassim (2007), Al-Haider (2008), Al-Marjan and Abdullah (2009), Al-Rubaie (2009), Mansoor (2009), Al-Janae'e (2010), Mansoor and Al-Shaikh (2010), Hussain *et al.* (2011a, b), Mama (2012), Mama and Abdullah (2012), Ahmed and Ali (2013), Al-Taei (2013), Hussain *et al.* (2013), Mama and Abdullah (2013a, b), Eassa *et al.* (2014), Mustafa (2016), Al-Janae'e (2017), Hussain (2017), Rasool (2017), Sadiq (2017), Al-Turaihi (2018), Bdair (2018), Hussein (2018), Al-Sahlany (2019), Al-Salami (2019), Al-Sahlany *et al.* (2020), Al-Asadiy (2021), Al-Khenifsawy (2022), Al-Khenifsawy and Al-Mayli (2022), Mala (2022).

Gambusia holbrooki (also reported as *Gambusia affinis*): Hussain (2008), Kadhim (2009).

Garra rufa (inclusive of *Garra rufa rufa*): Mhaisen (1986), Balasem *et al.* (1993), Al-Jadoaa (2002), Balasem *et al.* (2003), Al-Sa'adi (2007), Mhaisen *et al.* (2015).

Glyptothorax steindachneri: Al-Sa'adi (2007), Mhaisen *et al.* (2015).

Heteropneusted fossilis: Ali *et al.* (1987a), Al-Awadi (1997), Al-Awadi *et al.* (2010).

Hypophthalmichthys molitrix: Ali *et al.* (1988), Al-Zubaidy (1998), Al-Nasiri (2000), Al-Jadoaa (2002), Asmar *et al.* (2004), Abdullah (2005), Hussain (2005), Hussain *et al.* (2007), Hussain (2017).

Hypostomus plecostomus: Al-Tayyar *et al.* (2011).

Leuciscus vorax (also reported as *Aspius vorax*): Al-Daraji (1986), Mhaisen (1986), Al-Daraji and Al-Salim (1990), Al-Jadoaa (2002), Al-Sa'adi (2007), Mhaisen *et al.* (2015), Jawdhira (2019).

Luciobarbus barbulus (also reported as *Barbus barbulus*): Abdullah (2002), Abdullah and Mhaisen (2006).

Luciobarbus esocinus (also reported as *Barbus esocinus*): Khalifa (1982), Khalifa *et al.* (1983), Salih *et al.* (2000), Abdullah (2013), Abdullah and Abdullah (2013, 2015a, b).

Luciobarbus xanthopterus (also reported as *Barbus xanthopterus*): Khalifa (1982), Khalifa *et al.* (1983), Khalifa (1989), Bdair (2018).

Mastacembelus mastacembelus: Abdullah (2013), Abdullah and Abdullah (2013, 2015a, b).

Mesopotamichthys sharpeyi (reported as *Barbus sharpeyi*): Khalifa (1982), Khalifa *et al.* (1983), Al-Awadi (1997), Al-Jadoaa (2002), Al-Awadi (2003), Asmar *et al.* (2004), Zangana (2008), Al-Awadi *et al.* (2010).

Mystus pelusius: Ali *et al.* (1987a, b), Al-Awadi (1997), Al-Sa'adi (2007), Al-Awadi *et al.* (2010), Mhaisen *et al.* (2015).

Planiliza abu (also reported as *Liza abu*): Fattohy (1975), Ali *et al.* (1987a), Balasem *et al.* (1993), Al-Awadi (1997), Jori (1998), Adday *et al.* (1999), Al-Dosary (1999), Al-Nasiri (2000), Salih *et al.* (2000), Balasem *et al.* (2001), Al-Daraji *et al.* (2002), Al-Jadoaa (2002), Al-Nasiri *et al.* (2003), Al-Rubaie *et al.* (2003), Mhaisen *et al.* (2003), Al-Saadi (2007), Al-Sa'adi (2007), Al-Zubaidy (2007), Hussain (2007), Al-Jadoaa (2008), Hussain (2009), Al-Awadi *et al.* (2010), Al-Saadi *et al.* (2010, 2011), Al-Salmany (2015), Mhaisen *et al.* (2015), Al-Musawi (2016), Atwan (2016), Al-Khenifsawy (2022), Al-Khenifsawy and Al-Mayli (2022).

Planiliza subviridis (reported as *Mugil dussumieri*): Herzog (1969).

Poecilia latipinna: Kadhim (2009).

Poecilia reticulata: Al-Tayyar *et al.* (2011).

Poecilia sphenops: Naji (2010), Al-Tayyar *et al.* (2011).

Pterophyllum scalare: Al-Tayyar *et al.* (2011).

Silurus triostegus: Al-Jawda *et al.* (2003), Jori (2006), Abbas (2007), Shwani (2009), Abdullah and Shwani (2010).

Squalius lepidus: Abdullah (2013), Abdullah and Abdullah (2013, 2015a, b).

Trichopodus trichopterus (misidentified as *Trichogaster trichopterus*): Al-Tayyar *et al.* (2011).

Xiphophorus helleri: Al-Tayyar *et al.* (2011).

Unspecified host: Al-Tayyar, 2005 (see Picture 2 on Page 192).

Unidentified *Ichthyophthirius* species-host list

In addition to the records of *I. multifiliis*, mentioned above, some researchers had reported the occurrence of some unidentified species of *Ichthyophthirius* as in the following host-*Ichthyophthirius* spp. list:

Cyprinus carpio: Al-Saboonchi *et al.* (2009), Obaid *et al.* (2021).

Mesopotamichthys sharpeyi (reported as *Barbus sharpeyi*): Shamsuddin *et al.* (1971).

Mystus pelusius: Al-Dosary (1999).

Planiliza abu (reported as *Liza abu*): Sharma (1977).

Silurus triostegus: Shamsuddin *et al.* (1971).

It is appropriate to mention here that there are three known *Ichthyophthirius* species in the World (GBIF, 2023). These are *I. browni* Roque & Puytorac, 1966 and *I. cryptostomus* Zacharias, 1893 in addition to *I. multifiliis*. So, hence, the unidentified *Ichthyophthirius*, mentioned above from five fish species in Iraq, might be either *I. browni* or *I. cryptostomus*. However, most of the above-mentioned references in the subtitle *Ichthyophthirius* species-host list came from non-fish parasitologists, and hence, they failed to recognize what *Ichthyophthirius* species was concerned.

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قوائم مرجعية لأنواع الأسماك المصابة بطفيلي *Ichthyophthirius multifiliis*، العامل المسبب لمرض البقعة البيضاء في العراق

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المستخلص

أظهر العرض المرجعي للمصادر المتعلقة بظهور العامل المسبب لمرض البقعة البيضاء *Ichthyophthirius multifiliis* وكذلك الأنواع غير المشخّصة من هذا الجنس التي تصيب جلد، زعانف وغلاصم الأسماك في العراق لغاية نهاية 2022 أن 40 نوعا من الأسماك معروفة كمضيّفات لهذا الطفيلي لحد الآن وخمسة أنواع من المضيّفات للأنواع غير المشخّصة من هذا الجنس. توزعت الأسماك المصابة في مناطق مختلفة من أنهار العراق وبعض فروعها، بعض البحيرات، المنخفضات، الأهوار، شبكات المبازل، مفاقس وأحواض الأسماك فضلا عن بعض الأسماك المأخوذة من الأسواق وأسماك زينة. شملت هذه الأنواع السمكية 24 نوعا من أسماك المياه العذبة المتوطنة، سبعة أنواع من الأسماك الدخيلة، سبعة أنواع من أسماك الزينة، نوعا واحدا من الأسماك البحرية علاوة على نوع غير محدد من أسماك الزينة.

الكلمات المفتاحية: مرض البقعة البيضاء، *Ichthyophthirius multifiliis*، الأسماك، العراق.

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