

Checklists of the Species of *Trichodina* Ehrenberg, 1830 (Ciliophora: Oligohymenophorea: Peritrichida) from Fishes of Iraq

Furhan T. Mhaisen^{1*} & Kefah N. Abdul-Ameer²

¹Tegnervägen 6B, Katrineholm 641 36, Sweden

²Department of Biology, College of Education for Pure Science, University of Baghdad, Iraq

*Corresponding author: mhaisenft@yahoo.co.uk

Abstract: Surveying 150 references concerning the occurrence of species of the genus *Trichodina* infecting fishes of Iraq, till the end of 2019, showed the occurrence of 31 *Trichodina* species as well as some unidentified *Trichodina* species from 39 valid fish species. These *Trichodina* species were reported from two marine fish species and 37 freshwater fish species of Iraq. Among the infected fishes with these *Trichodina* species, the mugilid fish *Planiliza abu* was infected with the highest number of parasite species (19 species), followed by infection of the silurid fish *Silurus triostegus* with 16 species, while 16 fish species were infected with only one *Trichodina* species each. Among the *Trichodina* species of fishes of Iraq, *T. domerguei* was reported from 37 fish host species, followed by *T. cottidarum* which infected 14 fish species, while 11 *Trichodina* species were reported from one fish host species each.

Keywords: Ciliophora, Oligohymenophorea, Peritrichida, *Trichodina*, Fishes, Iraq

Introduction

The genus *Trichodina* Ehrenberg, 1830 is one of the most specious genera within the phylum Ciliophora as it includes 159 valid species (GBIF, 2020). However, WoRMS (2020) included 88 valid species. World widely, Australia has a unique and species-rich native trichodinid fauna, perhaps as many as 150 species (Dove & O'Donoghue, 2005). Aguilar-Aguilar & Islas-Ortega (2015) listed 18 *Trichodina* species out of 30 ciliophoran species from fishes of Mexico, while Özer & Öztürk (2015) listed 13 *Trichodina* species from fishes of Turkey and Chanda et al. (2019) listed 42 *Trichodina* species from India. Historically, *Trichodina* taxonomy passed through dramatic changes since when Kudo (1939) placed this genus within the class Ciliata, subphylum Ciliophora of the phylum Protozoa. According to GBIF (2020), they belong to the family Trichodinidae, order Peritrichida, class Oligohymenophorea of the phylum Ciliophora. WoRMS (2020)

uses the same names of these ranks, except the use of order Mobilida instead of Peritrichida.

Figure 1 shows that *Trichodina* species has a basal adhesive disc which contains a varying number of interlinking units, commonly referred to as sclerotized “teeth” or denticles which aid the parasite in attaching to its host. These denticles which, although solid, consist of three distinct regions, i.e. a distal blade, a central part and a proximal ray. Number, arrangement, and shapes of these denticles are important taxonomic characters (Basson & Van As, 2006). These parasites are 35-60 μm in diameter, with a height of 25-55 μm (Roberts & Janovy, 2009).

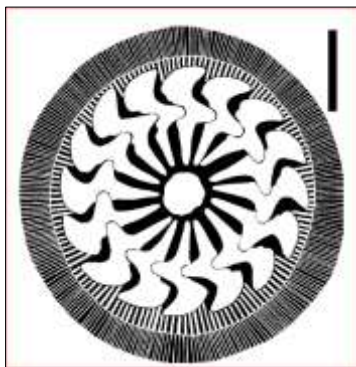


Figure 1: A photomicrograph of *Trichodina* species, scale bar= 10 μm (from Dove & O'Donoghue, 2005).

Most ciliates are free living, but many are commensals of vertebrates and invertebrates, and a few are parasitic (Roberts & Janovy, 2009). *Trichodina* species are among the more common ciliates encountered on cyprinids (Hoole et al., 2001).

Species of *Trichodina* may cause some damage to fish gills, but most produce little pathogenic effect (Roberts & Janovy, 2009). Hyperplasia and hypertrophy can result from the feeding activity of ciliophorans such as *Trichodina* (Noga, 2010). They are of importance for fish farming in South America, given that at high infestation levels, they cause significant mortality among farmed fishes (Maciel et al., 2018).

In Iraq, Herzog (1969) published the first parasitological investigation on fishes of Iraq, but he recorded no any *Trichodina* species. The first *Trichodina* species (*T. domerguei*) was recorded by Shamsuddin et al. (1971) from eight freshwater fish species brought from fish markets at Baghdad. After that, many fish parasitological surveys were achieved which showed the record of additional trichodinid species in Iraq (Al-Zubaidy, 1998; Abdullah, 2002; Abdul-Ameer, 2004; Hussain, 2005; Jori, 2006; Al-Marjan, 2007; Bashê, 2008; Hussain, 2008; Al-Nasiri & Mhaisen, 2009; Shwani, 2009; Al-Marjan, 2010; Hussain, 2010; Al-Saadi, 2014; Al-Salmany, 2015; Atwan, 2016; Rasheed, 2016; Abdul-Ameer & Atwan, 2017; Mohammed, 2017; Abdul-Ameer & Atwan, 2018a, b). In addition, two new *Trichodina* species were described for the first time in the World from Iraq: *T. erbilensis* and *T.*

kurdistani by Shwani et al. (2010). The present article is aimed to revise all records on *Trichodina* species of fishes of Iraq and provide update lists on them and their host species in Iraq. This article is a continuation of previous checklists of some parasites of fishes of Iraq, which were published in this century, such as those of acanthocephalan species (Mhaisen, 2002), *Gyrodactylus* species (Mhaisen & Abdul-Ameer, 2013), diplozoid species (Mhaisen & Abdul-Ameer, 2014), ancylo-discoidid and ancyrocephalid species (Mhaisen & Abdul-Ameer, 2019b), *Dactylogyrus* species (Mhaisen & Abdul-Ameer, 2019a) and *Myxobolus* species (Mhaisen & Al-Jawda, 2020) 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-Rubaei, 2016b, 2018), Al-Najaf Al-Ashraf province (Mhaisen & Al-Rubaei, 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 other specific regions of Iraq such as Kurdistan (Mhaisen & Abdullah, 2016, 2017) and Basrah marshy area (Mhaisen et al., 2017a).

Sources and Methods

A total of 150 references (95 research papers, 42 unpublished M. Sc. and M. Tech. theses, eight unpublished Ph. D. theses and five conference abstracts) dealing with records of *Trichodina* 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 *Trichodina* 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.

Results and Discussion

Surveys Achieved on *Trichodina* Species from Fishes of Iraq

The available literature concerning the occurrence of *Trichodina* species from 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 (Al-Niaemi, 1997; Rahemo & Al-Niaemi, 2001; Al-Jawda et al., 2003; Zangana, 2008), Salah Al-Din province (Abdul-Ameer, 1989; Al-Nasiri & Mhaisen, 2009) and Baghdad province (Ali et al., 1987b; Balasem et al., 1993; Mhaisen et al., 1995; Adday et al., 1999; Asmar et al., 2003; Mansor et al., 2012; Al-Saadi, 2013; Atwan, 2016; Rasheed, 2016; Hammood, 2017; Abdul-Ameer & Atwan, 2017, 2018a, b; Bdair, 2018; Abbas,

- 2019; Hameed, 2019), as well as some tributaries of Tigris river which included Greater Zab river (Abdullah, 2002; Abdullah & Mhaisen, 2006; Bashê, 2008; Shwani, 2009; Abdullah & Shwani, 2010; Bashê & Abdullah, 2010; Shwani et al., 2010; Muhammad et al., 2013; Al-Marjan, 2016), Lesser Zab river (Abdullah, 2002; Abdullah & Mhaisen, 2006; Mama, 2012; Mama & Abdullah, 2012; 2013a) 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; Mohammed, 2017).
- 2- Euphrates river and its branches at Al-Anbar province (Al-Salmay, 2015), Babylon province (Al-Sa'adi, 2007; Al-Zubaidy, 2007; Hussain, 2007, 2008, 2009; Al-Sa'adi et al., 2012; Mhaisen et al., 2015; Al-Musawi, 2016), Karbala province (Al-Saadi, 2007; Al-Saadi et al., 2010, 2011), Al-Diwaniyah province (Al-Jadoaa, 2002; Al-Waaly, 2005; Shakir, 2018; Shakir & Al-Asadiy, 2018), Al-Najaf Al-Ashraf province (Al-Awadi, 2003) and Al-Muthanna province (Al-Asadiy et al., 2012; Shakir, 2018; Shakir & Al-Asadiy, 2018; Al-Helli, 2019).
 - 3- Shatt Al-Arab river (Al-Salim, 1992) and its branches which included Garmat Ali river (Jori, 1998; Al-Dosary, 1999; Adday, 2001; Al-Saboonchi et al., 2009; Kadhim, 2009; Al-Janae'e, 2010; Al-Saboonchi et al., 2014), Kuritrad river (Al-Saboonchi et al., 2009), Al-Salihiya river (Al-Janae'e, 2010; Al-Saboonchi et al., 2010, 2014).
 - 4- Some lakes, depressions and marshes: These included surveys from Darbandikhan lake in Sulaimaniya province (Abdullah, 2005; Abdullah, 2013; Abdullah & Abdullah, 2013, 2015), two lakes in Al-Anbar province: Al-Habbaniya lake (Ali et al., 1988a; Mhaisen et al., 1999) and Al-Qadisiya dam lake (Asmar et al., 1999; Balasem et al., 2003), Hemrin dam lake in Diyala province (Balasem et al., 2000), Al-Razzaza lake in Kerbala province (Hussain, 2010), 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) and Al-Hammar marsh in Basrah province (Mohamad, 1989; Al-Salim & Mohamad, 1995; Jori, 2006; Awad et al., 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 Duhok province (Ali, 2002; Sadiq, 2017), Nineveh province (Al-Hamdane & Azziz, 2006), Erbil province (Mustafa, 2016), Salah Al-Dean province (Ali et al., 1988b, d; Khalifa, 1989), Diyala province (Mhaisen et al., 1993a), Baghdad province (Khalifa et al., 1978; Khalifa, 1982, 1989; Al-Aubaidi, 1999; Al-Aubaidi et al., 1999; Mohammad-Ali et al., 1999; Sadek, 1999; Al-Nasiri, 2000; Salih et al., 2000; Al-Tamimi, 2001; Asmar et al., 2001; Al-Nasiri et al., 2002, 2003; Abdul-Ameer, 2004; Asmar et al., 2004; Sadek et al., 2006; Al-Haider, 2008; Al-Aubaidi, 2009), Babylon province (Ali & Shaaban, 1984; Ali et al., 1988c; Mhaisen et al., 1989, 1990; Mhaisen & Abul-Eis, 1991; Mhaisen et al., 1993a, b; Al-Zubaidy, 1998; Mohammed, 2000; Asmar et al., 2001; Al-Jadoaa, 2002; Al-Zamily, 2002; Hussain, 2005; Al-Rubaie et al., 2007; Hussain et al., 2007, 2011a, b; Al-Taei,

2013; Hussain et al., 2013; Al-Musawi, 2016; Hussain, 2017), Wasit province (Ali et al., 1988c; Mhaisen et al., 1993a) and Basrah province (Mhaisen, 1986; Jassim, 2007; Ahmed & Ali, 2013; Eassa et al., 2014; Rasool, 2017) in addition to some floating cages at Babylon province (Al-Taei, 2013; Jawdhira et al., 2017; Al-Turaihi, 2018), Al-Najaf Al-Ashraf province (Al-Salami, 2019) and Basrah province (Eassa et al., 2014).

7- Fish hatcheries at Erbil province (Al-Marjan, 2007; Al-Marjan & Abdullah, 2007; Mama, 2012; Mama & Abdullah, 2012, 2013b; Al-Marjan & Abdullah, 2015) and Wasit province (Mhaisen & Abul-Eis, 1993).

8- Fish markets at Erbil province (Al-Marjan, 2010) and Baghdad province (Shamsuddin et al., 1971; Al-Zamily, 2002; Mansoor, 2009; Mansoor & Al-Shaikh, 2010; Al-Saadi, 2014).

Surveying literature concerning *Trichodina* species from fishes of Iraq showed the infection of 39 valid fish species with 31 *Trichodina* species as well as some unidentified species of *Trichodina*. The 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 Actinopteryi

Order Cypriniformes

Family Cyprinidae

Arabibarbus grypus (Heckel 1843)

Capoeta aculeata (Valenciennes, 1844)¹

Capoeta trutta (Heckel, 1843)

Carasobarbus luteus (Heckel, 1843)

Carassius auratus (Linnaeus, 1758)

Carassius carassius (Linnaeus, 1758)

Cyprinion kais Heckel, 1843

Cyprinion macrostomus Heckel, 1843²

Cyprinus carpio Linnaeus, 1758

Garra rufa (Heckel, 1843)

Garra variabilis (Heckel 1843)

Luciobarbus esocinus Heckel, 1843

Luciobarbus xanthopterus Heckel, 1843

Mesopotamichthys sharpeyi (Günther, 1874)

Family Xenocyprididae³

Ctenopharyngodon idella (Valenciennes, 1844)

Hypophthalmichthys molitrix (Valenciennes, 1844)

Family Leuciscidae

Acanthobrama marmid Heckel, 1843

Alburnus caeruleus Heckel, 1843

Alburnus orontis Sauvage, 1882⁴

Alburnus sellal Heckel, 1843

Chondrostoma regium (Heckel, 1843)

- Leuciscus vorax* (Heckel, 1843)
Squalius cephalus (Linnaeus, 1758)
Squalius spurius Heckel, 1843⁵
- Order Siluriformes
- Family Bagridae
Mystus pelusius (Solander, 1794)
- Family Sisoridae
Glyptothorax steindachneri (Pietschmann 1913)⁶
- Family Siluridae
Silurus glanis Linnaeus, 1758
Silurus triostegus Heckel, 1843
- Family Heteropneustidae
Heteropneustes fossilis (Bloch, 1794)
- Order Synbranchiformes
- Family Mastacembelidae
Mastacembelus mastacembelus (Banks & Solander, 1794)
- Order Cichliformes
- Family Cichlidae
Coptodon zillii (Gervais, 1848)
Oreochromis aureus (Steindachner, 1864)
- Order Cyprinodontiformes
- Family Aphaniidae
Aphanius stoliczkanus (Day, 1872)⁷
- Family Poeciliidae
Gambusia holbrooki Girard, 1859
Poecilia latipinna (Lesueur 1821)
- Order Mugiliformes
- Family Mugilidae
Planiliza abu (Heckel, 1843)
Planiliza subviridis (Valenciennes, 1836)
- Order Perciformes
- Family Sparidae
Acanthopagrus arabicus Iwatsuki, 2013
Sparidentex hasta (Valenciennes 1830)

¹ *Capoeta aculeata* is a native species in Iran (Froese & Pauly, 2019; Fricke et al., 2020), but it is also found in the Tigris-Euphrates basin (Coad, 2010).

² The specific name of this fish is spelled as *macrostomus* according to Fricke et al. (2020) 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).

³ It is appropriate to mention here that all references so far concerning the occurrence of *Trichodina* 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 Xenocyprinidae. This is also followed by Fricke et al. (2020) but not yet by Froese & Pauly (2019).

- ⁴ 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.
- ⁵ According to Froese & Pauly (2019) and Fricke et al. (2020), *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*.
- ⁶ *Glyptothorax steindachneri* is a native species in Iran and Turkey (Froese & Pauly, 2019). According to Fricke et al. (2020), it is distributed in Iraq and Turkey. Coad (2010) demonstrated that it is found in the Tigris-Euphrates basin at Mosul, Iraq.
- ⁷ According to Freyhof et al. (2017), *Aphanius dispar* in the Arabian Peninsula waters is a complex species with four different species and the species in Iraq was *Aphanius stoliczkanus* (Day, 1872).

***Trichodina*-Host List**

Reviewing references concerning the occurrence of *Trichodina* species so far recorded from fishes of Iraq demonstrated the record of 31 *Trichodina* species. *Trichodina* names and their authorities are checked mainly with GBIF (2020). When no information on any *Trichodina* species or its authority is available in GBIF (2020), some other literature were applied for this purpose. These parasites are alphabetically arranged. Under each *Trichodina* 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 *Trichodina* species are chronologically arranged, but references of the same year are alphabetically arranged. The reference of the first record in Iraq of any *Trichodina* species is underlined. In order to economise space, site of infection with these *Trichodina* species will not be demonstrated here as such parasites usually live on fish gills but in weakened fishes they possibly cover the entire surface of the infected fish (Hoffman, 1999). So, fish skin, fins and gills are the natural sites of infection with such parasites. However, a small number of *Trichodina* species are endozoic, live inside fish body, mostly in the urinary tract (Basson & Van As, 2006). For example, *T. urinaria* was reported from urinary bladder and urethra of some fish species (Bykhovskaya-Pavlovskaya et al., 1962; Nepszy, 1988). It is reliable to state here that Al-Salim (1992) claimed that *T. domerguei* was detected from the blood of *P. subviridis* (reported as *L. subviridis*). Mhaisen et al. (2016) demonstrated that occurrence of this parasite in fish blood is doubtful. 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 *Trichodina* Species from Fishes of Iraq” in the Results and Discussion of this article.

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

1- *Trichodina acuta* Lom, 1961 was reported from *C. carpio* by Al-Marjan (2007), Al-Marjan & Abdullah (2007), Mama (2012) and Mama & Abdullah (2012, 2013b) and from *S. triostegus* by Mohammed (2017).

2- *Trichodina anguilli* Wu, 1961 was reported from *C. carpio* by Al-Marjan (2010).

3- *Trichodina borealis* Shtein & Stein-Albova, 1953 was reported from *C. zillii* by Shakir (2018) and Shakir & Al-Asadiy (2018), *G. holbrooki* (as *Gambusia affinis*) by Hussain (2008) and from *P. abu* by Shakir (2018) and Shakir & Al-Asadiy (2018). It is reliable to state here that Shakir (2018) gave a wrong authority as (Dogiel, 1940) Shul'man & Shul'man-Albova, 1953 for this parasite and Hussain (2008) gave a wrong authority as (Dogell, 1940), while Shakir & Al-Asadiy (2018) gave no authority.

4- *Trichodina centrostrigeata* Basson, Van As & Paperna, 1983 was reported from *C. zillii* by Atwan (2016), Mohammed (2017) and Abdul-Ameer & Atwan (2018b) and from both *O. aureus* and *P. abu* by Abbas (2019). It is appropriate to mention here that Abdul-Ameer & Atwan (2018b) had erroneously reported the authority of this parasite inside brackets.

5- *Trichodina cottidarum* Dogiel, 1948 was reported from *A. sellal* (reported as *Chalcalburnus sellal*) by Al-Sa'adi (2007) and Mhaisen et al. (2015), *A. grypus* by Abbas (2019), *C. aculeata* by Al-Salmany (2015), *C. luteus* by Al-Salmany (2015) and Bdair (2018), *Carassius C. auratus* by Bdair (2018), *C. regium* by Al-Salmany (2015), *C. zillii* (also as *Tilapia zillii*) by Al-Sa'adi (2007), Al-Sa'adi et al. (2012), Mhaisen et al. (2015), Rasheed (2016), Abbas (2019) and Al-Helli (2019), *C. kais* by Al-Sa'adi (2007), Al-Salmany (2015) and Mhaisen et al. (2015), *C. macrostomum* by Al-Salmany (2015), *C. carpio* by Abdul-Ameer (2004), Hussain (2005), Al-Rubaie et al. (2007), Hussain et al. (2007), Al-Nasiri & Mhaisen (2009), Hussain et al. (2011a, b), Al-Taei (2013), Hussain et al. (2013), Rasheed (2016), Bdair (2018) and Al-Salami (2019), *H. molitrix* by Hussain (2005) and Hussain et al. (2007), *L. vorax* by Al-Salmany (2015), *L. xanthopterus* by Al-Salmany (2015) and Bdair (2018) and *P. abu* (also as *Liza abu*) by Al-Sa'adi (2007), Hussain (2007, 2009), Al-Saadi (2014), Mhaisen et al. (2015), Al-Musawi (2016), Atwan (2016), Mohammed (2017), Abbas (2019) and Hameed (2019).

6- *Trichodina domerguei* (Wallengren, 1897) Haider, 1964 was reported from *A. marmid* by Mhaisen et al. (1995), Abdullah (2005), Al-Janae'e (2010) and Bdair (2018), *A. arabicus* (as *Acanthopagrus latus*) by Al-Janae'e (2010), *A. caeruleus* by Balasem et al. (1993), Salih et al. (2000), Balasem et al. (2002b), Mhaisen et al. (2002), Asmar et al. (2003), Al-Sa'adi (2007) and Mhaisen et al. (2015), *A. orontis* by Al-Sa'adi (2007) and Mhaisen et al. (2015), *A. sellal* by Mhaisen et al. (2015) as well as three synonyms of *A. sellal* which included *Alburnus capito* by Adday et al.

(1999), Balasem et al. (2002b) and Mhaisen et al. (2002), *Alburnus mossulensis* by Al-Janae'e (2010) and *C. sellal* by Balasem et al. (2003) and Al-Sa'adi (2007), *A. stoliczkanus* (as *A. dispar*) by Al-Awadi (2003), *A. grypus* (as *Barbus grypus*) by Shamsuddin et al. (1971), Ali et al. (1987a), Balasem et al. (1993), Salih et al. (2000), Al-Zubaidy (2007) and Al-Janae'e (2010), *C. trutta* (as *Varicorhinus trutta*) by Al-Jawda et al. (2003), *C. luteus* (also as *Barbus luteus*) by Shamsuddin et al. (1971), Mhaisen et al. (1995), Asmar et al. (1999), Al-Nasiri (2000), Balasem et al. (2001), Abdullah (2002), Al-Jadoaa (2002), Balasem et al. (2002a, b), Mhaisen et al. (2002), Al-Awadi (2003), Asmar et al. (2003), Mhaisen et al. (2003), Abdullah (2005), Al-Waaly (2005), Abdullah & Mhaisen (2006), Al-Saadi (2007), Al-Zubaidy (2007), Al-Janae'e (2010), Al-Saadi et al. (2010) and Bdair (2018), *C. auratus* by Salih et al. (2000), Asmar et al. (2003, 2004), Al-Azebawe (2010), Al-Janae'e (2010) and Bdair (2018), *C. carassius* by Mhaisen et al. (1999), Mohammad-Ali et al. (1999), Salih et al. (2000), Mhaisen et al. (2003), Asmar et al. (2004), Al-Sa'adi (2007) and Mhaisen et al. (2015), *C. regium* by Balasem et al. (1993), Mhaisen et al. (1995), Adday et al. (1999), Abdullah (2002), Mhaisen et al. (2002), Abdullah (2005) and Abdullah & Mhaisen (2006), *C. zillii* (also as *T. zillii*) by Al-Sa'adi (2007), Al-Sa'adi et al. (2012), Mhaisen et al. (2015), Shakir (2018) and Shakir & Al-Asadiy (2018), *C. idella* by Ali et al. (1988c), Mhaisen et al. (1990), Mhaisen & Abul-Eis (1993), Al-Zubaidy (1998), Mohammad-Ali et al. (1999), Muhammed (2000), Salih et al. (2000), Asmar et al. (2001), Al-Jadoaa (2002), Asmar et al. (2004) and Jassim (2007), *C. kais* by Balasem et al. (2002b), Al-Sa'adi (2007), Al-Azebawe (2010) and Mhaisen et al. (2015), *C. macrostomum* by Ali et al. (1988b, d), Balasem et al. (1993), Mhaisen et al. (1995), Abdullah (2002), Al-Jadoaa (2002), Abdullah & Mhaisen (2006) and Al-Salmany (2015), *C. carpio* by Shamsuddin et al. (1971), Mhaisen (1986), Ali et al. (1988a, c), Mhaisen & Abul-Eis (1991), Balasem et al. (1993), Mhaisen & Abul-Eis (1993), Mhaisen et al. (1993a, b), Al-Zubaidy (1998), Adday et al. (1999), Al-Aubaidi (1999), Al-Aubaidi et al. (1999), Asmar et al. (1999), Mohammad-Ali et al. (1999), Sadek (1999), Al-Nasiri (2000), Balasem et al. (2000), Muhammed (2000), Salih et al. (2000), Al-Tamimi (2001), Asmar et al. (2001), Al-Jadoaa (2002), Al-Nasiri et al. (2002), Al-Zamily (2002), Balasem et al. (2002a), Mhaisen et al. (2002), Asmar et al. (2003), Balasem et al. (2003), Mhaisen et al. (2003), Abdul-Ameer (2004), Asmar et al. (2004), Sadek et al. (2006), Al-Marjan (2007), Al-Marjan & Abdullah (2007), Al-Rubaie et al. (2007), Al-Saadi (2007), Al-Zubaidy (2007), Jassim (2007), Al-Haider (2008), Al-Aubaidi (2009), Mansoor (2009), Al-Janae'e (2010), Al-Saadi et al. (2010), Mansoor & Al-Shaikh (2010), Hussain et al. (2011a), Eassa et al. (2014), Hussain (2017), Al-Turaihi (2018) and Bdair (2018), *G. holbrooki* by Kadhim (2009), *G. rufa* by Balasem et al. (1993), Mhaisen et al. (1995), Al-Jadoaa (2002), Balasem et al. (2002a, b, 2003), Al-Sa'adi (2007) and Mhaisen et al. (2015), *G. steindachneri* by Al-Sa'adi (2007) and Mhaisen et al. (2015), *H. fossilis* by Ali et al. (1987a, b), Mohamad (1989), Balasem et al. (1993), Al-Salim & Mohamad (1995), Al-Shaikh et al. (1995), Al-Awadi (1997), Al-Sa'adi (2007), Al-

Awadi et al. (2010) and Mhaisen et al. (2015), *H. molitrix* by Ali et al. (1988c, 1989b), Al-Zubaidy (1998), Asmar et al. (2004), Abdullah (2005), Jassim (2007) and Hussain (2017), *L. vorax* (also as *Aspius vorax*) by Ali et al. (1987a), Adday et al. (1999), Mohammad-Ali et al. (1999), Al-Jadoaa (2002) and Bdair (2018), *L. esocinus* (as *Barbus esocinus*) by Shamsuddin et al. (1971), Adday et al. (1999) and Mohammad-Ali et al. (1999), *L. xanthopterus* (also as *B. xanthopterus*) by Shamsuddin et al. (1971), Adday et al. (1999), Mohammad-Ali et al. (1999), Salih et al. (2000), Al-Sa'adi (2007), Al-Janae'e (2010), Al-Salmay (2015), Mhaisen et al. (2015) and Bdair (2018), *M. mastacembelus* by Balasem et al. (1993) and Adday (2001), *M. sharpeyi* (also as *Barbus sharpeyi*) by Shamsuddin et al. (1971), Al-Awadi (1997), Mohammad-Ali et al. (1999), Salih et al. (2000), Balasem et al. (2001), Al-Jadoaa (2002), Balasem et al. (2002a), Mhaisen et al. (2002), Al-Awadi (2003), Asmar et al. (2003), Balasem et al. (2003) and Al-Awadi et al. (2010), *M. pelusius* by Ali et al. (1987a, b), Salih et al. (2000), Adday (2001), Al-Jadoaa (2002), Al-Sa'adi (2007), Mhaisen et al. (2015) and Al-Helli (2019), *P. abu* (as *L. abu* and *Mugil abu*) by Shamsuddin et al. (1971), Ali et al. (1987a), Mhaisen et al. (1989), Balasem et al. (1993), Mhaisen & Abul-Eis (1993), Al-Shaikh et al. (1995), Mhaisen et al. (1995), Al-Awadi (1997), Jori (1998), Adday et al. (1999), Asmar et al. (1999), Mohammad-Ali et al. (1999), Al-Nasiri (2000), Salih et al. (2000), Asmar et al. (2001), Balasem et al. (2001, 2002a, b), Mhaisen et al. (2002), Al-Awadi (2003), Al-Jawda et al. (2003), Al-Nasiri et al. (2003), Al-Rubaie et al. (2003), Asmar et al. (2003), Balasem et al. (2003), Mhaisen et al. (2003), Al-Saadi (2007), Al-Sa'adi (2007), Al-Zubaidy (2007), Hussain (2007), Al-Jadoaa (2008), Al-Awadi et al. (2010), Al-Janae'e (2010), Al-Saadi et al. (2010, 2011), Al-Asadiy et al. (2012), Mhaisen et al. (2015), Al-Musawi (2016), Bdair (2018), Shakir (2018) and Shakir & Al-Asadiy (2018), *P. subviridis* (as *L. subviridis*) by Al-Salim (1992) and Al-Janae'e (2010), *P. latipinna* by Al-Janae'e (2010), *S. glanis* by Al-Niaemi (1997), Rahemo & Al-Niaemi (2001), Abdullah (2002) and Abdullah & Mhaisen (2006), *S. triostegus* by Shamsuddin et al. (1971), Ali et al. (1987a), Abdul-Ameer (1989), Mhaisen et al. (1995), Adday et al. (1999), Adday (2001), Balasem et al. (2001), Al-Jawda et al. (2003), Al-Rubaie et al. (2003), Jori (2006) and Al-Janae'e (2010), *S. cephalus* (as *Leuciscus cephalus*) by Abdullah (2005), *S. spurius* (as *Leuciscus spurius*) by Abdullah (2005) and *S. hasta* by Al-Janae'e (2010) in addition to unspecified host by Mansor et al. (2012). From the above list of host species, it seems that *T. domerguei* is the prevalent species within this genus on fishes of Iraq as a total of 37 host species are encountered.

7- *Trichodina elegini* Shul'mann-Albova, 1950 was reported from *C. luteus* by Al-Salmay (2015), *C. zillii* by Rasheed (2016) and Mohammed (2017), *C. macrostomum* by Al-Salmay (2015), *C. carpio* by Al-Salami (2019), *G. variabilis* by Al-Salmay (2015), *P. abu* (also as *L. abu*) by Al-Nasiri & Mhaisen (2009), Al-Salmay (2015), Al-Musawi (2016), Hammood (2017) and Mohammed (2017) and *S. triostegus* by Al-Salmay (2015) and Mohammed (2017). It is appropriate to mention here that the authority was misspelled as Shul'man-Albova instead of Shul'mann-Albova by Al-Nasiri & Mhaisen (2009), Rasheed (2016) and

Mohammed (2017) and that Al-Salami (2019) had misspelled the specific name of this parasite as *elegeni* instead of *elegini*.

8- *Trichodina erbilensis* Shwani, Abdullah & Asmat, 2010 was described as a new species from *S. triostegus* by Shwani (2009) and was published later on by Shwani et al. (2010).

9- *Trichodina gracilis* Polyanskii, 1955 was reported from *C. macrostomum* by Al-Salmany (2015) and Rasheed (2016), *C. carpio* by Hussain (2005), Hussain et al. (2007) and Al-Salami (2019), *P. abu* (as *L. abu*) by Al-Saadi (2014), Al-Salmany (2015), Atwan (2016), Rasheed (2016) and Mohammed (2017) and *S. triostegus* by Mohammed (2017).

10- *Trichodina heterodentata* Duncan, 1977 was reported from *C. carpio* by Al-Marjan (2007) and Al-Marjan & Abdullah (2007) and *O. aureus* by Abbas (2019). The authority of this parasite was misspelled once as Dancun instead of Duncan and once as Duncan by Al-Marjan & Abdullah (2007).

11- *Trichodina intermedia* Lom, 1960 was reported from *C. zillii* by Atwan (2016) and Abdul-Ameer & Atwan (2018b) and *C. carpio* by Atwan (2016).

12- *Trichodina inversa* Dogiel, 1948 was reported from both *C. zillii* and *P. abu* by Rasheed (2016).

13- *Trichodina kurdistani* Shwani, Abdullah & Asmat, 2010 was described as a new species from *S. triostegus* by Shwani (2009) and was published later on by Shwani et al. (2010).

14- *Trichodina lepsii* Lom, 1962 was reported from both *C. macrostomum* and *M. masatacembelus* by Al-Salmany (2015) and *P. abu* by Atwan (2016) and Al-Helli (2019).

15- *Trichodina magna* Van As & Basson, 1989 was reported from *O. aureus* by Abdul-Ameer & Atwan (2017).

16- *Trichodina murmanica* Poljansky, 1955 was reported from *C. zillii* by Rasheed (2016), *C. kais* by Al-Salmany (2015), *C. macrostomum* by Al-Salmany (2015) and Rasheed (2016), *C. carpio* by Mohammed (2017), *P. abu* (as *L. abu*) by Al-Nasiri & Mhaisen (2009), Al-Salmany (2015) and Mohammed (2017) and *S. triostegus* by Mohammed (2017). The authority of this parasite was misspelled as Polyanski by Al-Nasiri & Mhaisen (2009) and as Polyanskii by both Rasheed (2016) and Mohammed (2017).

17- *Trichodina mutabilis* Kozubski & Migala, 1968 was reported from *C. carpio* by Abdullah (2002), Abdullah & Mhaisen (2006), Al-Marjan (2007) and Al-Marjan & Abdullah (2007) and *S. triostegus* by Muhammad et al. (2013). The authority was misspelled as Kazubski instead of Kozubski by all the references which cited this parasite from fishes of Iraq.

18- *Trichodina nasi* Chen, 1956 was reported from *P. abu* by Mohammed (2017).

19- *Trichodina nigra* Lom, 1960 was reported from *C. luteus* (as *B. luteus*) by Al-Nasiri (2000), *C. idella* by Al-Jadoaa (2002), *C. macrostomum* by Al-Salmany (2015), *C. carpio* by Al-Zubaidy (1998), Sadek (1999), Al-Nasiri (2000), Al-Jadoaa (2002), Al-Nasiri et al. (2002), Sadek et al. (2006), Al-Rubaie et al. (2007),

Al-Zubaidy (2007), Al-Haider (2008), Hussain et al. (2011a), Al-Taei (2013) and Hussain et al. (2013), *H. molitrix* by Al-Zubaidy (1998) and Al-Jadoaa (2002), *L. vorax* (as *A. vorax*) by Al-Zubaidy (2007), *M. pelusius* by Al-Jadoaa (2002) and *P. abu* (as *L. abu*) by Al-Nasiri (2000), Al-Jadoaa (2002), Al-Nasiri et al. (2003), Al-Jadoaa (2008), Hussain (2009) and *S. triostegus* by Jori (2006) who erroneously applied the year of authority as 1961 instead of 1960, as well as from unspecified host by Mansor et al. (2012).

20- *Trichodina nobilis* Chen, 1963 was reported from *C. carpio* by Al-Marjan (2007), Al-Marjan & Abdullah (2007), Mama (2012), Mama & Abdullah (2012, 2013b) and Mustafa (2016).

21- *Trichodina ovonucleata* Raabe, 1958 was reported from *A. arabicus* (as *A. latus*) by Hussain (2010) who misspelled the authority as Raebe and erroneously inserted this authority within brackets.

22- *Trichodina pediculus* Ehrenberg, 1838 was reported from *L. vorax* by Al-Asadiy (2018a), *M. mastacembelus* by Bashê (2008) and Bashê & Abdullah (2010a) and *S. triostegus* by Abdullah (2013) and Abdullah & Abdullah (2013a, 2015a). It is appropriate to mention here that Al-Asadiy (2018a) reported the authority as (O.F. Müller, 1786) Ehrenberg, 1838.

23- *Trichodina prowazeki* Grupcheva & Lom, 1980 was reported from *S. triostegus* by Jori (2006).

24- *Trichodina ranae* Cunha, 1950 was reported from *S. triostegus* by Shwani (2009) and Abdullah & Shwani (2010). The authority was reported as da Cunha instead of Cunha by both studies.

25- *Trichodina reticulata* Hirschmann & Partsch, 1955 was reported from *C. zillii* by Rasheed (2016), *C. macrostomum* by Al-Salmany (2015), *C. carpio* by Mama (2012), Al-Saadi (2013), Mama & Abdullah (2012, 2013a, b) and Al-Salami (2019), *P. abu* (as *L. abu*) by Al-Salmany (2015), Mohammed (2017) and *S. triostegus* by Jori (2006), Awad et al. (2007) and Mohammed (2017).

26- *Trichodina schulmani* Chan, 1961 was reported from both *C. luteus* and *P. abu* (as *L. abu*) by Al-Salmany (2015).

27- *Trichodina spatulata* Kulemina, 1968 was reported from *C. macrostomum* by Al-Salmany (2015) and *P. abu* by Hammood (2017).

28- *Trichodina sphaeroidesi* Padnos & Nigrelli, 1942 was reported from *C. aculeata* by Al-Salmany (2015), *C. zillii* by Mohammed (2017), *C. macrostomum* by Al-Salmany (2015), *P. abu* (as *L. abu*) by Al-Salmany (2015) and Hameed (2019) and *S. triostegus* by Mohammed (2017). The specific name of this parasite was misspelled as *sphaeroides* and the authority was erroneously given as Dogiel, 1948 instead of Padnos & Nigrelli, 1942 by all three above-mentioned references.

29- *Trichodina strelkovi* Chan, 1961 was reported from both *A. grypus* and *C. luteus* by Atwan (2016), *C. auratus* by Mohammed (2017), *C. regium* by Atwan (2016) and Rasheed (2016), *C. zillii* by Atwan (2016), Rasheed (2016) and Mohammed (2017), *C. idella* by Rasheed (2016), *C. carpio* by Atwan (2016), Mohammed (2017), Al-Salami (2019) and Hameed (2019), *M. pelusius* by Atwan

(2016), *P. abu* (also reported as *L. abu*) by Al-Saadi (2014), Atwan (2016), Rasheed (2016) and Mohammed (2017) and *S. triostegus* by Mohammed (2017).

30- *Trichodina truttae* Mueller, 1937 was reported from *P. abu* by Rasheed (2016) who spelled the authority as Müller instead of Mueller.

31- *Trichodina urinaria* Dogiel, 1940 was reported from *P. abu* by Atwan (2016) and Abdul-Ameer & Atwan (2018a). As *T. urinaria* is known to be high specific to fish urinary bladder and urethra (Bykhovskaya-Pavlovskaya et al., 1962; Nepszy, 1988), its presence in abnormal microhabitat (the gills) and from non-perch host species (*P. abu*) might be considered as a result of an accidental infection (Abdul-Ameer & Atwan, 2018a).

Unspecified *Trichodina* species were reported from *A. stoliczkanus* (as *A. dispar*) by Kadhim (2009), *C. auratus* by Khalifa et al. (1978), *C. regium* by Al-Marjan (2016), *C. carpio* by Khalifa et al. (1978), Khalifa (1989), Al-Dosary (1999) as *Trichodina* sp. 2, Ali (2002), Al-Hamdane & Azziz (2006), Al-Saboonchi et al. (2009), Ahmed & Ali (2013), Al-Marjan & Abdullah (2015), Jawdhira et al. (2017), Rasool (2017) and Sadiq (2017), *P. abu* (as *L. abu*) by Ali & Shaaban (1984), Al-Dosary (1999) as *Trichodina* sp. 2 and Zangana (2008), *P. latipinna* by Kadhim (2009) and *S. triostegus* by Al-Dosary (1999) as *Trichodina* sp. 1 & 2 and Jori (2006) as well as unspecified host by Khalifa (1982) and Al-Saboonchi et al. (2010, 2014).

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

It is quite clear from this table that 35.5% (11 out of 31) *Trichodina* species infected only one host species each, out of 39 valid fish species which showed the infection with different *Trichodina* species in Iraq. On the other hand, both *T. domerguei* and *T. cottidarum* showed their infection to 37 and 14 fish host species, respectively.

The present list of 31 *Trichodina* species as well as unidentified *Trichodina* species constitutes 80% of the total species of the family Trichodinidae in Iraq. Other species of this family include two species of *Dipartiella*, one species of *Trichodinella* and five species of *Tripartiella* (Mhaisen, 2020) and hence, this family is considered as the most specious family (with 40 species) within the phylum Ciliophora (which is represented with a total of 75 species infecting fishes of Iraq), followed by the family Epistylididae which included 12 parasite species (Mhaisen, 2020).

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

1- <i>Trichodina acuta</i>	<i>Cyprinus carpio</i> , <i>Silurus triostegus</i>
2- <i>T. anguilli</i>	<i>Cyprinus carpio</i>
3- <i>T. borealis</i>	<i>Coptodon zillii</i> , <i>Gambusia holbrooki</i> , <i>Planiliza abu</i>
4- <i>T. centrostrigeata</i>	<i>Coptodon zillii</i> , <i>Oreochromis aureus</i> , <i>Planiliza abu</i>
5- <i>T. cottidarum</i>	<i>Alburnus sellal</i> , <i>Arabibarbus grypus</i> , <i>Capoeta aculeata</i> , <i>Carasobarbus luteus</i> , <i>Carassius auratus</i> , <i>Chondrostoma regium</i> , <i>Coptodon zillii</i> , <i>Cyprinion kais</i> , <i>C. macrostomum</i> , <i>Cyprinus carpio</i> , <i>Hypophthalmichthys molitrix</i> , <i>Leuciscus vorax</i> , <i>Luciobarbus xanthopterus</i> , <i>Planiliza abu</i>
6- <i>T. domerguei</i>	<i>Acanthobrama 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 trutta</i> , <i>Carasobarbus luteus</i> , <i>Carassius auratus</i> , <i>C. carassius</i> , <i>Chondrostoma regium</i> , <i>Coptodon zillii</i> , <i>Ctenopharyngodon idella</i> , <i>Cyprinion kais</i> , <i>C. macrostomum</i> , <i>Cyprinus carpio</i> , <i>Gambusia holbrooki</i> , <i>Garra rufa</i> , <i>Glyptothorax steindachneri</i> , <i>Heteropneustes fossilis</i> , <i>Hypophthalmichthys molitrix</i> , <i>Leuciscus vorax</i> , <i>Luciobarbus esocinus</i> , <i>L. xanthopterus</i> , <i>Mastacembelus mastacembelus</i> , <i>Mesopotamichthys sharpeyi</i> , <i>Mystus pelusius</i> , <i>Planiliza abu</i> , <i>P. subviridis</i> , <i>Poecilia latipinna</i> , <i>Silurus glanis</i> , <i>S. triostegus</i> , <i>Sparidentex hasta</i> , <i>Squalius cephalus</i> , <i>S. spurius</i> , unspecified host
7- <i>T. elegini</i>	<i>Carasobarbus luteus</i> , <i>Coptodon zillii</i> , <i>Cyprinion macrostomum</i> , <i>Cyprinus carpio</i> , <i>Garra variabilis</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>
8- <i>T. erbilensis</i>	<i>Silurus triostegus</i>
9- <i>T. gracilis</i>	<i>Cyprinion macrostomum</i> , <i>Cyprinus carpio</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>
10- <i>T. heterodentata</i>	<i>Cyprinus carpio</i> , <i>Oreochromis aureus</i>
11- <i>T. intermedia</i>	<i>Coptodon zillii</i> , <i>Cyprinus carpio</i>
12- <i>T. inversa</i>	<i>Coptodon zillii</i> , <i>Planiliza abu</i>
13- <i>T. kurdistani</i>	<i>Silurus triostegus</i>
14- <i>T. lepsii</i>	<i>Cyprinion macrostomum</i> , <i>Mastacembelus mastacembelus</i> , <i>Planiliza abu</i>
15- <i>T. magna</i>	<i>Oreochromis aureus</i>
16- <i>T. murmanica</i>	<i>Coptodon zillii</i> , <i>Cyprinion kais</i> , <i>C. macrostomum</i> , <i>Cyprinus carpio</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>
17- <i>T. mutabilis</i>	<i>Cyprinus carpio</i> , <i>Silurus triostegus</i>
18- <i>T. nasi</i>	<i>Planiliza abu</i>
19- <i>T. nigra</i>	<i>Carasobarbus luteus</i> , <i>Ctenopharyngodon idella</i> , <i>Cyprinion macrostomum</i> , <i>Cyprinus carpio</i> , <i>Hypophthalmichthys molitrix</i> , <i>Leuciscus vorax</i> , <i>Mystus pelusius</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i> , unspecified host
20- <i>T. nobilis</i>	<i>Cyprinus carpio</i>
21- <i>T. ovonucleata</i>	<i>Acanthopagrus arabicus</i>

Table 1, continued

22- <i>T. pediculus</i>	<i>Leuciscus vorax</i> , <i>Mastacembelus mastacembelus</i> , <i>Silurus triostegus</i>
23- <i>T. prowazeki</i>	<i>Silurus triostegus</i>
24- <i>T. ranae</i>	<i>Silurus triostegus</i>
25- <i>T. reticulata</i>	<i>Coptodon zillii</i> , <i>Cyprinion macrostomum</i> , <i>Cyprinus carpio</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>
26- <i>T. schulmani</i>	<i>Carasobarbus luteus</i> , <i>Planiliza abu</i>
27- <i>T. spatulata</i>	<i>Cyprinion macrostomum</i> , <i>Planiliza abu</i>
28- <i>T. sphaeroidesi</i>	<i>Capoeta aculeata</i> , <i>Coptodon zillii</i> , <i>Cyprinion macrostomum</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>
29- <i>T. strelkovi</i>	<i>Arabibarbus grypus</i> , <i>Carasobarbus luteus</i> , <i>Carassius auratus</i> , <i>Chondrostoma regium</i> , <i>Coptodon zillii</i> , <i>Ctenopharyngodon idella</i> , <i>Cyprinus carpio</i> , <i>Mystus pelusius</i> , <i>Planiliza abu</i> , <i>Silurus triostegus</i>
30- <i>T. truttae</i>	<i>Planiliza abu</i>
31- <i>T. urinaria</i>	<i>Planiliza abu</i>
<i>Trichodina</i> spp.	<i>Aphanius stoliczkanus</i> , <i>Carassius auratus</i> , <i>Chondrostoma regium</i> , <i>Cyprinus carpio</i> , <i>Planiliza abu</i> , <i>Poecilia latipinna</i> , <i>Silurus triostegus</i> , unspecified host

Host-*Trichodina* List

Names of all fish host species of Iraq, infected with *Trichodina* species (39 valid fish names and 19 synonyms in addition to some unidentified hosts) are alphabetically arranged in the following list. For each valid host species, *Trichodina* species are alphabetically arranged.

Acanthobrama marmid
Trichodina domerguei.

Acanthopagrus arabicus (reported as *Acanthopagrus latus*)
Trichodina domerguei, *T. ovonucleata*.

Acanthopagrus latus: See *Acanthopagrus arabicus*

Alburnus caeruleus
Trichodina domerguei.

Alburnus capito: See *Alburnus sellal*

Alburnus mossulensis: See *A. sellal*

Alburnus orontis
Trichodina domerguei.

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

Trichodina cottidarum, *T. domerguei*.

Aphanius dispar: See *Aphanius stoliczkanus*

Aphanius stoliczkanus (reported as *Aphanius dispar*)
Trichodina domerguei, *Trichodina* sp.

Arabibarbus grypus (also reported as *Barbus grypus*)
Trichodina cottidarum, *T. domerguei*, *T. strelkovi*.

Aspius vorax: See *Leuciscus vorax*

Barbus esocinus: See *Luciobarbus esocinus*

Barbus grypus: See *Arabibarbus grypus*

Barbus luteus: See *Carasobarbus luteus*

Barbus sharpeyi: See *Mesopotamichthys sharpeyi*

Barbus xanthopterus: See *Luciobarbus xanthopterus*

Capoeta aculeata
Trichodina cottidarum, *T. sphaeroidesi*.

Capoeta trutta (reported as *Varicorhinus trutta*)
Trichodina domerguei.

Carasobarbus luteus (also reported as *Barbus luteus*)
Trichodina cottidarum, *T. domerguei*, *T. elegini*, *T. nigra*, *T. schulmani*, *T. strelkovi*.

Carassius auratus
Trichodina cottidarum, *T. domerguei*, *T. strelkovi*, *Trichodina* sp.

Carassius carassius
Trichodina domerguei.

Chalcalburnus sellal: See *Alburnus sellal*

Chondrostoma regium
Trichodina cottidarum, *T. domerguei*, *T. strelkovi*, *Trichodina* sp.

Coptodon zillii (also reported as *Tilapia zillii*)
Trichodina borealis, *T. centrostrigata*, *T. cottidarum*, *T. domerguei*, *T. elegini*, *T. intermedia*, *T. inversa*, *T. murmanica*, *T. reticulata*, *T. sphaeroidesi*, *T. strelkovi*.

Ctenopharyngodon idella
Trichodina domerguei, *T. nigra*, *T. strelkovi*.

Cyprinion kais

Trichodina cottidarum, *T. domerguei*, *T. murmanica*.

Cyprinion macrostomum

Trichodina cottidarum, *T. domerguei*, *T. elegini*, *T. gracilis*, *T. lepsii*, *T. murmanica*, *T. nigra*, *T. reticulata*, *T. spatulata*, *T. sphaeroidesi*.

Cyprinus carpio

Trichodina acuta, *T. anguilli*, *T. cottidarum*, *T. domerguei*, *T. elegini*, *T. gracilis*, *T. heterodontata*, *T. intermedia*, *T. murmanica*, *T. mutabilis*, *T. nigra*, *T. nobilis*, *T. reticulata*, *T. strelkovi*, *Trichodina* sp.

Gambusia affinis: See *Gambusia holbrooki*

Gambusia holbrooki (reported as *Gambusia affinis*)

Trichodina borealis, *T. domerguei*.

Garra rufa

Trichodina domerguei.

Garra variabilis

Trichodina elegini.

Glyptothorax steindachneri

Trichodina domerguei.

Heteropneustes fossilis

Trichodina domerguei.

Hypophthalmichthys molitrix

Trichodina cottidarum, *T. domerguei*, *T. nigra*.

Leuciscus cephalus: See *Squalius cephalus*

Leuciscus spurius: See *Squalius spurius*

Leuciscus vorax (also reported as *Aspius vorax*)

Trichodina cottidarum, *T. domerguei*, *T. nigra*, *T. pediculus*.

Liza abu: See *Planiliza abu*

Liza subviridis: See *Planiliza subviridis*

Luciobarbus esocinus (reported as *Barbus esocinus*)

Trichodina domerguei.

Luciobarbus xanthopterus (also reported as *Barbus xanthopterus*)

Trichodina cottidarum, *T. domerguei*.

Mastacembelus mastacembelus

Trichodina domerguei, *T. lepsii*, *T. pediculus*.

Mesopotamichthys sharpeyi (also reported as *Barbus sharpeyi*)

Trichodina domerguei.

Mugil abu: See *Planiliza abu*

Mystus pelusius

Trichodina domerguei, *T. nigra*, *T. strelkovi*.

Oreochromis aureus

Trichodina centrostrigata, *T. heterodentata*, *T. magna*.

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

Trichodina borealis, *T. centrostrigata*, *T. cottidarum*, *T. domerguei*, *T. elegini*, *T. gracilis*, *T. inversa*, *T. lepsii*, *T. murmanica*, *T. nasi*, *T. nigra*, *T. reticulata*, *T. schulmani*, *T. spatulata*, *T. sphaeroidesi*, *T. strelkovi*, *T. truttae*, *T. urinaria*, *Trichodina* sp.

Planiliza subviridis (reported as *Liza subviridis*)

Trichodina domerguei.

Poecilia latipinna

Trichodina domerguei, *Trichodina* sp.

Silurus glanis

Trichodina domerguei.

Silurus triostegus

Trichodina acuta, *T. domerguei*, *T. elegini*, *T. erbilensis*, *T. gracilis*, *T. kurdistani*, *T. murmanica*, *T. mutabilis*, *T. nigra*, *T. pediculus*, *T. prowazeki*, *T. ranae*, *T. reticulata*, *T. sphaeroidesi*, *T. strelkovi*, *Trichodina* sp.

Sparidentex hasta

Trichodina domerguei.

Squalius cephalus (reported as *Leuciscus cephalus*)

Trichodina domerguei.

Squalius spurius (reported as *Leuciscus spurius*)

Trichodina domerguei.

Tilapia zillii: See *Coptodon zillii*

Unspecified hosts

Trichodina domerguei, *T. nigra*, *Trichodina* sp.

Varicorhinus trutta: See *Capoeta trutta*

It appears from the above host-*Trichodina* list that among the 39 valid infected fishes with these *Trichodina* species, the mugilid fish *P. abu* was infected with the highest number of parasite species (19 species), followed by infection of the silurid fish *S. triostegus* with 16 species. On the other hand, 16 fish species were infected with only one *Trichodina* species each.

Acknowledgements

Sincere thanks are due to Dr. Jörg Freyhof of Leibniz Institute for Evolution and Biodiversity Science, Berlin for ascertaining the specific name of the fish *Cyprinion macrostomum* through a correspondence with Dr. Atheer H. Ali of the University of Basrah, Iraq. Sincere thanks are also due to Dr. Atheer H. Ali of the College of Agriculture, University of Basrah for forwarding some literature and for his valuable suggestions while revising the manuscript.

References

- Abbas, J.A. (2019). The parasitic fauna of some species of fishes from Tigris river at Al-Autafia region, Baghdad province, Iraq. M. Sc. Thesis, Coll. Educ. Pure Sci. Ibn Al-Haitham, Univ. Baghdad: 140 pp. (In Arabic).
- Abdul-Ameer, K.N. (1989). Study of the parasites of freshwater fishes from Tigris river in Salah Al-Dien province, Iraq. M. Sc. Thesis, Coll. Sci., Univ. Baghdad: 98 pp. (In Arabic).
- Abdul-Ameer, K.N. (2004). The first record of the ciliated protozoan *Trichodina cottidarum* in Iraq on the gills of the common carp *Cyprinus carpio*. Ibn Al-Haitham J. Pure Appl. Sci., 17 (3): 1-6.
- Abdul-Ameer, K.N. & Atwan, F.K. (2017). First record of *Trichodina magna* Van As and Basson, 1989 (Ciliophora: Trichodinidae) from gills of blue tilapia *Oreochromis aureus* (Steindachner, 1864) in Iraq. Ibn Al-Haitham Sci. Conf. 2017 Spec. Issue: 59-63. <http://www.ihsciconf.org/conf/> www.ihsciconf.org.
- Abdul-Ameer, K.N. & Atwan, F.K. (2018a). First record of *Trichodina urinaria* Dogiel, 1940 (Ciliophora: Trichodinidae) in Iraq from gills of mugilid fish *Planiliza abu*. Biol. Appl. Environ. Res., 2 (1): 44-48.
- Abdul-Ameer, K.N. & Atwan, F.K. (2018b). First record of two species of the genus *Trichodina* Ehrenberg, 1838 (Ciliophora: Trichodinidae) in Iraq from gills of red-belly tilapia *Coptodon zillii*. Biochem. Cell. Arch., 18 (2): 1955-1958.
- Abdullah, S.M.A. (2002). Ecology, taxonomy and biology of some parasites of fishes from Lesser Zab and Greater Zab rivers in north of Iraq. Ph. D. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 153 pp. (In Arabic).
- Abdullah, S.M.A. (2005). Parasitic fauna of some freshwater fishes from Darbandikhan lake, north of Iraq. J. Dohuk Univ., 8 (1): 29-35.
- Abdullah, S.M.A. & Mhaisen, F.T. (2006). Parasitic infections with Protozoa and Crustacea on fishes of Lesser Zab and Greater Zab rivers, north of Iraq. Proc.

- 4th Sci. Conf. Coll. Vet. Med., Univ. Mosul, Mosul: 20-21 Sept. 2006, Vol. 1: 51-58.
- Abdullah, S.M.A. & Shwani, A.A.A. (2010). Ectoparasites of the Asian catfish *Silurus triostegus* (Heckel, 1843) from Greater Zab river- Kurdistan region- Iraq. J. Duhok Univ., 13 (1): 164-171.
- Abdullah, Y.S. (2013). Study on the parasites of some fishes from Darbandikhan lake in Kurdistan region, Iraq. M. Sc. Thesis, Fac. Sci. & Sci. Educ., Univ. Sulaimani: 116 pp.
- Abdullah, Y.S. & Abdullah, S.M.A. (2013). Protozoans infections of some fish species from Darbandikhan lake in Kurdistan region, Iraq. Kurd. Acad. J., A: Spec. Issue, 1st Int. Conf. Agric., Sci., Sulaimani: 20-21 Nov. 2013: 85-91.
- Abdullah, Y.S. & Abdullah, S.M.A. (2015). Observations on fishes and their parasites of Darbandikhan lake, Kurdistan region in north Iraq. Am. J. Biol. Life Scs., 3 (5): 176-180.
- Adday, T.K. (2001). Biology of the crustacean *Ergasilus ogawai* Kabata, 1992 which parasitized on some Iraqi fishes. M. Sc. Thesis, Coll. Agric., Univ. Basrah: 117 pp. (In Arabic).
- Adday, T.K.; Balasem, A.N.; Mhaisen, F.T. & Al-Khateeb, G.H. (1999). A second survey of fish parasites from Tigris river at Al-Zaafaraniya, south of Baghdad. Ibn Al-Haitham J. Pure Appl. Sci., 12 (1): 22-31.
- Aguilar-Aguilar, R. & Islas-Ortega, A.G. (2015). A checklist of ciliate parasites (Ciliophora) of fishes from Mexico. Zootaxa, 4027 (2): 270-280. Doi.org/10.11646/zootaxa.4027.2.6.
- Ahmed, S.M. & Ali, A.H. (2013). Serum proteins and leucocytes differential count in common carp (*Cyprinus carpio* L.) infested with ectoparasites. Mesopot. J. Mar. Sci., 28 (2): 151-162.
- Al-Asadiy, Y.D.K. (2018). Investigation the relationship between age groups and feeding of *Leuciscus vorax* and their parasitic infection. Proc. 3rd Sci. Agric. Conf., 5-6 Mar. 2018 (J. Kerbala Agric. Sci.): 55-67. (In Arabic).
- Al-Asadiy, Y.D.; Mousa, T.A.B. & Husain, M.M. (2012). Study the infection by *Trichodina domerguei* and *Neoechinorhynchus iraqensis* in the fish *Liza abu* in branch of Euphrates river and treatment it by some chemicals. Al-Muthanna J. Pure Scs., 1 (1): 87-99. (In Arabic).
- Al-Aubaidi, I.K. (1999). Ectoparasites of the common carp (*Cyprinus carpio* L.) in Al-Zaafaraniya fish farm in Baghdad and treatment of their infection with the monogenetic trematodes. M. Sc. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 80 pp. (In Arabic).
- Al-Aubaidi, I.K. (2009). Treatment of the common carp *Cyprinus carpio* infested with the ciliated protozoan *Trichodina domerguei* by using some chemicals. Iraqi J. Agric. (Spec. Issue), 14 (5): 176-181.
- Al-Aubaidi, I.K.; Mhaisen, F.T. & Balasem, A.N. (1999). The external parasites of the common carp (*Cyprinus carpio*) in Al-Zaafaraniya fish farm, Baghdad. Ibn Al-Haitham J. Pure Appl. Sci., 12 (1): 32-40.

- Al-Awadi, H.M.H. (1997). Some ecological aspects of the parasitic faunae of fishes and aquatic birds in Bahr Al-Najaf depression, Iraq. Ph. D. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 71 pp.
- Al-Awadi, H.M.H. (2003). Parasitic faunae (Protozoa and Monogenea) of six species of fish from Euphrates river near Kufa district (Najaf Al-Ashraf province), Iraq. *Babylon Univ. J., Pure Appl. Sci.*, 8 (3): 529-532.
- Al-Awadi, H.M.H.; Mhaisen, F.T. & Al-Joborae, F.F. (2010). Parasitic fauna of fishes in Bahr Al-Najaf depression, mid Iraq. *Bull. Iraq Nat. Hist. Mus.*, 11 (1): 1-9.
- Al-Azebawe, S.J.M. (2010). Isolation and diagnosis of some ectoparasites of fishes in Ibn Najim marsh and the ecological factors affected on them in Al-Najaf Al-Ashraf province. M. Sc. Thesis, Coll. Educ. Girls, Univ. Kufa: 111 pp. (In Arabic).
- Al-Dosary, S.H. (1999). A study on some protozoan parasites of six species of freshwater fishes of Qarmat Ali river, Basrah. M. Sc. Thesis, Coll. Agric., Univ. Basrah: 61 pp. (In Arabic).
- Al-Haider, S.M.A. (2008). Studying the biotic and abiotic factors affecting in survival rate of larvae and fingerling rearing ponds at Al-Furat Company-Babilon. M. Tech. Thesis, Al-Musaib Tech. Coll., Found. Tech. Educ.: 126 pp. (In Arabic).
- Al-Hamdane, A.H. & Azziz, A.H. (2006). Study of some parasitic diseases of pond fish in Mosul area. *Iraqi J. Vet. Sci.*, 20 (2): 225-228. (In Arabic).
- Al-Helli, A.M.S. (2019). Fish assemblage structure and some of its environmental and health aspects in Euphrates river near Samawa city. Ph. D. Thesis, Coll. Agric., Univ. Basrah: 208 pp. (In Arabic).
- Ali, A.H.; Mhaisen, F.T. & Khamees, N.R. (2014). Checklists of nematodes of freshwater and marine fishes of Basrah province, Iraq. *Mesopot. J. Mar. Sci.*, 29 (2): 71-96.
- Ali, M.D. (2002). A survey on health and diseases of carp fish raised in fish culture projects/ Erbil, Duhok and Sulimanyia region & other activities. Report prepared for FAO Representation in Iraq. FAO Coordination Office for Northern Iraq- Animal Production Unit: 33 pp.
- Ali, M.D. & Shaaban, F. (1984). Some species of parasites of freshwater fish raised in ponds and in Tigris- Al-Tharthar canal region. 7th Sci. Conf. Iraqi Vet. Med. Assoc., Mosul: 23-25 Oct. 1984: 44-46. (Abstract).
- Ali, N.M.; Abul-Eis, E.S. & Abdul-Ameer, K.N. (1988a). Study on the parasites of common carp *Cyprinus carpio* and other freshwater fishes in Habbaniyah lake, Iraq. *J. Biol. Sci. Res.*, 19 (2): 395-407.
- Ali, N.M.; Abul-Eis, E.S. & Abdul-Ameer, K.N. (1988b). On the occurrence of fish parasites raised in manmade lakes. 6th Conf. Europ. Ichthyol., Budapest: 15-19 Aug. 1988: 60. (Abstract).
- Ali, N.M.; Al-Jafery, A.R. & Abdul-Ameer, K.N. (1987a). Parasitic fauna of freshwater fishes in Diyala river, Iraq. *J. Biol. Sci. Res.*, 18 (1): 163-181.

- Ali, N.M.; Salih, N.E. & Abdul-Ameer, K.N. (1987b). Parasitic fauna of some freshwater fishes from Tigris river, Baghdad, Iraq. I: Protozoa. J. Biol. Sci. Res., 18 (2): 11-17.
- Ali, N.M.; Salih, N.E. & Abdul-Ameer, K.N. (1988c). Protozoa and Crustacea infesting three species of carp raised in ponds in Iraq. J. Biol. Sci. Res., 19 (2): 387-394.
- Ali, N.M.; Abul-Eis, E.S.; Abdul-Ameer, K.N. & Kadim, L.S. (1988d). On the occurrence of fish parasites raised in manmade lakes. I: Protozoa and Crustacea. J. Biol. Sci. Res., 19 (Suppl.): 877-885.
- Al-Jadoaa, N.A.A. (2002). The parasitic infections and pathological changes of some local and cultured fishes from Al-Qadisiya and Babylon provinces. Ph. D. Thesis, Coll. Educ., Al-Qadisiya Univ.: 158 pp. (In Arabic).
- Al-Jadoaa, N.A. (2008). Study of the parasitic infection of *Liza abu* fish in drainage water at Al-Diwaniya province. J. Babylon Univ., 15 (1): 256-263. (In Arabic).
- Al-Janae'e, A.M.S. (2010). Parasites of some Iraqi fishes in two localities varied in their trophic levels in inland water of Basrah. M. Sc. Thesis, Coll. Agric., Univ. Basrah: 228 pp. (In Arabic).
- Al-Jawda, J.M.; Balasem, A.N.; Mhaisen, F.T.; Al-Shaikh, S.M.J.; Asmar, K.R. & Adday, T.K. (2003). Some fish parasites from Tigris river at Neinava province, north of Iraq. Basrah J. Agric. Sci., 16 (2): 19-29.
- Al-Marjan, K.S.N. (2007). Some ectoparasites of the common carp (*Cyprinus carpio*) with experimental study of the life cycle of the anchor worm (*Lernaea cyprinacea*) in Ainkawa fish hatchery, Erbil province. M. Sc. Thesis, Sci. Educ. Coll., Univ. Salahaddin: 76 pp.
- Al-Marjan, K.S.N. (2010). First record of *Trichodina anguilli* Wu, 1961 (Ciliophora: Peri-trichida: Trichodinidae) in Iraq, on *Cyprinus carpio* collected from Erbil markets, Kurdistan region. Zanco (J. Pure Appl. Sci., Salahaddin Univ.), 23 (1): 99-103.
- Al-Marjan, K.S.N. (2016). Seasonal variations and prevalence of infections of some species of ectoparasites affecting freshwater fish, *Chondrostoma regium* from Greater Zab river, Kurdistan region, Iraq. PolyTechnic, 6 (1): 310-315.
- Al-Marjan, K.S.N. & Abdullah, S.M.A. (2007). Trichodinids ectoparasites (Ciliophora: Peritrichida: Trichodinidae) from common carp *Cyprinus carpio* in Iraq. J. Dohuk Univ., 10 (1): 50-55.
- Al-Marjan, K.S.N. & Abdullah, S.M.A. (2015). *Trichodina* sp. as bioindicator for evaluation of biochemical oxygen demand (BOD₅) in aquaculture fish farms (ponds). J. Univ. Zakho, 3A (1): 27-31.
- Al-Musawi, A.M.K. (2016). Epidemiological study of external parasites that parasitic on *Planiliza abu* in three different habitats in the province of Babylon. M. Tech. Thesis, Al-Musaib Tech. Coll., Al-Furat Al-Awsat Tech. Univ.: 126 pp. (In Arabic).

- Al-Nasiri, F.S. (2000). Parasitic infections of fishes in a man-made lake at Al-Amiriya region, Baghdad. M. Sc. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 133 pp. (In Arabic).
- Al-Nasiri, F.S & Mhaisen, F.T. (2009). Parasites of fishes collected from Tigris river, Salah Al-Deen province, Iraq. *Ibn Al-Haitham J. Pure Appl. Sci.*, 22 (2): 1-8.
- Al-Nasiri, F.S.; Mhaisen, F.T. & Al-Nasiri, S.K. (2002). Parasitic infections of the common carp, *Cyprinus carpio* in a man-made lake at Baghdad region. *Iraqi J. Agric. (Spec. Issue)*, 7 (1): 175-181.
- Al-Nasiri, F.S.; Mhaisen, F.T. & Al-Nasiri, S.K. (2003). Parasites of the grey mullet *Liza abu* in a man-made lake at Baghdad region. *Iraqi J. Agric. (Spec. Issue)*, 8 (1): 133-140.
- Al-Niaeemi, B.H.S. (1997). A study on parasites of the fish *Silurus glanis* L., from Tigris river in Mosul city with special reference to the histopathological effects caused by some infections. M. Sc. Thesis, Coll. Sci., Univ. Mosul: 116 pp. (In Arabic).
- Al-Rubaie, A.L.; Hussain, H.T. & Abdul-Ameer, K.N. (2007). The external parasites of the common carp (*Cyprinus carpio*) in Technical Institute of Al-Mussayab fish farm. *J. Babylon Univ., Sci.*, 14 (3): 46-50.
- Al-Rubaie, I.A.; Mohammad-Ali, N.R.; Balasem, A.N. & Al-Jawda, J.M. (2003). Study on fish diseases in Diyala river. *Iraqi J. Agric. (Spec. Issue)*, 8 (6): 40-47. (In Arabic).
- Al-Saadi, A.A.J.J. (2007). Ecology and taxonomy of parasites of some fishes and biology of *Liza abu* from Al-Husainia creek in Karbala province, Iraq. Ph. D. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 155 pp. (In Arabic).
- Al-Saadi, A.A.J.J. (2013). Some parasites from gills of five fish species and the first record of the monogenean *Ligophorus imitans* Euzet et Suriano, 1977 in Iraq. *Ibn Al-Haitham J. Pure Appl. Sci.*, 26 (1): 56-63.
- Al-Saadi, A.A.J. (2014). Isolation and identification of *Trichodina strelkovi* Chan, 1961 for the first time in Iraq from gills of the mugilid fish *Liza abu*. *J. Kerbala Univ.*, 12 (2), Sci.: 7-11.
- Al-Saadi, A.A.J.; Mhaisen, F.T. & Hasan, H.R. (2010). Ectoparasites of seven fish species from Al-Husainia creek, Karbala province, mid Iraq. *J. Kerbala Univ.*, 8 (4) Sci.: 1-7.
- Al-Saadi, A.A.J.; Mhaisen, F.T. & Hasan, H.R. (2011). Some aspects of the reproductive biology of the mugilid fish *Liza abu* (Heckel) in Al-Husainia creek, Karbala province, Iraq and effect of parasitism on its gonadosomatic index. *Iraqi J. Agric. Res. (Spec. Issue)*, 16 (3): 166-173. (In Arabic).
- Al-Sa'adi, B.A.-H.E. (2007). The parasitic fauna of fishes of Euphrates river: Applied study in Al-Musaib city. M. Tech. Thesis, Al-Musaib Tech. Coll., Found. Tech. Educ.: 102 pp. (In Arabic).
- Al-Sa'adi, B.A.; Mhaisen, F.T. & Al-Rubaie, A.-R.L. (2012). The first parasitological report on the redbelly tilapia *Tilapia zillii* (Gervais, 1848) in Iraq. *Proc. 1st Sci. Symp. Iraq Nat. Hist. Mus. Baghdad*: 20 June 2012: 1-6.

- Al-Saboonchi, A.A.; Al-Niaem, K.S. & Al-Janae'e, A.M. (2009). Effect of organically polluted water on common carp *Cyprinus carpio* infected with the anchor worm *Lernaea cyprinacea*. Proc. 3rd Sci. Conf. Coll. Sci., Univ. Baghdad. Baghdad: 24-26 March 2009: 252-259.
- Al-Saboonchi, A.A.; Khamees, N.R. & Al-Janae'e A.M. (2010). Salinity changes and their effect on the biodiversity in Al-Salihiya river. Basrah J. Sci., 28 (2): 83-91. (In Arabic).
- Al-Saboonchi, A.A.; Khamees, N.R. & Al-Janae'e, A.M. (2014). Effect of water quality on percentage and intensity of fish parasites that isolated from two rivers at Southern- Iraq. Global J. Fish. Aquacult. Res., 2 (2): 120-131.
- Al-Salami, F.J. (2019). Effect of supplementing Alhagi root powder to the ration of *Cyprinus carpio* fish on morbidity and severity of infestation with parasites. M. Tech. Thesis, Al-Musaib Tech. Coll., Al-Furat Al-Awsat Tech. Univ.: 108 pp. (In Arabic).
- Al-Salim, N.K. (1992). First record of four blood diseases in *Liza subviridis*. 3rd Sci. Conf., Fish. Mar. Resour., Basrah: 14-15 April 1992. (Abstract).
- Al-Salim, N.K. & Mohamad, E.T. (1995). Studies on some parasites of the stinging catfish (*Heteropneustes fossilis*) from Al-Hammar marsh- Basrah. A) Infection of *Heteropneustes fossilis* by four parasites and their effects on the fish infected. Mar. Mesopot., 10 (1): 155-170. (In Arabic).
- Al-Salmany, S.O.K. (2015). Parasitic infections of some fish species from Euphrates river at Al-Qaim city, Anbar province. M. Sc. Thesis, Coll. Sci., Univ. Tikrit: 193 pp. (In Arabic).
- Al-Shaikh, S.M.; Mhaisen, F.T.; Al-Khateeb, G.H.; Balasem, A.N. & Mansoor, N.T. (1995). Collection of some fish parasites from the lower reaches of Diyala river, mid Iraq. J. Environ. Sci. Health, A 30 (8): 1707-1715.
- Al-Taei, N.T.M. (2013). Study of some of the environmental aspects for a group of the external parasitic animals for common carp *Cyprinus carpio* L. in cages and pond at Al-Saddah/ Babylon province. M. Tech. Thesis, Al-Musayab Tech. Coll., Found. Tech. Educ.: 117 pp. (In Arabic).
- Al-Tamimi, S.S.J. (2001). Efficacy of formalin, chemogon insecticide and some plant extract in treating the common carp, *Cyprinus carpio*, infested with monogenetic trematodes. Ph. D. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 99 pp. (In Arabic).
- Al-Turaihi, Z.M.R. (2018). Efficacy of the water and alcohol extracts of *Melia azedarach* fruits for treating common carp *Cyprinus carpio* infected with some monogenean parasites. M. Sc. Thesis, Coll. Vet. Med., Univ. Baghdad: 114 pp.
- Al-Waaly, A.B.M. (2005). A comparative study for parasites of *Barbus luteus* fishes in Al-Daghara river and drainage water. M. Sc. Thesis, Coll. Educ., Univ. Al-Qadisiya: 101 pp. (In Arabic).
- Al-Zamily, N.A. (2002). Efficiency of some plant extracts in eradication of monogenetic trematodes parasitizing skin and gills of the common carp

- (*Cyprinus carpio* L.). M. Sc. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 90 pp. (In Arabic).
- Al-Zubaidy, A.B. (1998). Studies on the parasitic fauna of carps in Al-Furat fish farm, Babylon province, Iraq. Ph. D. Thesis, Coll. Sci., Univ. Babylon: 141 pp. (In Arabic).
- Al-Zubaidy, A.B. (2007). A study for some protozoan fauna of freshwater fishes from Hilla river, Babylon province, Iraq. Afr. J. Biol. Sci., 2 (2): 97-104.
- Asmar, K.R.; Balasem, A.N.; Adday, T.K. & Al-Jawda, J.M. (2003). Parasitic infections in some lotic water systems in mid Iraq. Iraqi J. Agric. (Spec. Issue), 8 (6): 59-65. (In Arabic).
- Asmar, K.R.; Balasem, A.N.; Al-Jawda, J.M. & Adday, T.K. (2004). Recording of parasitic and fungal infections in three fish farms, south of Baghdad. Iraqi J. Aquacult., 2: 117-132. (In Arabic).
- Asmar, K.R.; Balasem, A.N.; Al-Jawda, J.M.; Hummadi, A.J. & Adday, T.K. (2001). Study of the parasitic infections in some fish farms. I.A.E.C. Report No. 7050- PO 152-2001: 5 pp. (In Arabic).
- Asmar, K.R.; Balasem, A.N.; Mhaisen, F.T.; Al-Khateeb, G.H. & Al-Jawda, J.M. (1999). Survey of the parasites of some fish species from Al-Qadisiya dam lake, Iraq. Ibn Al-Haitham J. Pure Appl. Sci., 12 (1): 52-61.
- Atwan, F.K. (2016). Parasitic infections in some fishes from Tigris river, Al-Graiat location in Baghdad province, Iraq. M. Sc. Thesis, Coll. Educ. Pure Sci. (Ibn Al-Haitham), Univ. Baghdad: 136 pp. (In Arabic).
- Awad, A.H.; Abdullah, F.A. & Jori, M.M. (2007). Taxonomic study of parasites of the Asian catfish *Silurus triostegus* (Heckel, 1843) from Al-Hammar marsh, Basrah, Iraq. 2nd Sci. Conf. Rehabilit. South. Iraqi marshes. Basrah: 2-4 April 2007: 32. (Abstract). (In Arabic).
- Balasem, A.N.; Mhaisen, F.T.; Al-Jawda, J.M. & Asmar, K.R. (2002a). Collection of some fish parasites from the northern sector of Saddam's river, mid Iraq. Sci. J. Iraqi Atom. Energy Comm., 4 (2): 186-191.
- Balasem, A.N.; Mhaisen, F.T.; Adday, T.K.; Al-Jawda, J.M. & Asmar, K.R. (2003). A second survey of parasitic infections in freshwater fishes from Al-Qadisiya dam lake, Euphrates river, Iraq. Mar. Mesopot., 18 (2): 123-140. (In Arabic).
- Balasem, A.N.; Mhaisen, F.T.; Al-Jawda, J.M.; Asmar, K.R. & Adday, T.K. (2002b). Parasitic fauna of some fishes in northern sector of Saddam's river at Al-Mahmoodiya city, Iraq. Al-Tharwa Al-Samakia, 21: 43-48. (In Arabic).
- Balasem, A.N.; Mohammad-Ali, N.R.; Adday, T.K.; Ali, A.K. & Waheed, I.K. (2000). Parasitological survey on fish in Hemrin dam lake, province of Diyala. J. Diyala, 1 (8 Part 1): 104-114. (In Arabic).
- Balasem, A.N.; Mustafa, S.R.; Salih, A.M.; Al-Jawda, J.M. & Mohammad-Ali, N.R. (2001). A second study for fish parasites of Diyala river. Al-Fatah J., 10: 457-470. (In Arabic).

- Balases, A.N.; Mhaisen, F.T.; Al-Shaikh, S.M.J.; Al-Khateeb, G.H.; Asmar, K.R. & Adday, T.K. (1993). Survey of fish parasites from Tigris river at Al-Zaafaraniya, south of Baghdad, Iraq. *Mar. Mesopot.*, 8 (3): 226-235.
- Bashê, S.K.R. (2008). The parasitic fauna of spiny eel *Mastacembelus mastacembelus* (Banks and Solander, 1794) from Greater Zab river-Kurdistan region- Iraq. M. Sc. Thesis, Coll. Sci. Educ., Univ. Salahaddin: 62 pp.
- Bashê, S.K.R. & Abdullah, S.M.A. (2010). Parasitic fauna of spiny eel *Mastacembelus mastacembelus* from Greater Zab river in Iraq. *Iran. J. Vet. Res.*, Shiraz Univ., 11 (1), Ser. 30: 18-27.
- Basson, L. & Van As, J.G. (2006). Trichodinidae and other ciliophorans (Phylum Ciliophora). In: Woo, P.T.K. (ed.). *Fish diseases and disorders, Vol. I: Protozoan and metazoan infections*, 2nd edition. CABI, Wallingford: 154-182.
- Bdair, A.T. (2018). Diagnosis of ectoparasitic infestation in some fishes in the Tigris river at Al-Zaafaraniya region from Baghdad city. M. Sc. Thesis, Coll. Vet. Med., Univ. Baghdad: 118 pp. (In Arabic).
- Bykhovskaya-Pavlovskaya, I.E.; Gusev, A.V.; Dubinina, M.N.; Izyumova, N.A.; Smirnova, T.S.; Sokolovskaya, I.L.; Shtein, G.A.; Shul'man, S.S. & Epshtein, V.M. (1962). Key to parasites of freshwater fish of U.S.S.R. *Akad. Nauk, S.S.S.R., Moscow*: 727 pp. (In Russian).
- Chanda, S.; Barman, G.D. & Bandyopadhyay, P.K. (2019). A checklist of trichodinid ciliates (Ciliophora: Peritrichida: Trichodinidae) from India. *Rec. Zool. Surv. India*, 119 (4): 424-437. DOI:10.26515/rzsi/v119/i4/2019/141580.
- Coad, B.W. (2010). *Freshwater fishes of Iraq*. Pensoft Publ., Sofia: 274 pp. + 16 pls. www.briancoad.com.
- Dove, A.D.M. & O'Donoghue, P.J. (2005). Trichodinids (Ciliophora: Trichodinidae) from native and exotic Australian freshwater fishes. *Acta Protozool.*, 44: 51-60.
- Eassa, A.M.; Al-Jenaei, A.M.; Abdul-Nabi, Z.A.; Abood, M.A.; Kzaal, R.S. & Aliwy, Y.J. (2014). Comparative ecological study of pathogens structure between wild and cultured common carp *Cyprinus carpio* L. in Basrah. *Marsh Bull.*, 9 (2): 107-123.
- Freyhof, J.; Weissenbacher, A. & Geiger, M. (2017). *Aphanius kruppi*, a new killifish from Oman with comments on the *A. dispar* species group (Cyprinodontiformes: Aphaniidae). *Zootaxa*, 4338 (3): 557-573. <https://doi.org/10.11646/zootaxa.4338.3.10>.
- Fricke, R.; Eschmeyer, W.N. & Van der Laan, R. (eds.) (2020). *Eschmeyer's Catalog of Fishes: Genera, Species, References*. <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>. (Updated 2 March 2020).
- Froese, R. & Pauly, D. (Eds.) (2019). *FishBase. World Wide Web electronic publication*. www.fishbase.org, version (12/2019).

- GBIF (2020). Global Biodiversity Information Facility, on-line database, <http://www.gbif.org>. (Accessed 16 April 2020).
- Hameed, R.S. (2019). Parasites of some fish species from Tigris river in Al-Kamirah region at north of Baghdad province, Iraq. M. Sc. Thesis, Coll. Educ. Pure Sci./ Ibn Al-Haitham, Univ. Baghdad: 132 pp. (In Arabic).
- Hammood, N.W. (2017). Investigation of some parasitic and bacterial infections in some fish species of Tigris river at Baghdad city. M. Sc. Thesis, Coll. Sci., Univ. Tikrit: 141 pp. (In Arabic).
- Herzog, P.H. (1969). Untersuchungen über die parasiten der süßwasserfische des Irak. Arch. Fischereiwiss., 20 (2/3): 132-147.
- Hoole, D.; Bucke, D.; Burgess, P. & Wellby, I. (2001). Diseases of carp and other cyprinid fishes. Fishing News Books, Oxford: 264 pp.
- Hussain, H.T. (2005). Ectoparasitic infection of the common carp and silver carp fingerlings stocked under winter in Al-Shark Al-Awsat fish farm, Babylon province. M. Tech. Thesis, Al-Musayab Tech. Coll., Found. Tech. Educ.: 106 pp. (In Arabic).
- Hussain, H.T. (2007). Survey of ectoparasites of some fishes of Al-Hilla river in Babylon province. J. Babylon Univ., Sci., 14 (3): 228-232. (In Arabic).
- Hussain, H.T. (2008). Study on the external ectoparasites of mosquito fish (*Gambusia affinis*) in Al-Hilla river, Babylon province. J. Babylon Univ., Pure Appl. Sci., 15 (1): 245-248.
- Hussain, H.T. (2009). Effect of temperature on the external parasites which recorded on the mugilid fish *Liza abu* (Heckel, 1843) in Al-Hilla river, Babylon province. Sci. J. Kerbala Univ., 7 (3), Sci.: 5-11. (In Arabic).
- Hussain, H.T. (2010). Study on the parasitic fauna of *Acanthopagrus latus* (Houttuyn, 1782) in Al-Razzaza lake. Sci. J. Kerbala Univ., 8 (4), Sci.: 61-64. (In Arabic).
- Hussain, H.T. (2017). Distribution of infection with ectoparasites of fishes of one private farm in Al-Eskandriya district, Babylon province, Iraq. J. Babylon Univ., Pure Appl. Sci., 25 (4): 1329-1335. (In Arabic).
- Hussain, H.T.; Mhaisen, F.T. & Al-Rubaie, A.L. (2007). Ectoparasitic infection of the common carp and silver carp fingerlings stocked during winter in Al-Shark Al-Awsat fish farm, Babylon province. J. Babylon Univ., Sci., 14 (3): 204-219. (In Arabic).
- Hussain, H.T.; Naief, T.S. & Hwaidi, E.H. (2011a). Comparative study of external parasitic infection in the common carp (*Cyprinus carpio*) bred in monoculture and polyculture. Sci. J. Kerbala Univ., 9 (4): 64-71. (In Arabic).
- Hussain, H.T.; Hwaidi, E.H.; Elewi, H.H. & AbidAli, H.M. (2011b). Survey of ectoparasitic infections on the common carp *Cyprinus carpio* in three fish farms at Al-Eskandriya, Babylon province. Sci. J. Kerbala Univ., 9 (1): 126-131. (In Arabic).
- Hussain, H.T.; Howaidi, E.H.; Naif, T.S.; Abd, K.R. & Takheal, M.H. (2013). Study the relationship between the length of the fish and the incidence external parasites of common carp *Cyprinus carpio* in the Al-Shark Al-Awsat

- fish farm in Babylon province. J. Al-Qadisiyah Pure Sci., 18 (1): 1-6. (In Arabic).
- Jassim, A.A.R. (2007). Parasites of cultured fishes for three localities in Basrah, Iraq. M. Sc. Thesis, Coll. Agric., Univ. Basrah: 95 pp. (In Arabic).
- Jawdhira, A.H.; Abdulkarim, M.F. & Khaled, M. (2017). Diagnosis of parasitic diseases of fish cages (*Cyprinus carpio*) in the Al furat river bridge of Mussayab in Babylon province. Kufa J. Vet. Med. Sci., 8 (1): 90-93.
- Jori, M.M. (1998). Study of the parasites of two mugilid fish species and the effect of some on the blood parameters. M. Sc. Thesis, Coll. Agric., Univ. Basrah: 136 pp. (In Arabic).
- Jori, M.M. (2006). Parasitic study on the Asian catfish *Silurus triostegus* (Heckel, 1843) from Al-Hammar marshes, Basrah, Iraq. Ph. D. Thesis, Coll. Educ., Univ. Basrah: 192 pp.
- Kadhim, A.H. (2009). Disease agents of four fish species in Basrah province. M. Sc. Thesis, Coll. Agric., Univ. Basrah: 102 pp. (In Arabic).
- Khalifa, K.A. (1982). Occurrence of parasitic infections in Iraqi fish ponds. 2nd Sci. Conf., Arab Biol. Union, Fés: 17-20 March 1982: 333. (Abstract).
- Khalifa, K.A. (1989). Incidence of parasitic infestation of fishes in Iraq. Pak. Vet. J., 9 (2): 66-69.
- Khalifa, K.A.; Hassan, F.K.; Atiah, H.H. & Latif, B.M.A. (1978). Parasitic infestation of fishes in Iraqi waters. Iraqi J. Biol. Sci., 6 (1): 58-63.
- Khamees, N.R.; Mhaisen, F.T. & Ali, A.H. (2015). Checklists of crustaceans of freshwater and marine fishes of Basrah province, Iraq. Mesopot. J. Mar. Sci., 30 (1): 1-32.
- Kudo, R.R. (1939). Protozoology, 2nd edition. Charles C. Thomas Publ., Illinois: 689 pp.
- Maciel, P.O.; Garcia, F.; Chagas, E.C.; Fujimoto, R.Y. & Tavares-Dias, M. (2018). Trichodinidae in commercial fish in South America. Rev. Fish Biol. Fish., 28: 33-56. Doi.org/10.1007/s11160-017-9490-1.
- Mama, K.S. (2012). A comparative study on the parasitic fauna of the common carp *Cyprinus carpio* from Ainkawa fish hatchery (Erbil) and Lesser Zab river in Kurdistan region, Iraq. M. Sc. Thesis, Coll. Educ.- Sci. Dept., Univ. Salahaddin: 89 pp.
- Mama, K.S. & Abdullah, S.M.A. (2012). A comparative study on the parasitic fauna of the common carp *Cyprinus carpio* from Ainkawa fish hatchery (Erbil) and Lesser Zab river in Kurdistan region, Iraq. Mesopot. J. Agric., 42 (2): 19-26.
- Mama, K.S. & Abdullah, S.M.A. (2013a). Parasitic infections of the common carp *Cyprinus carpio* from Lesser Zab river in Kurdistan region, Iraq. Proc. 1st Ann. Int. Interdiscip. Conf., AIIC, Azores, Portugal: 24-26 April 2013: 895-900.
- Mama, K.S. & Abdullah, S.M.A. (2013b). Infections of common carp *Cyprinus carpio* with ciliated protozoans parasites from Ainkawa fish hatchery in

- Kurdistan region, Iraq. Proc. Aquacult. Eur. Trondheim, Norway: 9-13 August 2013: 12-16.
- Mansoor, N.T. (2009). Ectoparasites and eye parasites of *Cyprinus carpio* L. from Bab Al-Muatham fish markets, Baghdad city. M. Sc. Thesis, Coll. Vet. Med., Univ. Baghdad: 82 pp.
- Mansoor, N.T. & Al-Shaikh, S.M.J. (2010). Protozoans infection of *Cyprinus carpio* L. from Bab Al-Muatham fish markets, Baghdad city. Iraqi J. Vet. Med., 34 (1): 156-164.
- Mansoor, N.T.; Falah, A.B.; Al-Jawda, J.M. & Asmar, K.R. (2012). Histopathological study of some Tigris river fish which infected by parasites. Iraqi J. Vet. Med., 36 (1): 33-42 (In Arabic).
- Mhaisen, F.T. (1986). Records of some fish parasites from Shatt-Al-Arab river and the north west of the Arab Gulf. Bull. Basrah Nat. Hist. Mus., 6 (1): 111-124.
- Mhaisen, F.T. (2002). Literature review and check lists of acanthocephalans of fishes of Iraq. Al-Mustansiriya J. Sci., 13 (1): 13-25.
- Mhaisen, F.T. (2019). Checklists of parasites of fishes of Thi-Qar province, Iraq. Biol. Appl. Environ. Res., 3 (2): 152-167.
- Mhaisen, F.T. (2020). Index-catalogue of parasites and disease agents of fishes of Iraq. (Unpublished: mhaisenft@yahoo.co.uk).
- Mhaisen, F.T. & Abdul-Ameer, K.N. (2013). Checklists of *Gyrodactylus* species (Monogenea) from fishes of Iraq. Basrah J. Agric. Sci., 26 (Spec. Issue 1): 8-25.
- Mhaisen, F.T. & Abdul-Ameer, K.N. (2014). Checklists of diplozoid species (Monogenea) from fishes of Iraq. Bull. Iraq Nat. Hist. Mus., 13 (2): 95-111.
- Mhaisen, F.T. & Abdul-Ameer, K.N. (2019a). Checklists of *Dactylogyrus* species (Monogenea) from fishes of Iraq. Biol. Appl. Environ. Res., 3 (1): 1-36.
- Mhaisen, F.T. & Abdul-Ameer, K.N. (2019b). Checklists of species of ancylostomoid and ancyrocephalid monogeneans from fishes of Iraq. Basrah J. Agric. Sci., 32 (Spec. 2): 45-62. <https://doi.org/10.37077/25200860.2019.256>.
- Mhaisen, F.T. & Abdullah, S.M.A. (2016). Checklists of parasites of farm fishes of Kurdistan region, Iraq. Iraqi J. Agric. Res., 21 (2): 204-216.
- Mhaisen, F.T. & Abdullah, S.M.A. (2017). Parasites of fishes of Kurdistan region, Iraq: Checklists. Biol. Appl. Environ. Res., 1 (2): 131-218.
- Mhaisen, F.T. & Abul-Eis, E.S. (1991). Parasites of the common carp *Cyprinus carpio* in the Babylon fish farm, Hilla, Iraq. Thalassographica, 14: 27-33.
- Mhaisen, F.T. & Abul-Eis, E.S. (1993). External parasites of Al-Wahda fish hatchery at Suwaira, south of Baghdad. Mar. Mesopot., 8 (2): 202-206.
- Mhaisen, F.T. & Al-Jawda, J.M. (2020). Checklists of the species of *Myxobolus* Bütschli, 1882 (Myxozoa: Myxosporidia) from fishes of Iraq. Biol. Appl. Environ. Res., 4 (2): 127-166.
- Mhaisen, F.T. & Al-Rubaie, A.L. (2016a). Checklists of fish parasites of Al-Najaf Al-Ashraf province, Iraq. Al-Kufa Univ. J. Biol., Spec. 2nd Int. Sci. Conf. Life Sci., Fac. Educ. Women, Univ. Kufa: 86-95.

- Mhaisen, F.T. & Al-Rubaie, A.L. (2016b). Checklists of parasites of farm fishes of Babylon province, Iraq. *J. Parasitol. Res.*, vol. 2016, Article ID 7170534, 15 pages. DOI:10.1155/2016/7170534.
- Mhaisen, F.T. & Al-Rubaie, A.L. (2018). Checklists of fish parasites of Babylon province of Iraq, exclusive of farm fishes. *Biol. Appl. Environ. Res.*, 2 (1): 57-110.
- Mhaisen, F.T.; Abdul-Ameer, K.N. & Hamdan, Z.K. (2018). Checklists of parasites of fishes of Salah Al-Din province, Iraq. *Biol. Appl. Environ. Res.*, 2 (2): 180-218.
- Mhaisen, F.T.; Ali, A.H. & Khamees, N.R. (2013a). Checklists of monogeneans of freshwater and marine fishes of Basrah province, Iraq. *Basrah J. Agric. Sci.*, 26 (Spec. Issue 1): 26-49.
- Mhaisen, F.T.; Ali, A.H. & Khamees, N.R. (2016). Checklists of protozoans and myxozoans of freshwater and marine fishes of Basrah province, Iraq. *Mesopot. J. Mar. Sci.*, 31 (1): 29-52.
- Mhaisen, F.T.; Ali, A.H. & Khamees, N.R. (2017a). Checklists of fish parasites of Basrah marshlands, Iraq. *Biol. Appl. Environ. Res.*, 1 (2): 237-278.
- Mhaisen, F.T.; Al-Mayali, H.M.H. & Al-Abodi, H.R.J. (2019). Checklists of parasites of fishes of Al-Diwaniyah province, Iraq. *Bull. Iraq Nat. Hist. Mus.*, 15 (3): 293-318.
- Mhaisen, F.T.; Al-Rubaie, A.L. & Al-Sa'adi, B.A. (2015). Ciliophoran and myxozoan parasites of fishes from the Euphrates river at Al-Musaib city, Babylon province, Mid Iraq. *Am. J. Biol. Life Sci.*, 3 (1): 12-16.
- Mhaisen, F.T.; Al-Saadi, A.A.J. & Al-Shamma'a, A.A. (1999). Some observations on fish parasites of Habbaniya lake. *Ibn Al-Haitham J. Pure Appl. Sci.*, 12 (1): 62-67.
- Mhaisen, F.T.; Al-Yamour, K.Y. & Allouse, S.B. (1995). Parasites of some freshwater fishes from Tigris river at Al-Rashidia, north of Baghdad, Iraq. *Arq. Mus. Bocage, Nova Série*, 2 (32): 547-554.
- Mhaisen, F.T.; Khamees, N.R. & Ali, A.H. (2013b). Checklists of trematodes of freshwater and marine fishes of Basrah province, Iraq. *Basrah J. Agric. Sci.*, 26 (Spec. Issue 1): 50-77.
- Mhaisen, F.T.; Khamees, N.R. & Ali, A.H. (2013c). Checklists of cestodes of freshwater and marine fishes of Basrah province, Iraq. *Basrah J. Agric. Sci.*, 26 (Spec. Issue 1): 78-98.
- Mhaisen, F.T.; Khamees, N.R. & Ali, A.H. (2014). Checklists of acanthocephalans of freshwater and marine fishes of Basrah province, Iraq. *Basrah J. Agric. Sci.*, 27 (1): 21-34.
- Mhaisen, F.T.; Ali, N.M.; Abul-Eis, E.S. & Kadim, L.S. (1989). Protozoan and crustacean parasites of the mugilid fish *Liza abu* (Heckel) inhabiting Babylon fish farm, Hilla, Iraq. *J. Biol. Sci. Res.*, 20 (3): 517-525.
- Mhaisen, F.T.; Ali, N.M.; Abul-Eis, E.S. & Kadim, L.S. (1990). Parasitological investigation on the grass carp (*Ctenopharyngodon idella*) of Babylon fish farm, Hilla, Iraq. *Iraqi J. Biol. Scs.*, 10 (1): 89-96.

- Mhaisen, F.T.; Al-Jawda, J.M.; Asmar, K.M. & Ali, M.H. (2017b). Checklists of fish parasites of Al-Anbar province, Iraq. *Biol. Appl. Environ. Res.*, 1 (1): 17-56.
- Mhaisen, F.T.; Balasem, A.N.; Al-Khateeb, G.H.; Al-Shaikh, S.M.J. & Al-Jawda, J.M. (1993a). Survey of parasites of farm fishes in three provinces in mid Iraq. *Al-Tharwa Al-Samakia*, 13: 84-87. (In Arabic).
- Mhaisen, F.T.; Balasem, A.N.; Al-Khateeb, G.H.; Asmar, K.R. & Adday, T.K. (2002). A second collection of fish parasites and fungi from the lower reaches of Diyala river, mid Iraq. *Vet.*, 12 (1): 24-32.
- Mhaisen, F.T.; Al-Khateeb, G.H.; Balasem, A.N.; Al-Shaikh, S.M.J.; Al-Jawda, J.M. & Mohammad-Ali, N.R. (2003). Occurrence of some fish parasites in Al-Madaen drainage network, south of Baghdad. *Bull. Iraq Nat. Hist. Mus.*, 10 (1): 39-47.
- Mhaisen, F.T.; Balasem, A.N.; Al-Khateeb, G.H.; Al-Shaikh, S.M.J.; Al-Jawda, J.M. & Haiawi, S.M. (1993b). Survey of parasites of three fish farms at Al-Latifya, south Baghdad. *Mar. Mesopot.*, 8 (2): 218-224.
- Mohamad, E.T. (1989). Study on parasites of the stinging catfish *Heteropneustes fossilis* (Bloch, 1797) from Al-Hammar marsh, Basrah. M. Sc. Thesis, Coll. Agric., Univ. Basrah: 103 pp. (In Arabic).
- Mohammad-Ali, N.R.; Balasem, A.N.; Mhaisen, F.T.; Salih, A.M. & Waheed, I.K. (1999). Observations on the parasitic fauna in Al-Zaafaraniya fish farm, south of Baghdad. *Vet.*, 9 (2): 79-88.
- Mohammed, H.J. (2017). Parasitic fauna of some fish species from Diyala river in Diyala province. M. Sc. Thesis, Coll. Educ. Pure Sci., Ibn Al-Haitham, Univ. Baghdad: 122 pp. (In Arabic).
- Muhammad, I.M.; Dhahir, S.F.; Bilal, S.J. & Abdullah, S.M.A. (2013). Parasitic fauna of some freshwater fishes from Greater Zab river, Kurdistan region, Iraq. *J. Univ. Zakho*, 1 (A), No. 2: 620-627.
- Muhammed, S.K. (2000). An external and eye parasite survey for carp fishes in Al-Eskandaryia region (Babylon). M. Sc. Thesis, Coll. Vet. Med., Univ. Baghdad: 82 pp. (In Arabic).
- Mustafa, S.I. (2016). Study on some disease agents of *Cyprinus carpio* L., 1758 of fish farm in Erbil city. M. Sc. Thesis, Coll. Educ., Univ. Salahaddin: 68 pp.
- Nepszy, S.J. (1988). Parasites of fishes in the Canadian waters of the Great Lakes. Technical Report (Great Lakes Fishery Commission), No. 51: 106 pp.
- Noga, E.J. (2010). Fish disease: Diagnosis and treatment, 2nd edition, Wiley-Blackwell, Iowa: 519 pp.
- Özer, A. & Öztürk, T. (2015). Trichodinid fauna of freshwater fishes with infestation indices in the Lower Kızılırmak delta in Turkey and a checklist of trichodinids (Ciliophora: Trichodinidae) in Turkish waters. *Turk. J. Zool.*, 39: 1-13. DOI:10.3906/zoo-1407-13.
- Rahemo, Z.I.F. & Al-Niaeemi, B.H.S. (2001). Parasites of *Silurus glanis* inhabiting Tigris river passing Mosul city. *J. Al-Qadisiya, Pure Sci.*, 6 (3): 116-125. (In Arabic).

- Rasheed, R.A.-R. (2016). Parasites of some fishes of Tigris river in Al-Shawwaka region, Baghdad city- Iraq. M. Sc. Thesis, Coll. Educ. Ibn Al-Haitham, Univ. Baghdad: 106 pp. (In Arabic).
- Rasool, A.H. (2017). Detection of some parasites and study their effects on certain blood and biochemical parameters of *Cyprinus carpio* in south of Iraq. M. Sc. Thesis, Coll. Vet. Med, Univ. Basrah: 102 pp.
- Roberts, L.S. & Janovy, J., Jr. (2009). Gerald D. Schmidt and Larry S. Roberts' foundations of parasitology, 8th edition, McGraw-Hill, N. Y.: Wm. C. Brown Publ., Dubuque: 701 pp.
- Sadek, A.A. (1999). Ectoparasites of the common carp (*Cyprinus carpio* L.) fingerlings intensively stocked during autumn and winter. M. Sc. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 100 pp. (In Arabic).
- Sadek, A.A.; Mhaisen, F.T. & Balasem, A.N. (2006). Ectoparasites of the common carp (*Cyprinus carpio* L.) fingerlings intensively stocked during autumn and winter. Ibn Al-Haitham J. Pure Appl. Sci., 19 (4A): 32-40.
- Sadiq, S.T. (2017). Isolation of some fish ectoparasites from the common carp *Cyprinus carpio* with histopathological alterations and PCR detection of the monogenean genus *Dactylogyrus*. M. Sc. Thesis, Coll. Vet. Med., Univ. Duhok: 94 pp.
- Salih, A.M.; Balasem, A.N.; Al-Jawda, J.M.; Asmar, K.R. & Mustafa, S.R. (2000). On a second survey of fish parasites in Al-Zaafarany fish farm- Baghdad. J. Diyala, 1 (8 Part 1): 220-238. (In Arabic).
- Shakir, A.M. (2018). Study of age, growth and parasites for two fish species in Euphratis river passing through Al-Qadisiyah and Al-Muthanna provinces. M. Sc. Thesis, Coll. Agric., Univ. Al-Muthanna: 109 pp. (In Arabic).
- Shakir, A.M. & Al-Asadiy, Y.D.K. (2018). Detection of parasites infecting *Coptodon zillii* and *Planiliza abu* caught from Euphrates river and their records as new hosts for three identified parasite species. Al-Muthanna J. Agric. Sci., 6 (4): 76-83. (In Arabic).
- Shamsuddin, M.; Nader, I.A. & Al-Azzawi, M.J. (1971). Parasites of common fishes from Iraq with special reference to larval form of *Contracaecum* (Nematoda: Heterocheilidae). Bull. Biol. Res. Cent., Baghdad, 5: 66-78.
- Shwani, A.A.A. (2009). The parasitic fauna of Asian catfish *Silurus triostegus* (Heckel, 1843) from Greater Zab river- Kurdistan region- Iraq. M. Sc. Thesis, Coll. Sci. Educ., Univ. Salahaddin: 75 pp.
- Shwani, A.A.A.; Abdullah, S.M.A. & Asmat, G. (2010). Two new species of *Trichodina* Ehrenberg, 1830 (Ciliophora: Trichodinidae) from *Silurus triostegus* in Iraq. Europ. J. Sci. Res., 40 (4): 598-604.
- Tan, M. & Armbruster, J.W. (2018). Phylogenetic classification of extant genera of fishes of the order Cypriniformes (Teleostei: Ostariophysii). Zootaxa, 4476 (1): 006-039. Doi.org/10.11646/zootaxa.4476.1.4.
- WoRMS (2020). World Register of Marine Species at <http://www.marinespecies.org>. (Accessed 21 Mar. 2020).

Zangana, M.G.M.A. (2008). Survey study of parasites of freshwater fishes from Al-Khazir river in Nineveh province. M. Sc. Thesis, Coll. Vet. Med., Univ. Mosul: 123 pp. (In Arabic).