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Checklists of Carp Parasites in Floating Cages of Iraq

Furhan T. Mhaisen
Tegnervägen 6B, Katrineholm 641 36, Sweden
e-mail:mhaisenft@yahoo.co.uk

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Abstract

Literature review of reports concerning the parasitic fauna of floating cage fishes in Iraq till the end of 2021 showed that a total of 57 parasite species are so far known from three fish species investigated for parasitic infections throughout the country. The parasitic fauna included 15 ciliophorans, three myxozoans, two trematodes, 28 monogeneans, five cestodes, one nematode, one acanthocephalan and two crustaceans. The common carp *Cyprinus carpio* was infected with all these 57 parasite species, the grass carp *Ctenopharyngodon idella* with four parasite species and the silver carp *Hypophthalmichthys molitrix* with only one parasite species.

Keywords: Parasites, Floating cages, Common carp, Grass carp, Silver carp, Iraq.

Introduction

Global production from aquaculture is growing substantially and provides increasingly significant volumes of fish and other aquatic food for human consumption, a trend that is projected to continue (FAO, 2010). The cage culture industry had rapidly increased during the last decades in response to the increasing demands on aquatic products (Halwart *et al.*, 2010). The improved utilization of natural resources had improved farming practices (FAO, 2020). However, such practice may lead to a reduction in available natural resources.

Although the first trial of floating cage culture in Iraq was practiced since mid-eighteens of the last century by the Iraqi State Enterprise for Fisheries in Habbaniyah Lake (personal communication with Dr. Attaallah M. Ali), but unfortunately this practice was failed due to some administrative problems as well due to the destruction of such cages by some local fishermen during the night. However, one survey for parasites of fishes of these cages (Ali *et al.*, 1988a) ascertained the presence of such cages while examining three species of carps from such cages. In 2008, another return to the cage culture in Iraq had been practiced (Eassa *et al.*, 2014). The floating cages in Iraq are the most beneficial and profitable projects (Salman and Saleh, 2019). Ali (2020) summarized the

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positive aspects of fish cages as no need to land to be established, allow optimal use of water, no needs to pumps, decrease of costs of their building, high productivity, possibility of changing their locations, easy observation and care of feeding, protecting fishes from natural enemies such as birds and predatory fishes and easy collecting and marketing of fishes, while the negative aspects included easy stealing of fishes and also fishes can be affected by a decrease in dissolved oxygen in water in case of inappropriate quantities of supplied water.

According to the statistics (Ministry of Agriculture, Baghdad, 2021), a total of 1081 working fish cage projects are scattered in Iraq, exclusive of Kurdistan Region, with a total area of 207289 m^2 (207.289 hectares). Of these projects, 402 are scattered in Basrah Province, 225 in Misan Province, 108 in Babylon Province, 87 in Baghdad Province, 80 in Thi Qar Province and 68 in Wasit Province. However, according to personal communication with Dr. Shamall M.A. Abdullah and Dr. Nasreen M. Abdul-Rahman, fish cages are distributed in Darbandikhan and Dokan lakes of Sulaimaniya Province, Kurdistan Region. On the other hand, one private project of floating cages in Erbil Province was terminated due to some technical problems (personal communication with Dr. Samir J. Bilal).

Few surveys were conducted on parasites of some cage fishes in Iraq. These included those from Al-Habbaniyah Lake at Al-Anbar Province (Ali *et al.*, 1988a), Babylon Province (Al-Taei, 2013; Al-Jubouri *et al.*, 2017; Al-Turaihi and Al-Rudainy, 2017; Jawdhira *et al.*, 2017; Al-Turaihi, 2018; Hussein, 2018; Hussain, 2019; Hussein *et al.*, 2021), Al-Najaf Al-Ashraf Province (Al-Salami, 2019; Al-Salami and Al-Saadi, 2019), Thi Qar Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020) and Basrah Province (Eassa *et al.*, 2014; Al-Nowfal, 2017; Al-Nowfal *et al.*, 2018, 2019; Khamees *et al.*, 2019). It is reliable to state here that no parasitic infections were reported from fishes in floating cages during a three-year's (2014-2016) survey in different areas of Basrah Province (Jassim, 2019).

The present article is designed to review the results of surveys on parasites of cage fishes of Iraq and provide parasite-host and host-parasite lists. This article represents a continuation to some recent checklists on some groups of fish parasites of Iraq, such as those on *Dactylogyrus* species (Mhaisen and Abdul-Ameer, 2019a), ancylodiscoidid and ancyrocephalid monogenetic 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) and *Contracaecum* species (Mhaisen and Abdul-Ameer, 2021b).

Sources and Methods

A total of 18 references (11 research papers, three unpublished M. Tech. theses, two unpublished M. Sc. theses and two conference abstracts) dealing with the parasitic fauna of cage fishes in different water bodies of Iraq were used to build up this article.

Listing of major parasitic groups is followed according to their evolutionary ranks, starting with the ciliophorans and ending with the crustaceans. For each major parasitic group, its systematic scheme will be given and followed by an alphabetical listing of its species (GBIF, 2022). For each parasite species, a chronological listing of references will be given, followed with documentation of its first record in Iraq and the total number of its hosts so far known in Iraq, based on the index-catalogue of parasites and disease agents of fishes of Iraq (Mhaisen, 2022), without mentioning this reference each time in order to economize space.

Results and Discussion

Surveying literature concerning the parasites, so far recorded from cage fishes of Iraq, showed the infection of three fish species with these parasites. The following is a list of the scientific names and authorities of such fishes together with their orders and families (Eschmeyer, 2022; Froese and Pauly, 2022).

Class Actinopterygii
Order Cypriniformes
Family Cyprinidae
Cyprinus carpio Linnaeus, 1758
Family Xenocyprididae
Ctenopharyngodon idella (Valenciennes, 1844)
Hypophthalmichthys molitrix (Valenciennes, 1844)

Parasite-Host List

Species of the parasitic fauna of cage fishes of Iraq are grouped here into eight major groups: phyla or subphyla for some species or classes for others (Kirjušina and Vismanis, 2007).

Major Groups of Parasites and Their Fish Hosts

As names of some major groups of parasites had been changed during the last few years, attention was paid to use the most recent names for the major parasite groups which infect fishes (GBIF, 2022). Eight major parasite groups are reported in this study: Ciliophora, Myxozoa, Trematoda, Monogenea, Cestoda, Nematoda, Acanthocephala and Crustacea.

Phylum Ciliophora

The phylum Ciliophora is represented in cage fishes of Iraq with one species each of the genera *Balantidium*, *Chilodonella*, *Ichthyophthirius* and *Tripartiella*, three species of the genus *Apiosoma* and seven species of *Trichodina* in addition to one unidentified species of *Trichodina* as indicated in the following systematic scheme (GBIF, 2022):

Phylum Ciliophora
- Class Heterotrichea
  - Order Heterotrichida
    - Family Balantidiidae
      - *Balantidium barbi* (Dogiel & Bykhovski, 1934) Jankovski, 1982
- Class Oligohymenophorea
  - Order Hymenostomatida
    - Family Ichthyophthiriidae
      - *Ichthyophthirius multifiliis* Fouquet, 1876
  - Order Peritrichida
    - Family Trichodinidae
      - *Trichodina cottidarum* Dogiel, 1948
      - *Trichodina domerguei* Wallengren, 1897
      - *Trichodina elegeni* Shulmann-Albova, 1950
      - *Trichodina gracilis* Polyanskii, 1955
      - *Trichodina nigra* Lom, 1960
      - *Trichodina reticulata* Hirschmann & Partsch, 1955
      - *Trichodina strelkovi* Chan, 1961
      - *Trichodina* sp.
    - Family Epistylididae
      - *Apiosoma amoebae* Grenfell, 1887
      - *Apiosoma campanulatum* Timofeev, 1962
      - *Apiosoma piscicola* Blanchard, 1885
    - Family Urceolariidae
      - *Tripartiella amurensis* (Chan, 1961)
- Class Cyrtophoria
  - Order Cyrtophorida
    - Family Chilodonellidae
      - *Chilodonella cyprini* (Moroff, 1902) Kahl, 1931

Apiosoma amoebae was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This ciliophoran was recorded for the first time in Iraq from skin, buccal cavity and gills of *C. idella* and buccal cavity of *H. molitrix* from ponds of Al-Furat Fish Farm, Babylon Province (Ali *et al.*, 1989). So far, six fish host species are known for this ciliophoran in Iraq.

Apiosoma campanulatum was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This parasite was recorded for the first time in Iraq from skin of *Cyprinion kais* from Euphrates River at Al-Anbar Province (Al-Salmany, 2015). So far, two fish host species are known for this parasite in Iraq.

Apiosoma piscicola was reported from skin and buccal cavity of *C. idella* and skin of *C. carpio* from fish cages in Al-Habbaniyah Lake (Ali *et al.*, 1988a). Its first record in Iraq was from skin, buccal cavity and gills of *C. idella*, *C. carpio* and *H. molitrix* from Al-Suwairah and Al-Latifiah fish ponds (Ali *et al.*, 1988b). *A. piscicola* has so far 11 fish host species in Iraq.

Balantidium barbi was reported from the digestive gland of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This is its first record in Iraq. Later on, it was reported from Iraq only from gills of *Coptodon zillii* from Karbala Main Drainage by Al-Hajimi (2021).

Chilodonella cyprini was reported from gills of *C. idella* and skin of *C. carpio* from cages in Al-Habbaniyah Lake (Ali *et al.*, 1988a). This parasite was recorded for the first time in Iraq from skin, buccal cavity and gills of *Mystus pelusius* from Tigris River at Baghdad (Ali *et al.*, 1987a). So far, 12 fish host species are known for *C. cyprini* in Iraq.

Ichthyophthirius multifiliis was reported from skin, fins and gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013), skin of *C. carpio* from cages at Al-Qurna, Al-Dayr and Abu Al-Khaseeb, Basrah Province (Eassa *et al.*, 2014), from skin, fins and gills of *C. carpio* from Al-Talbe Fish cages, Babylon Province (Al-Turaihi and Al-Rudainy, 2017; Al-Turaihi, 2018), skin, fins and gills of *C. carpio* from cages at the Euphrates River at Al-Mussaib District, Babylon Province (Hussein, 2018), gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020) and from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This ciliophoran was recorded for the first time in Iraq from skin and gills of *Planiliza subviridis* (reported as *Mugil dussumieri*) from Tigris River at Baghdad (Herzog, 1969). So far, 33 fish host species are known for *I. multifiliis* in Iraq.

Trichodina cottidarum was reported from skin and gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013) and from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). *T. cottidarum*

was recorded for the first time in Iraq from gills of *C. carpio* from a manmade lake at Al-Zawraa Park, Baghdad (Abdul-Ameer, 2004). So far, 13 fish species are known as hosts for *T. cottidarum* in Iraq.

Trichodina domerguei was reported from skin, buccal cavity and gills of *C. carpio* from floating cages in Al-Habbaniyah Lake (Ali *et al.*, 1988a), skin of *C. carpio* from cages at Al-Qurna, Al-Dayr and Abu Al-Khaseeb, Basrah Province (Eassa *et al.*, 2014) and from skin, fins and gills of *C. carpio* from Al-Talbe Fish cages, Babylon Province (Al-Turaihi and Al-Rudainy, 2017; Al-Turaihi, 2018). The first record of *T. domerguei* in Iraq was from skin and gills of eight freshwater fish species from Tigris River, Al-Tharthar Lake and fish markets in Baghdad City (Shamsuddin *et al.*, 1971), which include: *Arabibarbus grypus* (reported as *Barbus grypus*), *Carasobarbus luteus* (reported as *Barbus luteus*), *C. carpio*, *Luciobarbus esocinus* (reported as *Barbus esocinus*), *L. xanthopterus* (reported as *Barbus xanthopterus*), *Mesopotamichthys sharpeyi* (reported as *Barbus sharpeyi*), *Planiliza abu* (reported as *Mugil abu*) and *Silurus triostegus*. So far, 39 fish host species are known for *T. domerguei* in Iraq.

Trichodina elegeni was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). Its first record in Iraq was from skin of *P. abu* (reported as *Liza abu*) from Tigris River, passing through Salah Al-Din Province (Al-Nasiri and Mhaisen, 2009). So far, six fish host species are known for *T. elegini* in Iraq.

Trichodina gracilis was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This parasite was recorded for the first time in Iraq from skin of *C. carpio* in ponds of Al-Shark Al-Awsat Fish Farm, Babylon Province (Hussain, 2005). So far, five fish host species are known for this parasite in Iraq.

Trichodina nigra was reported from skin and gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013). This ciliophoran was recorded for the first time in Iraq from skin and gills of *C. carpio* and gills of *H. molitrix* from ponds of Al-Furat Fish Farm, Babylon Province (Al-Zubaidy, 1998). This parasite has, so far, ten fish host species in Iraq.

Trichodina reticulata was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This parasite was recorded for the first time in Iraq from skin and gills of *Silurus triostegus* from Al-Hammar Marsh, Basrah Province (Jori, 2006). So far, five fish host species are known for *T. reticulata* in Iraq.

Trichodina strelkovi was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This ciliophoran was recorded for the first time in Iraq from gills of *P. abu* (reported as *L. abu*) from fish markets in Baghdad City (Al-Saadi, 2014). Ten fish species are so far known for this parasite in Iraq.

Trichodina sp. was detected from skin and gills of *C. carpio* from cages in the Euphrates River at Al-Mussaib District, Babylon Province (Jawdhira *et al.*, 2017). In Iraq, so far 30 *Trichodina* species are known in addition to unidentified *Trichodina* species from eight fish species (Mhaisen, 2022) which included that from skin of *C. carpio* from different fish ponds in mid Iraq (Khalifa *et al.*, 1978).

Tripartiella amurensis was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This parasite was recorded for the first time in Iraq from skin of *C. carpio* in ponds of Al-Shark Al-Awsat Fish Farm, Babylon Province (Hussain, 2005). Four fish host species are so far known for this ciliophoran in Iraq.

Phylum Cnidaria- Class Myxozoa

Myxozoans of cage fishes of Iraq included one species of *Myxobolus* in addition to two unidentified species of this genus as indicated in the following systematic scheme (GBIF, 2022):

Phylum Cnidaria
Class Myxozoa
Order Bivalvulida
Family Myxobolidae
Myxobolus pfeifferi Thélohan, 1895
Myxobolus spp. 1 and 2.

Myxobolus pfeifferi was reported from gills of *C. carpio* from cages at Al-Qurna, Al-Dayr and Abu Al-Khaseeb, Basrah Province (Eassa *et al.*, 2014). This parasite was recorded for the first time in Iraq from gills of *Acanthobrama marmid* from Tigris River in Mosul City (Fattohy, 1975). So far, *M. pfeifferi* has 35 fish host species in Iraq.

Myxobolus sp. 1: Unidentified species of *Myxobolus* was detected from skin, gills and fins of *C. carpio* from cages in the Euphrates River at Al-Mussaib District, Babylon Province (Jawdhira *et al.*, 2017). *Myxobolus* sp. 2 was ascertained from *C. carpio* from earthen ponds of the Marine Science Centre, University of Basrah (Al-Nowfal *et al.*, 2018). This parasite was referred to as whirling disease agent (usually caused by the myxozoan *M. cerebralis*) from *C. carpio* from earthen ponds of Marine Science Centre (Al-Nowfal, 2017). However, the identification of the parasite was not confirmed (Al-Nowfal, 2017; Al-Nowfal *et al.*, 2018).

According to Dr. Najim R. Khamees (personal communication), the above infected fishes were obtained from cage fishes at Al-Hartha station and not from earthen ponds of the Marine Science Centre. So far 103 *Myxobolus* species are known from fishes of Iraq in addition to some unidentified *Myxobolus* species from seven fish species (Mhaisen, 2022) which included that from gills of *C. carpio* from two fish ponds, south of Erbil (Abdullah, 2004).

Phylum Platyhelminthes- Class Trematoda

The class Trematoda of cage fishes of Iraq includes one species each of the genera *Ascocotyle* and *Diplostomum*. These trematodes are as indicated in the following systematic scheme (GBIF, 2022):

Phylum Platyhelminthes
Class Trematoda
Order Diplostomida
Family Diplostomidae
Diplostomum spathaceum (Rudolphi, 1819) Olsson, 1876
Order Plagiorchiida
Family Heterophyidae
Ascocotyle coleostoma (Looss, 1896) Looss, 1899

Ascocotyle coleostoma (as metacercaria) was reported from skin of *C. carpio* from Al-Talbe Fish cages, Babylon province (Al-Turaihi, 2018). This trematode was recorded as metacercaria for the first time in Iraq from gills of *Heteropneustes fossilis* and *P. abu* (reported as *L. abu*) from Diyala River (Ali *et al.*, 1986). *A. coleostoma* has so far 34 fish host species in Iraq.

Diplostomum spathaceum (as metacercaria) was reported as the agent of diplostomiasis in *C. carpio* from fish cages at Al-Masshab River, northeast of Al-Hammar Marsh, Basrah Province (Al-Nowfal, 2017; Al-Nowfal *et al.*, 2019). This parasite was recorded for the first time in Iraq from the eyes of *C. luteus* (reported as *B. luteus*), *Cyprinion macrostomum* and *C. carpio* from Dokan Lake (Abdullah, 1990). So far, 34 fish host species are known for *D. spathaceum* in Iraq.

Phylum Platyhelminthes- Class Monogenea

The class Monogenea of cage fishes of Iraq included one species each of genera *Diplozoon*, *Discocotyle*, *Dogielius*, *Eudiplozoon*, *Octomacrum* and *Paradiplozoon*, nine species of *Gyrodactylus* and 13 species of *Dactylogyrus* as in the following systematic scheme (GBIF, 2022):

Phylum Platyhelminthes
Class Monogenea

Order Dactylogyridea
Family Dactylogyridae
Dactylogyrus achmerowi Gusev, 1955
Dactylogyrus anchoratus (Dujardin, 1845) Wagener, 1857
Dactylogyrus arcuatus Yamaguti, 1942
Dactylogyrus dogieli Gusev, 1953
Dactylogyrus extensus Mueller &Van Cleave, 1932
Dactylogyrus gobii Gvosdev, 1950
Dactylogyrus gvosdevi Gusev, 1955
Dactylogyrus lamellatus Akhmerow, 1952
Dactylogyrus minutus Kulwiec, 1927
Dactylogyrus molnari Ergens & Dulmaa, 1969
Dactylogyrus navicularis Gusev, 1955
Dactylogyrus simplex Bychowsky, 1936
Dactylogyrus vastator Nybelin, 1924
Dogielius persicus Molnár & Jalali, 1992
Order Gyrodactylidea
Family Gyrodactylidae
Gyrodactylus baicalensis Bogolepova, 1950
Gyrodactylus cernuae Malmberg, 1957
Gyrodactylus elegans von Nordmann, 1832
Gyrodactylus gobioninum Gusev, 1955
Gyrodactylus latus Bychowsky, 1933
Gyrodactylus markewitschi Kulakovskaya, 1952
Gyrodactylus medius Kathariner, 1895
Gyrodactylus menschikowi Gvosdev, 1950
Gyrodactylus ophiocephali Gusev, 1955
Order Mazocraeidea
Family Octomacridae
Octomacrum europaeum Roman & Bychowsky, 1956
Family Diplozoidae
Diplozoon paradoxum von Nordmann, 1832
Eudiplozoon nipponicum (Goto, 1891) Khotenovsky, 1984
Paradiplozoon pavlovskii (Bychowsky & Nagibina, 1959)
Family Discocotylidae
Discocotyle sagittata (Leuckart, 1842) Diesing, 1850

Dactylogyrus achmerowi was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013), from gills of *C. carpio* from Al-Talbe Fish cages, Babylon Province (Al-Turaihi and Al-Rudainy, 2017; Al-Turaihi, 2018), skin, fins and gills of *C. carpio* from cages in the Euphrates River at Al-Mussaib District, Babylon Province (Jawdhira *et al.*, 2017), gills of *C. carpio* from groups of

fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020) and from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This monogenean was recorded for the first time in Iraq from gills of *C. carpio* from Al-Wahda Fish Hatchery at ponds of both Al-Suwaira Fish Farm and Babylon Fish Farm (Mhaisen *et al.*, 1988). Now, *D. achmerowi* has 18 fish host species in Iraq.

Dactylogyrus anchoratus was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This parasite was recorded for the first time in Iraq from gills of *C. carpio* from Tigris River during 1993 at Al-Zaafaraniya (Mhaisen *et al.*, 1997), but its full description and measurements were provided later (Mhaisen *et al.*, 2003). So far, this parasite has 13 fish host species in Iraq.

Dactylogyrus arcuatus was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013), gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020), gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019) and from skin, fins and gills of *C. carpio* from fish cages in the Euphrates River at Al-Mussaib District, Babylon Province (Hussein *et al.*, 2021). This monogenean was recorded for the first time in Iraq from skin, buccal cavity and gills of *C. carpio* from fish ponds at Al-Suwairah and Al-Latifiyah (Salih *et al.*, 1988). Nine fish host species are so far known for *D. arcuatus* in Iraq.

Dactylogyrus dogieli was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013), gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020) and from skin and gills of *C. carpio* from fish cages in the Euphrates River at Al-Mussaib District, Babylon Province (Hussein *et al.*, 2021). This parasite was recorded for the first time in Iraq from gills of five fish species: *Alburnus sellal*, *C. luteus* (reported as *B. luteus*), *C. idella*, *C. kais* and *L. xanthopterus* from the Euphrates River at Al-Musaib City (Al-Sa'adi, 2007). So far, six fish host species are known for *D. dogieli* in Iraq.

Dactylogyrus extensus was reported from gills of *C. carpio* from fish cages of Al-Habbaniyah Lake (Ali *et al.*, 1988a), gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013), gills of *C. carpio* from Al-Talbe Fish cages, Babylon Province (Al-Turaihi and Al-Rudainy, 2017; Al-Turaihi, 2018), skin, fins

and gills of *C. carpio* from cages in the Euphrates River at Al-Mussaib District, Babylon Province (Jawdhira *et al.*, 2017), gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020), gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019), gills of *C. carpio* from cages at Al-Hartha District, Basrah Province (Khamees *et al.*, 2019) and from skin, fins and gills of *C. carpio* from fish cages in the Euphrates River at Al-Mussaib District, Babylon Province (Hussein *et al.*, 2021). The first record of *D. extensus* in Iraq was from the buccal cavity and gills of *C. carpio* from ponds of both Al-Suwaira Fish Farm and Al-Latifiya Fish Farm (Salih *et al.*, 1988). *D. extensus* and its synonym *D. solidus* (GBIF, 2022) have so far 23 fish host species in Iraq.

Dactylogyrus gobii was reported from skin and gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013). This monogenean was recorded for the first time in Iraq from gills of *C. carpio* in ponds of Al-Shark Al-Awsat Fish Farm, Babylon Province (Hussain *et al.*, 2005). Three fish species are so far known as hosts for this parasite in Iraq.

Dactylogyrus gvosdevi was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This was the first record of this parasite in Iraq and no more hosts are so far known for this monogenean in Iraq.

Dactylogyrus lamellatus was reported from gills of *C. idella* from fish cages of Al-Habbaniyah Lake (Ali *et al.*, 1988a). This parasite was recorded for the first time in Iraq from skin, buccal cavity and gills of *C. idella* from fish ponds at Al-Suwairah and Al-Latifiyah (Salih *et al.*, 1988). Three fish host species are so far known for *D. lamellatus* in Iraq.

Dactylogyrus minutus was reported from skin and gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013), from gills of *C. carpio* from Al-Talbe Fish cages, Babylon Province (Al-Turaihi and Al-Rudainy, 2017; Al-Turaihi, 2018), skin, fins and gills of *C. carpio* from cages in the Euphrates River at Al-Mussaib District, Babylon Province (Jawdhira *et al.*, 2017), gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020), gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019) and from gills of *C. carpio* from fish cages in the Euphrates River at Al-Mussaib District, Babylon Province (Hussein *et al.*, 2021). This parasite was recorded for the first time in Iraq (in a conference abstract) from gills of *C. carpio* from Tigris

River at Al-Zaafaranuiya, southern Baghdad as well as from the Euphrates River at Al-Qadisia Dam Lake (Mhaisen *et al.*, 1997), but the full paper was published later on (Mhaisen *et al.*, 2003). Fifteen fish host species are so far known for *D. minutus* in Iraq.

Dactylogyrus molnari was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This monogenean was recorded for the first time in Iraq from gills of *C. carpio* from both Ainkawa Fish Hatchery and Lesser Zab River (Mama, 2012). So far, only three fish species are known as hosts for this monogenean in Iraq.

Dactylogyrus navicularis was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013). This parasite was recorded for the first time in Iraq from fins, gills and mouth cavity of *C. carpio* from ponds of Al-Furat Fish Farm, Babylon Province (Al-Zubaidy, 1998). No more host species are so far known for this monogenean in Iraq.

Dactylogyrus simplex was reported from gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020) and from fins and gills of *C. carpio* from fish cages in the Euphrates River at Al-Mussaib District, Babylon Province (Hussein *et al.*, 2021). *D. simplex* was recorded for the first time in Iraq from gills of *C. carpio* from the new fish ponds at Al-Zaafaraniya, Baghdad (Sadek, 1999). Four fish host species are so far known for *D. simplex* in Iraq.

Dactylogyrus vastator was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013), from gills of *C. carpio* from Al-Talbe Fish cages, Babylon Province (Al-Turaihi and Al-Rudainy, 2017; Al-Turaihi, 2018), skin and gills of *C. carpio* from cages in the Euphrates River at Al-Mussaib District, Babylon Province (Jawdhira *et al.*, 2017), gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020), from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019) and skin and gills of *C. carpio* from fish cages in the Euphrates River at Al-Mussaib District, Babylon Province (Hussein *et al.*, 2021). This monogenean was recorded for the first time in Iraq from skin and gills of *C. macrostomum* from Tigris River in Baghdad (Ali *et al.*, 1987b). So far, *D. vastator* has 32 fish host species in Iraq.

Diplozoon paradoxum was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013) as well as from gills of *C. carpio* from groups of fish cages at three

stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020). This parasite was recorded for the first time in Iraq from gills of *C. luteus* from Al-Husainia Creek (Al-Saadi, 2007). Five fish host species are so far known for *D. paradoxum* in Iraq.

Discocotyle sagittata was reported from gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020) and from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This monogenean was recorded for the first time in Iraq (in a conference abstract) from gills of *P. abu* (reported as *L. abu*) from Euphrates River at Al-Qadisia Dam Lake as well as from drainage network at Al-Madaen, south Baghdad (Mhaisen *et al.*, 1997), but the full paper was published later on (Mhaisen *et al.*, 2003). Three host species are so far known for *D. sagittata* in Iraq.

Dogielius persicus was reported from gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020). This parasite was recorded for the first time in Iraq from gills of *C. luteus* (reported as *B. luteus*) from Greater Zab River (Abdullah, 2002). *D. persicus* has so far eight fish host species in Iraq.

Eudiplozoon nipponicum was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013) and from gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al.*, 2020). This monogenean was recorded for the first time in Iraq, as *Diplozoon nipponicum* Goto, 1891, from gills of *C. carpio* from a manmade lake near Baghdad City (Al-Nasiri, 2003). *E. nipponicum* and its synonym *D. nipponicum* (GBIF, 2022) have so far four fish host species in Iraq.

Gyrodactylus baicalensis was reported from skin, buccal cavity and gills of *C. carpio* from fish cages of Al-Habbaniyah Lake (Ali *et al.*, 1988a). This parasite was recorded for the first time in Iraq from skin, buccal cavity and gills of *C. carpio* from ponds of both Al-Suwaira Fish Farm and Al-Latifiya Fish Farm (Salih *et al.*, 1988). So far, *G. baicalensis* has 12 fish host species in Iraq.

Gyrodactylus cernuae was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This monogenean was recorded for the first time in Iraq from gills of both *C. macrostomum* and *M. sharpeyi* from Diyala River in Diyala Province (Mohammed, 2017). So far, only four fish host species are known for *G. cernuae* in Iraq.

Gyrodactylus elegans was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013), from skin and gills of *C. carpio* from Al-Talbe Fish cages, Babylon Province (Al-Turaihi and Al-Rudainy, 2017; Al-Turaihi, 2018) and from gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al*., 2020). *G. elegans* was recorded for the first time in Iraq from both *C. carpio* and *P. abu* (reported as *L. abu*) from ponds of both Al-Zaafaraniya Fish Farm and Al-Latifiya Fish Farm (Ali and Shaaban, 1984). *G. elegans* has so far 23 fish host species in Iraq.

Gyrodactylus gobioninum was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This parasite was recorded for the first time in Iraq from skin of *C. carpio* from Lesser Zab River (Mama, 2012). No more hosts are so far known for this parasite in Iraq.

Gyrodactylus latus was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019; Al-Salami and Al-Saadi, 2019). As mentioned above, *G. latus* was recorded for the first time in Iraq from gills of *C. carpio* (Al-Salami, 2019). So far, two host species are known for this parasite in Iraq.

Gyrodactylus markevitschi was reported from gills of *C. carpio* from groups of fish cages at three stations on the sides of Euphrates River at Dhi Qar (misspelled as TheQuar) Province (Al-Sahlany, 2019; Al-Sahlany *et al*., 2020). This monogenean was recorded for the first time in Iraq from gills of *Capoeta trutta* (Abdul-Ameer, 1989). Twelve host fish species are so far known for this parasite in Iraq.

Gyrodactylus medius was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). *G. medius* was recorded for the first time in Iraq from skin and fins of *C. carpio* from ponds of Al-Furat Fish Farm, Babylon Province (Al-Zubaidy, 1998). Five fish host species are so far known for *G. medius* in Iraq.

Gyrodactylus menschikowi was reported from gills of *C. carpio* from floating cages in Saddat Al-Hindia District, Babylon Province (Al-Taei, 2013). This parasite was recorded for the first time in Iraq from gills and skin of *C. carpio* and skin, fins and gills of *P. abu* (reported as *L. abu*) from Hilla River (Al-Zubaidy, 2007). Four host species are so far known for *G. menschikowi* in Iraq.

Gyrodactylus ophiocephali was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This was its first record in Iraq. No more hosts are so far

known for *G. ophiocephali* in Iraq.

Octomacrum europaeum was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). *O. europaeum* was recorded for the first time in Iraq from gills of *C. kais*, *C. macrostomum* and *Garra rufa* from the Euphrates River at Al-Musaib City (Al-Sa'adi, 2007). Four host species are so far known for *O. europaeum* in Iraq.

Paradiplozoon pavlovskii was reported from gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This parasite was recorded for the first time in Iraq from gills of *Leuciscus vorax* (reported as *Aspius vorax*) from Mehaijeran Creek, a side branch of Shatt Al-Arab River, Basrah Province (Khamees, 1983), under its synonymous name, *Diplozoon pavlovskii*. So far, *P. pavlovskii* and its synonym *D. pavlovskii* (GBIF, 2022) have 15 fish host species in Iraq.

Phylum Platyhelminthes- Class Cestoda

The class Cestoda of cage fishes of Iraq included one species each of genera *Glanitaenia*, *Ligula*, *Neogryporhynchus*, *Schyzocotyle* and *Valipora*. These cestodes are indicated in the following systematic scheme (GBIF, 2022). However, for the full authority of both *Valipora campylancristrota* and *Neogryporhynchus cheilancristrota*, Global Cestode Database (2022) was followed.

Phylum Platyhelminthes
- Class Cestoda
  - Order Bothriocephalidea
    - Family Bothriocephalidae
      - *Schyzocotyle acheilognathi* (Yamaguti, 1934) Brabec, Waeschenbach, Scholz, Littlewood & Kuchta, 2015
  - Order Cyclophyllidea
    - Family Dipylidiidae
      - *Valipora campylancristrota* (Wedl, 1855) Baer & Bona, 1960
    - Family Gryporhynchidae
      - *Neogryporhynchus cheilancristrotus* (Wedl, 1855) Baer & Bona, 1960
  - Order Diphyllobothriidea
    - Family Diphyllobothriidae
      - *Ligula intestinalis* (Linnaeus, 1758) Gmelin, 1790
  - Order Onchoproteocephalidea
    - Family Proteocephalidae
      - *Glanitaenia osculata* (Goeze, 1782) de Chambrier, Zehnder, Vaucher & Mariaux, 2004

Glanitaenia osculata was reported, by its synonym *Proteocephalus osculatus*, from the intestine of *C. carpio* from cages in the Euphrates River at Mussaib District, Babylon Province (Hussain, 2019). This cestode was recorded for the first time in Iraq by its synonymous name *Proteocephalus osculatus* (GBIF, 2022) from the alimentary canal of *L. vorax* (reported as *A. vorax*) from Al-Tharthar Lake (Al-Saadi, 1986). So far ten fish host species are known for *G. osculata* and its synonym *P. osculatus* in Iraq.

Ligula intestinalis (as plerocercoid) was reported from abdominal cavity of *C. idella* from cages of Al-Habbaniyah Lake (Ali *et al.*, 1988a) and from *C. carpio* from some floating cages in Babylon Province (Al-Jubouri *et al.*, 2017). This cestode larva was recorded for the first time in Iraq from the body cavity of *L. vorax* (reported as *A. vorax*) from Shatt Al-Arab River (Al-Hasani, 1985). Sixteen fish host species are so far known for *L. intestinalis* in Iraq.

Neogryporhynchus cheilancristrotus (as plerocercoids) was reported, by its synonymous name *Gryporhynchus cheilancristrotus* (GBIF, 2022) from the intestine of *C. carpio* from cages in the Euphrates River at Mussaib District, Babylon Province (Hussain, 2019). It is appropriate to indicate here that the same researcher (Hussain, 2019) also reported a cestode from the intestine of *C. carpio* which he named as *G. ligula*. However, there is no such a name in the literature (GBIF, 2022). This cestode was firstly recorded from Iraq as *G. cheilancristrotus* Wedl, 1855 from the intestine of *P. abu* (reported as *L. abu*) from Diyala River (Ali *et al.*, 1987a). Five host species are so far known for *N. cheilancristrotus* and its synonym *G. cheilancristrotus* in Iraq.

Schyzocotyle acheilognathi was reported as *Bothriocephalus acheilognathi* from intestine of *C. carpio* from cages of Al-Habbaniyah Lake (Ali *et al.*, 1988a). Also, this worm was reported by its other synonym (*B. opsariichthydis*) from the intestine of *C. carpio* from cages in the Euphrates River at Mussaib District, Babylon Province (Hussain, 2019). This cestode was recorded for the first time in Iraq as *B. acheilognathi* from the intestine of *C. carpio* from some fish ponds near Baghdad (Khalifa, 1982). *B. acheilognathi* is considered as a synonym of *S. acheilognathi* (GBIF, 2022). Earlier, both *B. gowkongensis* and *B. opsariichthydis* were considered as synonyms of *B. acheilognathi* (Kuchta and Scholz, 2007). Twenty fish host species in Iraq are so far known for *S. acheilognathi* and three of its synonyms: *B. acheilognathi*, *B. gowkongensis* and *B. opsariichthydis*.

Valipora campylancristrota (as plerocercus) was reported from gallbladder of *C. carpio* at cages of Al-Habbaniyah Lake (Ali *et al.*, 1988a). This cestode larva was recorded for the first time in Iraq from the gallbladder of *Mystus halepensis* (a synonym of *M. pelusius*) from Tigris

River in Baghdad and Al-Rashidiya (Ali *et al.*, 1987c). Five fish host species are so far known for this cestode in Iraq.

Phylum Nematoda

The phylum Nematoda of cage fishes of Iraq included only unspecified species of *Contracaecum* as indicated in the following systematic scheme (GBIF, 2022):

Phylum Nematoda
Class Chromadorea
Order Rhabditida
Family Anisakidae
Contracaecum sp. larva

Contracaecum sp.: The third stage larvae of *Contracaecum* sp. were reported from the body cavity of *C. carpio* from some floating cages at Babylon Province (Al-Jubouri *et al.*, 2017). *Contracaecum* species larvae were recorded for the first time in Iraq from ten fish species from different inland waters of Iraq (Herzog, 1969). Recent literature review concerning the occurrence of the nematode larval forms of the genus *Contracaecum* in fishes of Iraq showed the infection of 44 freshwater and marine fish species with such larvae (Mhaisen and Abdul-Ameer, 2021b). However, if the records of both *C. rudolphii* and *C. septentrionale* are excluded, then the remaining unidentified *Contracaecum* species larvae in Iraq has so far 41 fish host species.

Phylum Acanthocephala

The phylum Acanthocephala of cage fishes of Iraq included one species of *Neoechinorhynchus* as indicated in the following systematic scheme (GBIF, 2022):

Phylum Acanthocephala
Class Eoacanthocephala
Order Neoechinocephalida
Family Neoechinocephalidae
Neoechinorhynchus iraqensis Amin, Al-Sady, Mhaisen & Bassat, 2001

Neoechinorhynchus iraqensis was reported from the intestine of *C. carpio* from cages in the Euphrates River at Mussaib District, Babylon Province (Hussain, 2019). The same author had also showed that he found *N. agilis* in *C. carpio* of the same cages. It is appropriate to mention here that *N. agilis* was recorded for the first time in Iraq from intestine of *Mugil hishni* (a synonym of *P. abu*) from Shatt Al-Arab River

(Habash and Daoud, 1979) and then from some other freshwater fishes of Iraq, but after the nomination of *N. iraqensis* (Amin *et al.*, 2001), all the records of *N. agilis* from fishes of Iraq were considered as misidentifications of *N. agilis* and in fact were *N. iraqensis* (Mhaisen, 2002). *N. iraqensis* and *N. agilis* (GBIF, 2022) have so far 24 fish host species in Iraq.

Phylum Arthropoda- Subphylum Crustacea

The subphylum Crustacea of the phylum Arthropoda is represented in cage fishes of Iraq with one species each of the genera *Ergasilus* and *Lernaea* as indicated in the following systematic scheme (GBIF, 2022):

Phylum Arthropoda
Subphylum Crustacea
Class Hexanauplia
Order Cyclopoida
Family Ergasilidae
Ergasilus sieboldi Nordmann, 1832
Family Lernaeidae
Lernaea cyprinacea Linnaeus, 1758

Ergasilus sieboldi was reported from gills of *C. idella*, skin, buccal cavity and gills of *C. carpio* and gills of *H. molitrix* from fish cages at Al-Habbaniyah Lake (Ali *et al.*, 1988a). This crustacean was recorded for the first time in Iraq from gills of *L. vorax* (reported as *A. vorax*) from Al-Habbaniyah Lake (Herzog, 1969). *E. sieboldi* has so far 26 fish host species in Iraq.

Lernaea cyprinacea was reported from skin and gills of *C. carpio* from fish cages at Al-Habbaniyah Lake (Ali *et al.*, 1988a), skin of *C. carpio* from cages at Al-Qurna, Al-Dayr and Abu Al-Khaseeb, Basrah Province (Eassa *et al.*, 2014), skin of *C. carpio* from Al-Talbe Fish cages, Babylon Province (Al-Turaihi, 2018) and from skin and gills of *C. carpio* from fish cages in Al-Abbasiyah District, Al-Najaf Al-Ashraf Province (Al-Salami, 2019). This crustacean was recorded for the first time in Iraq from seven fish species: *A. grypus* (as *B. grypus*), *C. luteus* (as *B. luteus*), *Carassius auratus*, *C. idella*, *C. carpio*, *H. molitrix* and *L. xanthopterus* (as *B. xanthopterus*) from Al-Zaafaraniya fish culture station, Baghdad (Al-Hamed and Hermiz, 1973). Recent literature review concerning the occurrence of adult and larval forms of the genus *Lernaea*, infecting fishes of Iraq, showed the infection of 31 freshwater and marine fish species with such crustaceans (Mhaisen and Abdul-Ameer, 2021a). Among these lernaeid copepods, adult *L. cyprinacea* has so far 31 fish host species in Iraq.

It is appropriate to give here one final note concerning the subtitle

Parasite-Host List. The following ciliophoran species: *Balantidium barbi*, *Trichodina gracilis*, *T. strelkovi* and *Tripartiella amurensis* as well as the myxozoan *Myxobolus pfeifferi*, were not included in the list of scientific names by GBIF (2022). However, all the genera and higher ranks of these parasites are included in GBIF (2022).

Host-Parasite List

The following list is derived from the previous parasite-host list. Infected fishes are alphabetically listed. Their parasites are grouped in accordance with their sequence in the previous subtitle of Major Groups of Parasites and Their Fish Hosts. Names of parasites of these fishes, within each major parasite groups, are here alphabetically listed.

The grass carp *Ctenopharyngodon idella*:
Ciliophora: *Apiosoma piscicola* and *Chilodonella cyprini*.
Cestoda: *Ligula intestinalis*.
Crustacea: *Ergasilus sieboldi*.

The common carp *Cyprinus carpio*:
Ciliophora: *Apiosoma amoebae*, *A. campanulatum*, *A. piscicola*, *Balantidium barbi*, *Chilodonella cyprini*, *Ichthyophthirius multifiliis*, *Trichodina cottidarum*, *T. domerguei*, *T. elegeni*, *T. gracilis*, *T. nigra*, *T. reticulata*, *T. strelkovi*, *Trichodina* sp. and *Tripartiella amurensis*.
Myxozoa: *Myxobolus pfeifferi*, *Myxobolus* sp. 1 and *Myxobolus* sp. 2.
Trematoda: *Ascocotyle coleostoma* and *Diplostomum spathaceum*.
Monogenea: *Dactylogyrus achmerowi*, *D. anchoratus*, *D. arcuatus*, *D. dogieli*, *D. extensus*, *D. gobii*, *D. gvosdevi*, *D. lamellatus*, *D. minutus*, *D. molnari*, *D. navicularis*, *D. simplex*, *D. vastator*, *Diplozoon paradoxum*, *Discocotyle sagittata*, *Dogielius persicus*, *Eudiplozoon nipponicum*, *Gyrodactylus baicalensis*, *G. cernuae*, *G. elegans*, *G. gobioninum*, *G. latus*, *G. markevitschi*, *G. medius*, *G. menschikowi*, *G. ophiocephali*, *Octomacrum europaeum* and *Paradiplozoon pavlovskii*.
Cestoda: *Glanitaenia osculata*, *Ligula intestinalis*, *Neogryporhynchus cheilancristrotus*, *Schyzocotyle acheilognathi* and *Valipora campylancristrota*.
Nematoda: *Contracaecum* sp.
Acanthocephala: *Neoechinorhynchus iraqensis*.
Crustacea: *Ergasilus sieboldi* and *Lernaea cyprinacea*.

The silver carp *Hypophthalmichthys molitrix*:
Crustacea: *Ergasilus sieboldi*.

It is obvious from the above host-parasite list that *C. carpio* was infected with the highest number (57) of parasite species, followed by *C. idella* (four species) and *H. molitris* (one species). This variance in number of parasite species is attributed to the fact that all the surveyed literature on the parasitic fauna of cage fishes in Iraq (18 references) covered *C. carpio* (Ali *et al.*, 1988a; Al-Taei, 2013; Eassa *et al.*, 2014; Al-Jubouri *et al.*, 2017; Al-Nowfal, 2017; Al-Turaihi and Al-Rudainy, 2017; Jawdhira *et al.*, 2017; Al-Nowfal *et al.*, 2018; Al-Turaihi, 2018; Hussein, 2018; Al-Nowfal *et al.*, 2019; Al-Sahlany, 2019; Al-Salami, 2019; Al-Salami and Al-Saadi, 2019; Hussain, 2019; Khamees *et al.*, 2019; Al-Sahlany *et al.*, 2020; Hussein *et al.*, 2021), while only one reference covered both *C. idella* and *H. molitrix* (Ali *et al.*, 1988a).

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قوائم مرجعية لطفيليات أسماك الكارب في الأقفاص العائمة في العراق

فرحان ضمد محيسن

بناية 6 ب، كاترينا هولم 36 641، السويد

e-mail: mhaisenft@yahoo.co.uk

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المستخلص

أظهر العرض المرجعي للمصادر المتعلقة بالمجموعة الحيوانية المتطفلة على أسماك الأقفاص العائمة في العراق حتى نهاية العام 2021 بأن ما مجموعه 57 نوعا طفيليا معروفا لحد الآن من ثلاثة أنواع من الأسماك المفحوصة بحثا عن إصاباتها الطفيلية في عموم القطر. شملت المجموعة الحيوانية المتطفلة 15 نوعا من حاملات الأهداب، ثلاثة أنواع من البوغيات المخاطية، نوعين من المخرّمات، 28 نوعا من أحادية المنشأ، خمسة أنواع من الديدان الشريطية، نوعا واحدا من الديدان الخيطية، نوعا واحدا من الديدان شوكية الرأس ونوعين من القشريات. كانت أسماك الكارب الإعتيادي مصابة بكل هذه الأنواع السبعة والخمسين من الطفيليات، الكارب العشبي مصابا بأربعة أنواع من الطفيليات والكارب الفضي مصابا بنوع واحد فقط من تلك الطفيليات.

الكلمات المفتاحية :طفيليات، أقفاص عائمة، كارب إعتيادي، كارب عشبي، كارب فضي، العراق.