Review Article

Checklists of Parasites of Farm Fishes of Babylon Province, Iraq

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Literature reviews of all references concerning the parasitic fauna of fishes in fish farms of Babylon province, middle of Iraq, showed that a total of 92 valid parasite species are so far known from the common carp (Cyprinus carpio), the grass carp (Ctenopharyngodon idella), and the silver carp (Hypophthalmichthys molitrix) as well as from three freshwater fish species (Carassius auratus, Liza abu, and Heteropneustes fossilis) which were found in some fish farms of the same province. The parasitic fauna included one mastigophoran, three apicomplexans, 13 ciliophorans, five myxozoans, five trematodes, 45 monogeneans, five cestodes, three nematodes, two acanthocephalans, nine arthropods, and one mollusc. The common carp was found to harbour 81 species of parasites, the grass carp 30 species, the silver carp 28 species, L. abu 13 species, C. auratus one species, and H. fossilis one species. A host-parasite list for each fish species was also provided.

1. Introduction

Although fish farming in Iraq started in 1955 with a small pond in Al-Zaafaraniya, south of Baghdad city [1], an advance was achieved in fish farming industry in Iraq during the seventies and early eighties of the last century when many fish farms were established especially in the middle of Iraq [2]. However, such achievement was hindered due to consequences of the war situations during 1980–1988 and 1991 as well as the economic sanction imposed by the UN against Iraq on August 6, 1990. During the last few years, a great advance was achieved in fish farming in general and fish cages in particular due to the increasing demand on fish protein as well as the increasing investment in fish-culture industry in most provinces of Iraq. According to the statistics, a total of 441 working fish farms are scattered in Iraq [3]. Of these farms, a total of 72 working fish farms are situated in Babylon province alone with a water area of 44.5% of the total water area of fish farms in Iraq.

Under extensive fish culture and inadequate administrative and control measures, fish farms are vulnerable to great hazards due to the infection with parasites and other disease agents [2, 4, 5]. Many parasite species can easily spread among fishes suffering from crowd and bad managements, especially those parasites with direct life cycles [6].

In connection with the parasites of cultured fishes of Babylon province, Mhaisen et al. [7] surveyed the literature on the parasitic fauna of fishes of Al-Furat Fish Farm (previously known as Babylon Fish Farm), which is the biggest fish farm in Babylon province, and showed that the parasitic fauna of fishes of that farm included 60 valid parasite species (10 protozoans, three myxozoans, one trematode, 29 monogeneans, five cestodes, three nematodes, two acanthocephalans, six crustaceans, and one mollusc larva). In addition, some investigations on other fish farms in Babylon province were done. Such data are scattered in different local journals, unpublished theses, and few other sources. Therefore, the present paper was aimed at gathering data from the literature concerning all fish farms of Babylon province and providing a list of parasite species according to their major groups as well as a host-parasite list for cultured fishes of these farms and some other fish species found in such farms. Such parasite list will help owners of fish farms and fish veterinarians to know what sort of parasites are found in their fish farms, which will help them later in taking appropriate measures for their control.
2. Sources and Methods

A total of 50 references (33 published articles, 12 unpublished theses, two unpublished reports, one book, one conference abstract, and one review article) dealing with the parasites of farm fishes of Babylon province were used to prepare the present paper. Data from such references was gathered to provide host-parasite and parasite-host lists. The systematic account of these parasites is based on some electronic sites [8–12] as well as some taxonomic references [13–16].

The index-catalogue of parasites and disease agents of fishes of Iraq [17] was used to indicate the total number of fish hosts harbouring each parasite species in the whole waters of Iraq.

3. Parasitological Investigations Achieved on Fish Farms of Babylon Province

Few fish farms in Babylon province were surveyed for some parasitic infections. Fishes from Al-Furat Fish Farm received the greatest attention in this respect. So far 25 chronologically arranged references [18–42] were concerned with the parasitic fauna of Al-Furat Fish Farm. Only seven references [43–49] were concerned with the parasitic fauna of Al-Shark Al-Awsat Fish Farm. The literature concerned with fish parasites of other farms in Babylon province included those from Al-Latifiya Fish Farm [6, 50–52]; Al-Bajaa Fish Farm [26]; Abdul-Razzak Al-Janabi Fish Farm; Fawzi Al-Janabi Fish Farm and Ali Al-Hayali Fish Farm [53]; three fish farms at Al-Iskandariya district: Abdul-Hadi Al-Matloob Fish Farm, Hussain Al-Gaiem Fish Farm, and Maki Chinak Fish Farm [54]; Technical Institute of Al-Musaib Fish Farm [55]; and Al-Manahil (Al-Bilad) Fish Farm at Al-Iskandariya district [56]. In addition, surveys were done from some unnamed fish ponds such as those at Al-Mahaweel district [57], Al-Musaib district [58], Al-Iskandariya district [59], and Sadat Al-Hindiya district [60] as well as some other unnamed farms in the province [61–65].

4. Results and Discussion

Surveysing the literature concerning the parasites so far recorded from fish farms of Babylon province showed the presence of 92 parasite species. These parasites included one mastigophoran, three apicomplexans, 13 ciliophorans, five myxozoans, five trematodes, 45 monogeneans, five cestodes, three nematodes, two acanthocephalans, nine arthropods, and one mollusc. The common carp was found to harbour 81 species of parasites, the grass carp 30 species, the silver carp 28 species, L. abu 13 species, C. auratus one species, and H. fossilis one species. The layout and names of the major taxonomic groups (phyla and classes) followed a checklist of an FAO Fisheries Technical Paper [66]. These major groups represent the concerned phyla of the parasites, but due to the great numbers of parasite species of the phylum Platyhelminthes, its three classes (Trematoda, Monogenea, and Cestoda) were applied in addition to their phylum.

5. Major Groups of Parasitic Fauna: Parasite-Host List

The parasite-host list is arranged in the major groups (phyla or classes) of parasitic fauna according to Kirjusina and Vismans [66]. For each major group, a list of species together with their hosts and concerned references is given. To economize space, names of fish farms are not given here as they can be easily detected from the previous subtitle “Parasitological Investigations Achieved on Fish Farms of Babylon Province.” Also the systematic account of all major groups is given down to the specific name of all parasites. For each parasite species, all records in farm fishes in Babylon province are given together with the first record of each concerned parasite in Iraq as well as the present number of all hosts so far known in Iraq for each concerned species based on the index-catalogue of parasites and disease agents of fishes of Iraq [17].

5.1. Phylum Mastigophora. The phylum Mastigophora is represented in farm fishes of Babylon province with only one parasite species of the genus Ichthyobodo. The systematic account of this parasite, followed by parasite-host list, is given here.

Phylum Mastigophora

Class Kinetoplastidea

Order Kinetoplastida

Family Bodoniidae

Ichthyobodo necator (Henneguy, 1884) Pinto, 1928

Ichthyobodo necator (Henneguy, 1884) Pinto, 1928, was erroneously reported as Costia necatrix from the skin and gills of C. carpio [27]. The first record of C. necatrix in Iraq was from body surface of H. fossilis from Al-Ashar Canal at Basrah [67]. Seven fish host species are so far known for this parasite (as C. necatrix) in Iraq [17].

5.2. Phylum Apicomplexa. The phylum Apicomplexa, which is known as phylum Myzozoa according to WoRMS [12], is represented in farm fishes of Babylon province with three species; two of them belonged to the genus Eimeria and one unspecified species to the genus Haemogregarina.

Phylum Apicomplexa

Class Sporozoa

Order Eucoccidioida

Family Eimeriidae

Eimeria dogieli (Dogiel, 1948) Pellerdy, 1963

Eimeria mylopharyngodoni Chen, 1956

Family Haemogregarinidae

Haemogregarina sp.
Eimeria dogielii (Dogiel, 1948) Pellerdy, 1963, was recorded from the intestine of C. carpio [27]. So far, this is the only record of E. dogielii from fishes of Iraq [17].

Eimeria mylopharyngodoni Chen, 1956, was recorded from C. carpio [49]. The specific name was misspelled as mylopharyngodon and no authority, site of infection, parasite description, and illustration were given for this parasite by Hussain et al. [49]. So this record is considered as questionable especially if we take in consideration that Hussain et al. [49]. So this record is considered as questionable.

Haemogregarina sp. was found on gills of C. carpio [49]. The specific name was misspelled as mylopharyngodoni is known to infect intestine, kidneys, and liver of fishes [68]. This is the only record of E. mylopharyngodoni from fishes of Iraq [17].

In Iraq, three species of Haemogregarina were so far recorded from blood of three fish species in Basrah province only [17]. So we think that the record of Haemogregarina sp. from gills of C. carpio by Hussain et al. [49] with neither description nor a good illustration is considered as questionable.

5.3. Phylum Ciliophora. The phylum Ciliophora is represented in farm fishes of Babylon province with 13 species, three of which belonged to the genera Chilodonella, Ichthyophthirius, and Tripartiella, five to the genus Apiosoma, and four to the genus Trichodina in addition to unspecified species of the genus Trichodina.

Phylum Ciliophora

Class Kinetophragminophorea

Order Cyrtophorida

Family Chilodonellidae

Chilodonella cyprini (Moroff, 1902) Strand, 1928

Class Oligohymenophorea

Order Hymenostomatida

Family Ichthyophthiriidae

Ichthyophthirius multifiliis Fouquet, 1876

Order Petrichida

Family Epistyliidae

Apiosoma amoebae (Grenfell, 1887) Lom, 1966

Apiosoma cylindriformis (Chen, 1955) Lom, 1966

Apiosoma minuta (Chen, 1961) Lom, 1966

Apiosoma piscicola Blanchard, 1885

Apiosoma poteriformis (Timofeev, 1962) Lom, 1966

Order Mobilida

Family Trichodinidae

Trichodina cottidarum Dogiel, 1948

Trichodina domerguei (Wallengren, 1897)

Trichodina gracilis Polyanskii, 1955

Trichodina nigra Lom, 1960

Trichodina sp.

Tripartiella amurenensis (Chan, 1961)

Chilodonella cyprini (Moroff, 1902) Strand, 1928, was recorded from skin, buccal cavity, and gills of C. idella [27, 29, 43, 51], skin, fins, buccal cavity, and gills of C. carpio [27, 30, 43, 51, 53], and skin and gills of H. molitrix [27, 43, 51]. The first record of C. cyprini in Iraq was from skin, buccal cavity, and gills of Mystus pelius from Tigris River at Baghdad [69]. So far, 13 fish host species are known for this parasite in Iraq [17].

Ichthyophthirius multifiliis Fouquet, 1876, was recorded from skin and gills of C. idella [27, 29, 43, 51, 56], skin, fins, and gills of C. carpio [25, 27, 29, 30, 35, 43, 45, 47, 49, 51, 53–56, 59, 60, 65], and skin and gills of H. molitrix [27, 29, 45, 47, 51]. The first record of I. multifiliis in Iraq was from the skin and gills of Chelon subviridis (reported as Mugil dussumieri) from Tigris River near Baghdad [70]. So far, this parasite has 35 fish host species in Iraq [17].

Apiosoma amoebae (Grenfell, 1887) Lom, 1966, was reported from skin, buccal cavity, and gills of C. idella [20, 24, 27], skin and buccal cavity of C. carpio [27, 55], and gills and buccal cavity of H. molitrix [20, 27]. It is appropriate to mention here that A. amoebae was reported as Glossatella amoebae [27, 55]. The first record of A. amoebae in Iraq was from the skin, buccal cavity, and gills of C. idella from Babylon Fish Farm [20]. So far, this parasite has five fish host species in Iraq [17].

Apiosoma cylindriformis (Chen, 1955) was reported from gills of C. idella [20, 24, 27], buccal cavity and gills of C. carpio [27], and gills of H. molitrix [20, 21, 27]. Al-Zubaidy [27] reported A. cylindriformis as Glossatella cylindriformis. The first record of A. cylindriformis in Iraq was from gills of C. idella and H. molitrix from Babylon Fish Farm [20]. So far, A. cylindriformis has seven fish host species in Iraq [17].

Apiosoma minuta (Chen, 1961) Lom, 1966, was recorded from skin of C. carpio [45, 47]. This was its first record in Iraq. So far, A. minuta has two fish host species in Iraq as it was recently recorded from Luciobarbus xanthopterus by Al-Salmony [71].

Apiosoma piscicola Blanchard, 1885, was recorded from skin, buccal cavity, and gills of C. idella [27, 51], skin, buccal cavity, and gills of C. carpio [27, 29, 51, 55], and buccal cavity and gills of H. molitrix [20, 21, 27, 29, 51]. It is appropriate to mention here that A. piscicola was reported as Glossatella piscicola [27]. A. piscicola was recorded for the first time in Iraq from skin, buccal cavity, and gills of C. idella, C. carpio and H. molitrix from Al-Suwaiera and Al-Latifiya Fish Farms [51]. So far, this parasite has ten fish host species in Iraq [17].

Apiosoma poteriformis (Timofeev, 1962) Lom, 1966, was recorded from skin and gills of C. idella [20, 24, 27] and buccal cavity and gills of C. carpio [27]. It is appropriate to mention here that A. poteriformis was reported as Glossatella poteriformis by Al-Zubaidy [27]. A. poteriformis was recorded for the first time in Iraq from gills of C. idella from Babylon Fish Farm [20]. So far, this parasite has three fish host species in Iraq [17].
Trichodina cottidarum Dogiel, 1948, was recorded from skin and gills of C. carpio [45, 47, 49, 54, 59, 60] and skin and gills of H. molitrix [45, 47]. T. cottidarum was recorded for the first time in Iraq from gills of C. carpio from a manmade lake at Baghdad city [72]. So far, this parasite has 13 fish host species in Iraq [17].

Trichodina domerguei (Wallengren, 1897) was recorded from skin, fins, buccal cavity, and gills of C. idella [24, 27, 29, 43, 51, 56], skin, fins, buccal cavity, and gills of C. carpio [25, 27, 29, 30, 35, 43, 51, 53, 55, 56, 59], skin, buccal cavity, and gills of H. molitrix [20, 27, 51], and skin and gills of L. abu [23, 56]. The first record of T. domerguei in Iraq was from skin, fins, and gills of eight freshwater fish species from Tigris River, Al-Tharthar Lake, and fish markets in Baghdad city [73]. So far, T. domerguei has 39 host species in Iraq [17] and, therefore, it is the most prevalent ciliate species among fishes of Iraq.

Trichodina gracilis Polyanskii, 1955, was recorded from skin of C. carpio [45, 47]. This was its first record in Iraq. So far, it has three fish host species in Iraq [17].

Trichodina nigra Lom, 1960, was recorded from skin and gills of the three carp species: C. idella [29], C. carpio [27, 29, 35, 49, 55, 59, 60], and H. molitrix [27, 29]. The first record of T. nigra in Iraq was from skin and gills of C. carpio and gills of H. molitrix from Babylon Fish Farm [27]. So far, T. nigra has nine host species in Iraq [17].

Unidentified specimen of Trichodina was recorded from L. abu [50] with no mention to site of infection. In addition to 24 recognized Trichodina species so far recorded from fishes of Iraq, some unidentified species of Trichodina were so far recorded from six fish species [17].

Tripartiella amurensis (Chan, 1961) was recorded from skin of C. carpio [45, 47]. This was its first record in Iraq. No more records are so far known for T. amurensis in Iraq [17].

5.4. Phylum Myxozoa. The phylum Myxozoa is represented in farm fishes of Babylon province with five species; two species belonged to the genera Apharyngostrigea and Ascocotyle and three species to the genus Myxobilatus.

Phylum Myxozoa
Class Myxosporea
Order Bivalvulida
Family Sphaerosporidae
Myxobilatus legeri (Cépedé, 1905)
Myxobilatus pfeifferi Thélohan, 1895
Myxobilatus dogieli Bykhovskaya-Pavlovskaya & Bykhovski, 1940
Myxobilatus muelleri Bütschli, 1882
Myxobilatus oviformis Thélohan, 1892

Myxobilatus legeri (Cépedé, 1905), erroneously reported as Myxobilatus legeri, with no given authority, description, and illustration, was recorded from skin and gills of C. carpio [54]. This was the only record of M. legeri in Iraq [17].

Myxobilatus dogieli Bykhovskaya-Pavlovskaya & Bykhovski, 1940, was recorded from kidneys and gallbladder of L. abu [56]. The first record of M. dogieli in Iraq was mainly from the external surface of heart, liver, and ovariies of L. abu from Tigris River at Baiji town [74]. So far, M. dogieli has nine host species in Iraq [17].

Myxobilatus muelleri Bütschli, 1882, was recorded from intestine and liver of C. carpio [27] with the specific name spelled as mülleri. The first record of M. muelleri in Iraq was from gills of Luciobarbus xanthopterus, reported as B. xanthopterus [70]. So far, M. muelleri has eight host species in Iraq [17].

Myxobilatus oviformis Thélohan, 1892, was recorded from skin, intestine, and kidneys of C. carpio [27, 54, 59]. The first report of M. oviformis in Iraq was from gill arches and heart of four fish species [70]. So far, M. oviformis has 20 fish host species in Iraq [17].

Myxobilatus pfeifferi Thélohan, 1895, was recorded from gills, intestine, liver, kidneys, and gallbladder of C. idella [29], gills, gallbladder, intestine, kidneys, and liver of C. carpio [25, 27, 29, 53, 59], gills, liver, and intestine of H. molitrix [27, 29], and gills, intestinal wall, and gonads of L. abu [23]. The first report of M. pfeifferi in Iraq was from gills of Acanthobrama marmid from Tigris River at Mosul city [75]. So far, M. pfeifferi is the prevalent myxozoan among fishes of Iraq as it has 35 fish host species [17].

5.5. Phylum Platyhelminthes: Class Trematoda. The class Trematoda of the phylum Platyhelminthes is represented in farm fishes of Babylon province with five species; two species belonged to the genera Apharyngostrigea and Ascocotyle and three species to the genus Diplostomum.

Phylum Platyhelminthes
Class Trematoda

Order Diplostomida

Family Strigeidae
Apharyngostrigea cornu (Zeder, 1800)

Family Diplostomidae
Diplostomum indistinctum (Guberlet, 1923)
Diplostomum paraspathaceum Schigin, 1965
Diplostomum spathaceum (Rudolphi, 1819)

Family Plagiocotylidae
Ascocotyle coleostoma (Looss, 1896)

Apharyngostrigea cornu (Zeder, 1800) was recorded as metacercaria from mesentery, coelom and liver of C. carpio [52]. This was its first report in Iraq. No more records are so far known on the occurrence of A. cornu from fishes of Iraq [17]. The adult worm of this parasite was detected from the
intestine of the purple heron *Ardea purpurea* in Bahr Al-Najaf Depression [76].

*Ascocotyle coleostoma* (Looss, 1896) Looss, 1899, was recorded as metacercaria from gills of *H. fossilis* [56]. This parasite was reported for the first time in Iraq from gills of *H. fossilis* and *L. abu* from Diyala River [77]. *A. coleostoma* has so far 34 fish host species in Iraq [17]. The adult worm of *A. coleostoma* was detected from the grey heron *A. cinerea* in Babylon (now Al-Furat) Fish Farm [78].

*Diplostomum indistinctum* (Guberlet, 1923) Hughes, 1929, was recorded as metacercaria from eyes of *H. molitrix* [43]. The first occurrence of metacercarids of *D. indistinctum* was from eyes of *Luciobarbus esocinus*, reported as *B. esocinus* from fish market in Mosul city [79]. No more records are so far known on the occurrence of this parasite from fishes of Iraq [17].

*Diplostomum paraspathaceum* Schigin, 1965, was recorded as metacercaria from eyes of both *C. idella* [43] and *C. carpio* [43]. This was its first record in Iraq. No more hosts are so far known for this parasite in Iraq [17].

*Diplostomum spathaceum* (Rudolphi, 1819) Olsson, 1876, was recorded as metacercaria from eyes of the three carp species: *C. idella* [43, 56], *C. carpio* [29, 43], and *H. molitrix* [43, 56]. The first occurrence of metacercarids of *D. spathaceum* was from eyes of *C. luteus*, reported as *B. luteus*, *Cyprinion macrostomum*, and *C. carpio* from Dokan Lake [80]. Thirty-four hosts are so far known for this parasite in fishes of Iraq [17]. Metacercarids of *Diplostomum* spp. are responsible for worm cataract which causes fish blindness [81]. Adult worms of this parasite were found in the intestine of some fish-eating birds such as the silver gull *Larus argentatus* in Bahr Al-Najaf Depression [76].

5.6. Phylum Platyhelminthes: Class Monogenea. The class Monogenea of the phylum Platyhelminthes is represented in farm fishes of Babylon province with 45 species: 12 species of the genus *Gyrodactylus*, 26 species of *Dactylogyridae*, and one species of each of the genera *Pseudacolpenteron*, *Diplozoon*, *Eudiplozoon*, *Paradiplozoon*, and *Microcotyle* in addition to some unidentified species of *Dactylogyridae* and *Diplozoon*. It is appropriate to mention here that this group is considered as Monogenea by some electronic sites [9–12] but as Monogenoidea in some references [14, 66].

Phylum Platyhelminthes

Class Monogenea

Order Gyrodactyliidea

Family Gyrodactyliidae

*Gyrodactylus baicalensis* Bogolepova, 1950

*Gyrodactylus ctenopharygodontis* Ling in Gusev, 1953

*Gyrodactylus elegans* von Nordmann, 1832

*Gyrodactylus kherulensis* Ergens, 1974

*Gyrodactylus macracanthus* Hukuda, 1940

*Gyrodactylus malmbergi* Ergens, 1961

*Gyrodactylus markevitchi* Kulakovskaya, 1952

*Gyrodactylus medius* Kathariner, 1895

*Gyrodactylus menschikowi* Gvosdev, 1950

*Gyrodactylus salaris* Malmberg, 1957

*Gyrodactylus sprostonae* Ling, 1962

*Gyrodactylus vicinus* Bychowsky, 1957

Order Dactylogyriidea

Family Dactylogyridae

*Dactylogyrus achmerowi* Gusev, 1955

*Dactylogyrus amurensis* Akhmerov, 1952

*Dactylogyrus anchoratus* (Dujardin, 1845) Wagener, 1857

*Dactylogyrus arcuatus* Yamaguti, 1942


*Dactylogyrus cornu* Linstow, 1878

*Dactylogyrus crassus* Kulwiec, 1927

*Dactylogyrus ctenopharygodon*is Akhmerov, 1952

*Dactylogyrus dogieli* Gusev, 1953

*Dactylogyrus ergensi* Molnár, 1964

*Dactylogyrus extensus* Mueller & Van Cleave, 1932

*Dactylogyrus gobi* Gvosdev, 1950

*Dactylogyrus hypophthalmichthys* Akhmerov, 1952

*Dactylogyrus inexpectatus* Izjumova, in Gusev, 1955

*Dactylogyrus jamansajensis* Osmanov, 1958

*Dactylogyrus lamellatus* Akhmerov, 1952

*Dactylogyrus latituba* Gusev, 1955

*Dactylogyrus lopuchinae* Jukhimenko, 1981

*Dactylogyrus minutus* Kulwiec, 1927

*Dactylogyrus navicularis* A. Gusev, 1955

*Dactylogyrus phoxini* Malevitskaia, 1949

*Dactylogyrus propinquus* Bychowsky, 1931

*Dactylogyrus sahuensis* Ling in Chen et al., 1973

*Dactylogyrus simplex* Bychowsky, 1936

*Dactylogyrus skribini* Akhmerov, 1954

*Dactylogyrus vastator* Nybelin, 1924

*Dactylogyrus spp.*

*Pseudacolpenteron pavlovskii* Bychowsky & Gusdev, 1955

Order Mazocraeidea

Family Diplozoidae

*Diplozoon paradoxum* Nordmann, 1832
Diplozoon sp.
Eudiplozoon nipponicum (Goto, 1891)
Paradiplozoon barbi (Reichenbach-Kline, 1951)

Family Microcotylidae
Microcotyle donavini van Beneden & Hesse, 1863

Gyrodactylus baicalensis Bogolepova, 1950, was recorded from skin, fins, and gills of C. carpio [25, 27, 29, 52]. The first report of G. baicalensis in Iraq was from skin, buccal cavity, and gills of C. carpio from Al-Suwaira and Al-Latifiyah Fish Farms [52]. So far, G. baicalensis has eight fish host species in Iraq [17].

Gyrodactylus ctenophargodontis Ling in Gusev, 1952, was recorded from skin, fins, buccal cavity, and gills of both C. idella [24, 27]. The first report of G. ctenophargodontis in Iraq was from gills of C. idella from Babylon Fish Farm [24]. No more hosts are so far recorded for this parasite in Iraq [17].

Gyrodactylus elegans von Nordmann, 1832, was recorded from skin, fins, buccal cavity, and gills of both C. idella [27, 29, 52] and C. carpio [25–27, 29, 30, 32, 33, 43, 50, 52, 53, 55, 56, 60] as well as from gills of H. molitrix [29] and from L. abu [50] with no mention to site of infection. The first report of G. elegans in Iraq was from C. carpio from Al-Zaafaraniya Fish Farm and L. abu from Al-Latifiyah Fish Farm [50]. So far, G. elegans has 23 fish host species in Iraq [17].

Gyrodactylus kherulensis Ergens, 1974, was recorded from skin and gills of C. idella [27] and skin, fins, and gills of C. carpio [18, 27]. The first report of G. kherulensis in Iraq was from gills of C. carpio from Babylon Fish Farm [18]. So far, G. kherulensis has four fish host species in Iraq [17].

Gyrodactylus macracanthus Hukuda, 1940 (reported as G. paralatus Gusev, 1955), was recorded from skin and gills of C. carpio [27] and skin, fins, and buccal cavity of H. molitrix [27]. This was its first report in Iraq. Later on, it was reported from both hosts [82] as G. paralatus also. According to Gusev [83] and Pugachev et al. [14], G. paralatus is a synonym of G. macracanthus. No more hosts are so far known for G. macracanthus or its synonym G. paralatus from fishes of Iraq [17].

Gyrodactylus malmbergi Ergens, 1961, was recorded from skin, fins, and gills of C. carpio [27] and from skin and gills of H. molitrix [27]. This was its first report in Iraq and no more hosts are so far known for G. malmbergi from fishes of Iraq [17].

Gyrodactylus markevitschi Kulakovskyka, 1952, was recorded from skin and gills of C. carpio [27, 45, 47, 60]. The first report of this parasite in Iraq was from gills of Capoeta trutta (reported as Varicorhinus trutta) from Tigris River at Baiji town [74]. So far, G. markevitschi has six host species in Iraq [17].

Gyrodactylus medius Kathariner, 1895, was recorded from skin and fins of C. carpio [27]. This was its first record in Iraq. The year of authority of this parasite was erroneously given as 1893 instead of 1895 by Al-Zubaidy [27] as well as by three other references according to Mhaisen and Abdul-Ameer [15]. Also, the authorship of this parasite was given as Katheriner instead of Kathariner according to MonoDB [10]. Now, this parasite has three host species in Iraq [17].

Gyrodactylus menschikowi Gvosdev, 1950, was recorded from skin and gills of C. carpio [60]. The first report of this parasite in Iraq was from gills and skin of C. carpio and skin, fins, and gills of L. abu both from Hilla River [84]. So far, no more hosts for this parasite are known in Iraq [17].

Gyrodactylus salaris Malmberg, 1957, was recorded from skin and gills of C. carpio [27, 29]. The first report of this parasite in Iraq was from gills and skin of C. carpio from Al-Furat Fish Farm [27]. The year of authority of this parasite was reported as 1956 instead of 1957 by Al-Zubaidy [27] and Al-Jadoaa [29]. No more hosts for this parasite are so far known in Iraq [17].

Gyrodactylus sprostonae Ling, 1962, was recorded from skin and fins of C. carpio [27]. This was its first report in Iraq. Now, this parasite has seven host species in Iraq [17].

Gyrodactylus vicinus Bychowsky, 1957, was recorded from skin, fins, and gills of C. carpio [27, 35]. The first report of this parasite in Iraq was from skin, fins, and gills of C. carpio from Al-Furat Fish Farm [27]. Now, it has three host species in Iraq [17].

Finally, the unidentified Gyrodactylus species reported from C. carpio [34, 38] were the same 11 species which had been recorded in Al-Zubaidy [27]. In Iraq, so far 15 fish host species were reported for some unspecified Gyrodactylus species [17].

Dactylogyrus achmerowi Gusev, 1955, was recorded from gills of C. carpio [19, 27, 29, 30, 32, 33, 36, 54, 55, 60]. The first report of D. achmerowi in Iraq was from gills of C. carpio from Al-Wahda Fish Hatchery at Al-Suwaira and Babylon Fish Farm [19]. Now, it has 11 host species in Iraq [17].

Dactylogyrus amurenensis Akhmerov, 1952, was recorded from gills of C. carpio [55]. This was its first report in Iraq. However, neither description and measurements nor illustration was given. So far, this parasite has two host species in Iraq [17].

Dactylogyrus anchoratus (Dujardin, 1845) Wagener, 1857, was recorded from gills of C. carpio [45, 47]. The first report and description of D. anchoratus in Iraq were from gills of C. carpio from Tigris River at Al-Zaafaraniya [85, 86]. Now, it has seven fish host species in Iraq [17].

Dactylogyrus arcuatus Yamaguti, 1942, was recorded from gills of C. idella [29] and skin, buccal cavity, and gills of C. carpio [25, 27, 35, 36, 49, 52, 55, 59, 60]. The first report of D. arcuatus in Iraq was from skin, buccal cavity, and gills of C. carpio from Al-Suwaira and Al-Latifiyah Fish Farms [52]. Now, it has seven fish host species in Iraq [17].

Dactylogyrus barboiides Gusev, Ali, Abdul-Ameer, Amin & Molnár, 1993, was recorded from gills of C. carpio [60]. D. barboiides was described as a new species from gills of Barbus grypus from Tigris River near Baiji town [87]. Now, it has three fish host species in Iraq [17].

Dactylogyrus corni Linstow, 1878, was recorded from gills of C. carpio [27, 59]. D. corni was recorded for the first time in Iraq from gills of five fish species from Diyala River [88]. So far, it has 13 fish host species in Iraq [17].

Dactylogyrus crassus Kulwie, 1927, was recorded from gills of C. carpio [45, 47, 55, 60]. D. crassus was recorded for
the first time in Iraq from gills of *C. carpio* from Al-Shark Al-Awsat Fish Farm [45]. It is appropriate to mention here that the specific name *crassus* was misspelled as *carassus* by Al-Rubaie et al. [55]. No more hosts are so far known for this parasite in Iraq [17].

*Dactylogyrus ctenopharyngodonis* Achmerow, 1952, was recorded from gills of *C. idella* from Al-Shark Al-Awsat Fish Farm [43]. This is the only report on the occurrence of *D. ctenopharyngodonis* in fishes of Iraq [17].

*Dactylogyrus dogielii* Gusev, 1953, was recorded from gills of *C. carpio* in fish cages and an earthen pond in Sadat Al-Hindiyah [60]. The first report of *D. dogielii* was from five fish species from Euphrates River at Al-Musaib city [89] and its full description and illustration were published later by Al-Sa‘adi et al. [90]. Six host species are so far known for *D. dogielii* in Iraq [17].

*Dactylogyrus ergensi* Molnár, 1964, was recorded from gills of *C. carpio* from Al-Furat Fish Farm [27]. This was its first report in Iraq. No more hosts were reported for *D. ergensi* in Iraq [17].

*Dactylogyrus extensus* Mueller & Van Cleave, 1932, was recorded from gills of *C. idella* [29], buccal cavity and gills of *C. carpio* [25, 27, 29, 30, 32, 33, 36, 43, 45, 47, 52, 54, 55, 59, 60], and gills of *H. molitrix* [29, 45, 47]. The first report of *D. extensus* in Iraq was from the buccal cavity and gills of *C. carpio* from Al-Suwaia and Al-Latifiya Fish Farms [52]. *D. solidus* which was also recorded from the same host by Salih et al. [52] as well as by Mhaisen & Abul-Eis [25] and Al-Rubaie et al. [55] is considered as a synonym of *D. extensus* according to Gibson et al. [13]. *D. extensus* and its synonym *D. solidus* have so far 17 fish host species in Iraq [17].

*Dactylogyrus gobii* Gvosdev, 1950, was recorded from skin and gills of *C. carpio* [45, 47, 60]. *D. gobii* was recorded for the first time in Iraq from gills of *C. carpio* from Al-Shark Al-Awsat Fish Farm [45]. Now, it has three host species in Iraq [17].

*Dactylogyrus hypophthalmichthys* Achmerow, 1952, was recorded from skin, buccal cavity, and gills of *H. molitrix* [21, 27, 43, 45, 47, 52, 56]. It is reliable to state here that *D. hypophthalmichthys* was recorded as *Neodactylogyrus hypophthalmichthys* by Asmar et al. [56]. The first report of *D. hypophthalmichthys* in Iraq was from the buccal cavity and gills of *H. molitrix* from Al-Suwaia and Al-Latifiya Fish Farms [52]. *H. molitrix* is the only host so far known for *D. hypophthalmichthys* in Iraq [17].

*Dactylogyrus inexpectatus* Izjumova, in Gusev, 1955, was recorded from skin and gills of *C. idella* [27, 29, 52], gills of *C. carpio* [27, 29], and gills of *H. molitrix* [29]. The first report of *D. inexpectatus* in Iraq was from skin and gills of *C. idella* from Al-Suwaia and Al-Latifiya Fish Farms [52]. Now, it has five host species in Iraq [17].

*Dactylogyrus jamansajensis* Osmanov, 1958, was recorded from gills of *C. carpio* [45, 47]. The first report of *D. jamansajensis* in Iraq was from gills of *C. luteus* from manmade lakes, north of Baghdad [91]. Now, it has five host species in Iraq [17].

*Dactylogyrus lamellatus* Achmerow, 1952, was recorded from skin, fins, buccal cavity, and gills of *C. idella* [24, 27, 43, 52, 56] and gills of *C. carpio* [27]. The first report of *D. lamellatus* in Iraq was from the skin, buccal cavity, and gills of *C. idella* from Al-Suwaira and Al-Latifiya Fish Farms [52]. Now, it has three host species in Iraq [17].

*Dactylogyrus vastator* Nybelin, 1924, was recorded from gills of *C. idella* [27] and skin and gills of *C. carpio* [26, 27, 30, 32, 33, 35, 36, 43, 49, 52, 53, 56, 59, 60, 64]. The first report of *D. vastator* from Iraq was from skin and gills of *C. macrostomum*
from Tigris River at Baghdad [94]. So far, *D. vastator* was reported from 33 fish host species from north, middle, and south of Iraq [17].

Unidentified *Dactylogyrus* species were recorded from skin and gills of *C. idella* [56] and from skin, buccal cavity, and gills of *C. carpio* [34, 38, 56]. Some of these specimens were larval stages [56], while the unidentified *Dactylogyrus* species of Al-Zubaidy et al. [34, 38] were the same 15 species which were recorded in Al-Zubaidy [27]. In Iraq, so far nine fish host species were reported for some unspecified *Dactylogyrus* species [17].

_Pseudocolpenteron pavlovskii_ Bychowsky & Gussev, 1955, was recorded from fins and gills of *C. carpio* [25, 27, 45, 47] and gills of _H. molitrix_ [27]. The first report of _P. pavlovskii_ from Iraq was from skin and gills of *C. carpio* from Babylon Fish Farm [25]. This species has so far only two host species in Iraq [17].

_Diplozoon paradoxum_ Nordmann, 1832, was recorded from gills of *C. carpio* [60]. This parasite was recorded for the first time in Iraq from gills of _Carasobarbus luteus_, reported as _Barbus luteus_, from Al-Husainia creek, Karbala province [95]. Now, it has five fish hosts in Iraq [17].

Unidentified *Diplozoon* species were recorded from gills of *C. carpio* [43]. Some other unidentified *Diplozoon* species occurred as larvae in 12 fish host species in Iraq [17].

_Eudiplozoon nipponicum_ (Goto, 1891) was recorded from gills of *C. carpio* [60]. This parasite was recorded for the first time in Iraq from gills of *C. carpio* from a manmade lake in Baghdad [96] as _Diplozoon nipponicum_ but then it was reported by its valid name _E. nipponicum_ by all subsequent researchers. So far, three host species are known for _E. nipponicum_ in Iraq [17].

_Paradiplozoon barbi_ (Reichenbach-Klinke, 1951) was recorded from gills of *C. carpio* [27] as _Diplozoon barbi_. This parasite was recorded for the first time in Iraq from gills of _Chondrostoma nasus, C. regium_, and _C. carpio_ from Tigris River at Baghdad [97] as _Diplozoon barbi_. Also, all the subsequent records in the Iraqi literature, except the checklists of Mhaisen and Abdul-Ameer [16], referred to this parasite as _D. barbi_. According to Khotenovsky [98], _D. barbi_ is a synonym of _P. barbi_. Eight host species are so far known for this parasite in Iraq [17].

_Microcotyle donavini_ van Beneden & Hesse, 1863, was recorded from gills of _L. abu_ from Babylon Fish Farm [22]. This was its first report in Iraq. Ten host species are so far known for _M. donavini_ in Iraq [17].

5.7. *Phylum Platyhelminthes: Class Cestoda*. The class Cestoda of the phylum Platyhelminthes is represented in farm fishes of Babylon province with five species: one species of each of the genera *Bothriocephalus*, *Ligula*, and *Neogryporhynchus* as well as two species of *Proteocephalus*.

*Phylum Platyhelminthes*

Class Cestoda

Order *Bothriocephalidea*

Family *Bothriocephalidae*

*Bothriocephalus acheilognathi* Yamaguti, 1934

Order *Diphyllobothriidea*

Family *Diphyllobothriidae*

*Ligula intestinalis* (L., 1758) Bloch, 1782

Order *Proteocephalidea*

Family *Proteocephalidae*

*Proteocephalus osculatus* (Goeze, 1782) Nybelin, 1942

*Proteocephalus torulosus* (Batsch, 1786) Nufer, 1905

Order *Cyclophyllidea*

Family *Dilepididae*

*Neogryporhynchus cheilancristrotus* (Wedl, 1855) Baer & Bona, 1960

*Bothriocephalus acheilognathi* Yamaguti, 1934, was recorded from the intestine of both *C. idella* [24, 56] and *C. carpio* [25–27, 52, 53, 62]. It is appropriate to mention here that this worm was reported by its synonym _B. opsariichthydis_ by Salih et al. [52] and Al-Zubaidy [27]. The first report of _B. acheilognathi_ in Iraq was from the intestine of _C. carpio_ from different fish farms near Baghdad [99]. Two other species of *Bothriocephalus*, _B. gowkongensis_ Yeh, 1955, and _B. opsariichthydis_ Yamaguti, 1934, were also reported from Iraq [17]. According to Molnár [100], both these two species are considered as synonyms of *B. acheilognathi*. At the present time, _B. acheilognathi_ and both of its above-named synonyms has so far a total of 21 host species in Iraq [17].

*Ligula intestinalis* (L., 1758) Bloch, 1782, was recorded from the body cavity of both *C. idella* [24, 27, 29] and *C. carpio* [27]. _L. intestinalis_ was reported for the first time in Iraq as a plerocercoid from the body cavity of _Leuciscus vorax_ (reported as _A. vorax_) from Shatt Al-Alah River [101]. So far, this species has 13 fish host species in Iraq [17]. In Iraq, the adult stage of _L. intestinalis_ was reported from the intestine of the moorhen _Gallinula chloropus chloropus_ from around Baghdad [102].

*Proteocephalus osculatus* (Goeze, 1782) Nybelin, 1942, was recorded from the intestine of *C. carpio* [27]. The first report of this parasite in Iraq was from the intestine of _L. vorax_ (reported as _A. vorax_) from Al-Tharthar Lake [103]. So far, this species has eight fish host species in Iraq [17].

*Proteocephalus torulosus* (Batsch, 1786) Nufer, 1905, was recorded from intestine of *C. carpio* [27]. The first report of this parasite in Iraq was from the intestine of _C. carpio_ from a fish farm near Baghdad city [99]. So far, this species has two fish host species in Iraq [17].

*Neogryporhynchus cheilancristrotus* (Wedl, 1855) Baer & Bona, 1960, was recorded from the intestine of _C. carpio_ by Al-Zubaidy [27] as _Gryporhynchus cheilancristrotus_. The first report of _N. cheilancristrotus_ in Iraq was from the intestine of _L. abu_ from Diyala River [104]. So far, this species has four fish host species in Iraq [17].
5.8. Phylum Nematoda. The phylum Nematoda is represented in farm fishes of Babylon province with three species: unidentified larval species of the genus Contraecacum as well as one species of each of the genera Cucullanus and Rhabdocoeca.

Phylum Nematoda
Class Secernentea
Order Ascaridida
Family Anisakidae
Contraecacum spp.
Family Cucullanidae
Cucullanus cyprini Yamaguti, 1941
Order Spirurida
Family Rhabdocoebidae
Rhabdocoeca hellichi (Sr´amek, 1901)

Unidentified larval species of Contraecacum was recorded from the intestinal wall, body cavity, liver, spleen, heart, and gonads of C. carpio [27, 29] and intestinal wall of L. abu [22, 37, 42]. The first report of Contraecacum spp. larvae in Iraq was from the body cavity and different viscera of 10 fish species from different inland waters of Iraq [70]. Contraecacum spp. larvae have so far 40 fish host species in Iraq [17]. Adult worms of Contraecacum spp. were detected from six species of aquatic birds in Iraq, Egreta alba, Ardeo lalloides, Botaurus stellaris, Ardea purpurea, and Ceryle rudis, from Bahr Al-Najaf Depression [76].

Cucullanus cyprini Yamaguti, 1941, was recorded from the intestine of C. carpio [27]. The first report of this parasite in Iraq was from the intestine of Alburnus caeruleus and Luciobarbus xanthopterus (reported as B. xanthopterus) from Al-Tharthar Lake [103]. So far, this species has 15 fish host species in Iraq [17].

Rhabdocoeca hellichi (Sr´amek, 1901), erroneously reported as R. bellichi, was recorded from intestine of the three carp species: C. idella [29], C. carpio [29], and H. molitrix [29]. Ali et al. [105] reported this parasite (also erroneously as R. bellichi) from the intestine and coelom of L. xanthopterus (reported as B. xanthopterus), H. fossilis, and Mystus pelusi (reported as M. halepensis). Eight fish species are so far known for this parasite in Iraq [17].

5.9. Phylum Acanthocephala. The phylum Acanthocephala is represented in farm fishes of Babylon province with two valid species of the genus Neoechinorhynchus.

Phylum Acanthocephala
Class Eoacanthocephala
Order Neoechinorhynchida
Family Neoechinorhynchidae
Neoechinorhynchus iraensis Amin, Al-Sady, Mhaisen & Bassat, 2001

Neoechinorhynchus rutili (Muller, 1780) Hamann, 1892

Neoechinorhynchus iraensis Amin, Al-Sady, Mhaisen & Bassat, 2001, was recorded from intestine of both C. carpio [27] and L. abu [22, 50]. It is appropriate to mention here that this species was reported as N. agilis from C. carpio and L. abu by Al-Zubaidy [27] and Ali et al. [22], respectively. N. agilis is a misidentification of N. iraensis [106]. The first report of N. iraensis was as species de novo from the intestine of L. abu from the Euphrates River at Al-Fallujah region [107], while its description was given later by Amin et al. [108]. N. iraensis and the misidentified N. agilis have so far 24 fish host species in Iraq [17].

Neoechinorhynchus rutili (Muller, 1780) Hamann, 1892, was recorded from the intestine of three carp species: C. idella [29], C. carpio [27, 29], and H. molitrix [29]. N. rutili was firstly recorded by Herzog [70] from L. xanthopterus (reported as B. xanthopterus) from Tigris and Diyala rivers near Baghdad and from L. abu (reported as Mugil abu) from Citscher Oasis near Al-Fallujah. N. rutili has so far 16 fish host species in Iraq [17].

5.10. Phylum Arthropoda: Subphylum Crustacea. The subphylum Crustacea of the phylum Arthropoda is represented in farm fishes of Babylon province with nine species: one species of each of the genera Argulus, Dermoergasilus, Paraergasilus, Lamprolegen, and Lernaeo and three species of Ergasilus in addition to unidentified species of Ergasilus.

Phylum Arthropoda
Subphylum Crustacea
Class Maxillopoda
Order Arguloida
Family Argulidae
Argulus foliaceus (L., 1758)
Order Cyclopoida
Family Ergasilidae
Dermoergasilus varicoleus Ho, Jayaran & Radhakrishnan, 1992
Ergasilus barbi Rahemo, 1982
Ergasilus mosulensis Rahemo, 1982
Ergasilus sieboldi von Nordmann, 1832
Paraergasilus inflatus Ho, Khamees & Mhaisen, 1996
Family Lernaeidae
Lamprolegen pulchella von Nordmann, 1832
Lernaeo cyprinae L., 1758

Argulus foliaceus (L., 1758) was recorded from gills of the three carp species: C. idella [27], C. carpio [25, 27], and H. molitrix [27] as well as from fins of C. auratus [58]. A. foliaceus was reported for the first time in Iraq [70] from skin of C. carpio from Al-Zaafaraniya Fish-Culture Station and
C. luteus (reported as B. luteus) from Al-Habbaniyah Lake [70]. A. foliaceus has so far 16 fish host species in Iraq [17].

Dermoergasilus varicoleus Ho, Jayarajan & Radhakrishnan, 1992, was recorded from gills of L. Abu [31, 40]. This crustacean was reported for the first time in Iraq from gills of L. Abu from Shatt Al-Arab River [109]. D. varicoleus has so far nine fish host species in Iraq [17].

Ergasilus barbi Rahemo, 1982, was recorded from gills of L. Abu [46]. This crustacean was firstly detected from gills of B. grypus from Tigris River at Mosul city by Fattohy [75] and its full description as a new species was achieved by Rahemo [110]. E. barbi has so far 13 fish host species in Iraq [17].

Ergasilus mosulensis Rahemo, 1982, was recorded from gills of the three carp species, C. idella [27], C. carpio [27], and H. molitrix [27] as well as gills of L. Abu [46]. This crustacean was firstly detected from gills of L. Abu from Tigris River at Mosul city by Fattohy [75] and its full description as a new species was achieved by Rahemo [110]. E. mosulensis has so far 23 fish host species in Iraq [17].

Ergasilus sieboldi von Nordmann, 1832, was recorded from gills, buccal cavity, and skin of the three carp species: C. idella [27, 29], C. carpio [25, 27, 29, 51, 55], and H. molitrix [27, 29, 56]. The first report of E. sieboldi in Iraq was from gills of L. vorax (reported as A. vorax) from Al-Habbaniyah Lake [70]. E. sieboldi has so far 26 fish host species in Iraq [17].

Ergasilus sp. was recorded from L. Abu [50] with no mention to site of infection. In addition to 11 species of Ergasilus so far recorded from fishes of Iraq, some specimens of unidentified Ergasilus species were also recorded from 12 fish species in Iraq [17].

Paraergasilus inflatus Ho, Khamees & Mhaisen, 1996, was recorded from gills of H. molitrix [27]. This crustacean was reported as a new species from gill rakers of L. Abu from Shatt Al-Arab River [111]. D. varicoleus has so far seven fish host species in Iraq [17].

Lamproglene pulchella von Nordmann, 1832, was recorded from gills of C. carpio [27]. The first report of L. pulchella in Iraq was from gills of Chondrostoma regium and Capoeta (reported as Varicorhinus trutta) from Tigris River at Mosul city [112]. L. pulchella has so far 19 fish host species in Iraq [17].

Lernae cyprinacea L., 1758, was recorded from skin, fins, and gills of the three carp species, C. idella [24, 27–29, 43, 51], C. carpio [6, 25–31, 39, 41, 43, 44, 48, 51, 53–55, 57, 61, 63], and H. molitrix [21, 27–29, 43], as well as gills of L. Abu [23]. The first report of the anchor worm L. cyprinacea in Iraq was from skin, fins, buccal cavity, pharyngeal cavity, gills, and anus of seven freshwater fish species from Al-Zaafaraniya Fish-Culture Station [113]. L. cyprinacea is the commonest crustacean among fishes of Iraq as it has so far 30 fish host species in Iraq [17].

5.11. Phylum Mollusca. The phylum Mollusca is represented in farm fishes of Babylon province with only one parasite species of the genus Unio. The systematic account of this parasite, followed by parasite-host list, is given here.

Phylum Mollusca

Class Bivalvia

Order Unionoida

Family Unionidae

Unio pictorum (Linnaeus, 1758)

Unio pictorum (Linnaeus, 1758) was recorded from gills of both C. carpio [27, 29] and H. molitrix [27]. The first report of the glochidial larvae of U. pictorum in Iraq was from gills of eight freshwater fish species from Diyala River [104]. It is appropriate to mention here that the authority of U. pictorum was erroneously stated as Zhadin, 1938, in all the Iraqi literature except Al-Salmany [71]. U. pictorum has so far 24 fish host species in Iraq [17].

6. Host-Parasite List

The following host-parasite list for fish parasites in fish farms of Babylon province is compiled. For each host, the scientific names of all recorded parasites are alphabetically enlisted under their major parasitic groups. To economize space, references of previous records for each parasite species are not given here. These can be obtained from the account of each concerned parasite species in the part of major groups of parasitic fauna within the results and discussion part.

6.1. Cyprinus carpio Linnaeus, 1758

Mastigophora: Ichthyobodo necator.

Apicomplexa: Eimeria dogielii, E. mylopharyngodoni, and Haemogregarina sp.


Myxozoa: Myxobilatus legeri, Myxobolus muelleri, M. oviformis, and M. pfeifferi.

Trematoda: Apharyngostrigea cornu, Diplodostomum paraspacthaceum, and D. spathaceum.

Cestoda: Bothriocephalus acheilognathi, Ligula intestinalis, Neogryporhynchus cheilancristrotus, Proteocephalus osculatus, and P. torulosus.

Nematoda: Contraacecum sp., Cucullanus cyprini, and Rhabdochoana hellichi.

Acanthocephala: Neoechinorhynchus iraensis and N. rutili.

Crustacea: Argulus foliaceus, Ergasilus mosulensis, E. sieboldi, Lamproglerna pulchella, and Lernaea cyprinacea.

Mollusca: Unio pictorum.

6.2. Ctenopharyngodon idella (Valenciennes, 1844)


Myxozoa: Myxobolus pfeifferi.

Trematoda: Diplodistomum paraspathaceum and D. spathaceum.


Cestoda: Bothriocephalus acheilognathi and Ligula intestinalis.

Nematoda: Rhabdochoana hellichi.

Acanthocephala: Neoechinorhynchus rutili.

Crustacea: Argulus foliaceus, Ergasilus mosulensis, E. sieboldi, and Lernaea cyprinacea.

6.3. Hypophthalmichthys molitrix (Valenciennes, 1844)


Myxozoa: Myxobolus pfeifferi.

Trematoda: Diplostomum indistinctum and D. spathaceum.


Nematoda: Rhabdochoana hellichi.

Acanthocephala: Neoechinorhynchus rutili.


Mollusca: Unio pictorum.

6.4. Carassius auratus (Linnaeus, 1758)

Crustacea: Argulus foliaceus.

6.5. Heteropneustes fossilis (Bloch, 1794)

Trematoda: Ascocotyle coleostoma.

6.6. Liza abu (Heckel, 1843)

Ciliophora: Trichodina domerguei and Trichodina sp.

Myxozoa: Myxobolus dogielii and Myxobolus donavini.

Monogenea: Gyrodactylus elegans and Microcotyle donavini.

Nematoda: Contraacecum sp.

Acanthocephala: Neoechinorhynchus iraensis.

Crustacea: Dermogasillus varicoleus, Ergasilus barbi, E. mosulensis, Ergasilus sp., and Lernaea cyprinacea.

Competing Interests

The authors declare that there are not any competing interests related to the publication of this paper.

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