

Checklists of Monogeneans of Freshwater and Marine Fishes of Basrah Province, Iraq

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Abstract. The literature review on monogeneans of freshwater and marine fishes of Basrah province, Iraq indicated the presence of 54 monogenean taxa from 18 freshwater fish species, 11 marine fish species and five marine fish species entering fresh waters. Among these parasites, the monopisthocotyleans are represented with 26 valid species as well as eight parasites which were identified to the generic level only, while the polyopisthocotyleans are represented with 14 valid species as well as six parasites which were identified to the generic level only. The total number of monogenean species for each fish species ranged from a minimum of one parasite species in 11 fish hosts to a maximum of 14 parasite species in only one host (*Silurus triostegus*). The monogenean species richness ranged from their infection of one host in case of 33 monogenean species to the infection of 16 hosts in the case of the infection with *Dactylogyrus vastator*.

Key words: Monogenea, freshwater fishes, marine fishes, Basrah province, Iraq.

Introduction

The naming of the Monogenea/ Monogenoidea remains confusing, partly because there is no clear answer to the problem and by 1974, the International Congress of Parasitology (ICOPA) in Warsaw agreed to the name 'Monogenea' as the highest level appellation for the group (68). The class Monogenea, used to be known as monogenetic trematodes, includes skin and gill flat worms with direct life cycles (25). These are important fish pathogens, especially for carp fingerlings under extensive fish culture practice and their direct life cycles and fish crowding are good conditions for their easy spread among fishes (29). According to their attachment organs, monogeneans are provided either with hooks and hooklets and hence they are known as monopisthocotyleans or with clamps and hence they are known as polyopisthocotyleans (40). It is interesting to state here that the name Monogenoidea, instead of Monogenea, is applied for this class with two subclasses: Polyonchoinea and Heteronchoinea instead of Monopisthocotylidea and Polyopisthocotylidea, respectively (30).

Basrah province is situated in the extreme southern part of Iraq. It is the only Iraqi province which has an overlooking on the Arab Gulf. There is a large variety of aquatic environments in this province. These ranged from the shallow marshy area in the north to the end parts of the Tigris and Euphrates rivers where they meet and result in the formation of Shatt Al-Arab River which discharges its waters in the Arab Gulf at Al-Fao town. Shatt Al-Arab River has many tributaries which irrigate the nearby area, dominated by date palm fields. A manmade canal (Shatt Al-Basrah canal) collects the

drainage waters from mid and south Iraq and discharges in Khor Al-Zubair lagoon which represents a north western arm of the Arab Gulf in the nearby desert area. Marine fishes inhabit the north and northwest parts of the Arab Gulf. Some marine fishes are found in the freshwaters of Shatt Al-Arab River and its tributaries as well as Shatt Al-Basrah canal. Both Shatt Al-Arab River and Shatt Al-Basrah canal facilitate the anadromous migration of some marine fishes to the marshy area or even to some other inland waters of south Iraq. According to unpublished data obtained by two of us (A.H.A. and N.R.K.), water temperature in the whole Basrah province ranges from about 12 °C during winter to 38 °C during summer, while the salinity shows a wide range. It is about 0.6 ‰ in Al-Qurna town, but in Shatt Al-Arab River, it ranges from 2.3 ‰ at Basrah city, 5 ‰ at Abu Al-Khaseeb town and 31.1 ‰ at Al-Fao town. In Shatt Al-Basrah canal, the salinity ranged from 14.6 ‰ in its northern part to 23.6 ‰ at about mid distance and 42 ‰ in its junction with Khor Al-Zubair lagoon. Salinity in Khor Abdullah reaches 44 ‰.

Information concerning monogeneans of fishes of Basrah province are scattered in different local scientific journals, M. Sc. and Ph. D. theses as well as in few conference abstracts. Some of this information is really outdated, some parasites and fishes have been misidentified or given with wrong authorities and some parasite names are misspelled. For these reasons, it was decided to review these data in accordance with up-to-date fish and parasite classification using available web sites (35, 45, 68, 69, 73) and to provide a host- parasite checklist. This review is a continuation of previous literature reviews done on the same subject (64, 58, 62). Finally, it was also planned to compare the richness of fishes of this province with monogenean parasites with that of the whole Iraq based on data extracted from the index-catalogue of parasites and disease agents of fishes of Iraq (59).

Sources and Methods

A total of 33 references (research papers and theses) dealing with monogeneans of fishes of Basrah province were used to prepare the present review. Data from such references was gathered to provide host- parasite and parasite- host lists. The systematic account of these monogeneans is based on the well known electronic site (68). The scientific names of all parasites and their synonyms were checked with some electronic sites concerned with parasite classification (45, 68, 69, 73) as well as some taxonomic references. For fishes, the scientific names were reported as they appeared in their original references and then checked with the recent account on freshwater fishes of Iraq (34). However, the valid names used in this article were updated in accordance with Froese & Pauly (37)

The index-catalogue of parasites and disease agents of fishes of Iraq (59) was used to show the first record in Iraq for some monogeneans reported in this article as well as the total number of hosts so far recorded for each of them from Iraq. Depending on the same index-catalogue (59), the total number of fish hosts harbouring each

monogenean species in Basrah province is compared with the total number of monogeneans harboured by the same host in the whole country of Iraq.

Results and Discussion

Surveys Achieved on Monogeneans of Fishes in Basrah

Although the first report on parasites of fishes of Iraq (41) covered many parts of Iraq, there is no reference on any fish monogeneans from Basrah province. It is also the case for the checklist of parasites of fishes of Iraq (57). Studies which reported some monogenean infections from fishes of Basrah province can be grouped into five major categories according to the fish habitats. These are:

- 1- The marshy area (Al-Hammar marsh) north of Basrah.
- 2- Shatt Al-Arab River and its creeks and canals.
- 3- Brackish waters of Shatt Al-Arab estuary at Al-Fao town and Shatt Al-Basrah canal.
- 4- Fish farms scattered in Basrah province.
- 5- Marine waters of Khor Al-Zubair lagoon and Khor Abdullah, northwest of the Arab Gulf.

Surveys on fish monogeneans from the marshy area of Basrah province were achieved in Al-Hammar marsh, north of Basrah (8, 10, 48, 1).

Studies carried out on Shatt Al-Arab River and its creeks and canals included those from Shatt Al-Arab River near Al-Ashar, near Nahr Khooz and near Al-Seebah (54), Mehajeran Creek, south of Basrah city (51, 63), Al-Majidiah River, north of Basrah city (56), Garmat Ali River, north of Basrah city (7, 47, 3, 22, 23, 5, 20, 24, 19, 50, 18, 52) and Al-Salihiya canal (18).

Only two reports are known on fish monogeneans from the brackish waters of Shatt Al-Arab estuary near Al-Fao town as well as the brackish waters of Shatt Al-Basrah canal (53, 54).

Four reports are known on monogeneans from fish farms of Basrah province (12, 4, 46, 44). Three fish farms were investigated: Basrah University experimental culture station and fry caring ponds in Garmat Ali shire, Abu Saadi fish farm in Al-Mdaina shire and Faddak Company for animal and agricultural production in Shatt Al-Arab shire.

Reports on monogeneans of marine fishes of Iraq included those from Khor Al-Zubair lagoon (9; 61) and from Khor Abdullah (26, 27, 28, 49, 11, 67).

Monogeneans Recorded from Fishes of Basrah

The review of literature indicated that a total of 54 monogenean taxa belonging to two subclasses, three orders and 12 families, were recorded as indicated in Table (1). These taxa are alphabetically presented under their families and genera. Their systematic account was based on some major accounts (39, 72, 55, 42, 68, 73). Names of hosts are quoted as they appeared in their relevant literature but the valid names have been

updated according to Froese & Pauly (37) and the full authority of each valid fish host is shown in Table (2).

Family Ancylo-discoididae

This family is represented in Basrah fishes by five valid species and two unidentified species belonging to two genera.

Ancylo-discoides parasiluri Yamaguti, 1937 was reported only from *Silurus triostegus* from Al-Hammar marsh (48, 1).

Bychowskyella gharui (Tripathi, 1959) Gusev, 1961 (misspelled as *B. qharui*) was recorded only from *S. triostegus* from Al-Hammar marsh (48).

Chauhanellus australis (Young, 1967) Bychowsky & Nagibina, 1969 was reported as *Hamatopeduncularia australis* Young, 1967 from *Arius bilineatus* (= *Netuma bilineata*) from Khor Al-Zubair lagoon (9). According to some sites (35, 42, 73), *C. australis* belongs to the family Dactylogyridae.

Cleidodiscus sp. was recorded from *S. triostegus* from Al-Hammar marsh (48). This is the only record of this genus from fishes of Iraq (59).

Hamatopeduncularia arii Yamaguti, 1953 was recorded only from *S. triostegus* from Al-Hammar marsh (48).

Hamatopeduncularia sp. was recorded only from *A. bilineatus* (= *N. bilineata*) from Khor Al-Zubair lagoon (9) and from the same fish from Khor Abdullah (49).

Thaparocleidus vistulensis (Siwak, 1932) Lim, 1996 was recorded for the first time in Iraq as *Ancylo-discoides vistulensis* Siwak, 1932 from *S. triostegus* from Tigris River at Baiji town (2). Later on, *A. vistulensis* was recorded from *Silurus glanis* from Tigris river at Mosul (21), from eight fish species from Basrah: *Aspius vorax*, *Barbus sharpeyi* (= *Mesopotamichthys sharpeyi*), *Chalcalburnus sellal* (= *Alburnus sellal*), *Heteropneustes fossilis*, *Liza abu*, *Mastacembelus mastacembelus*, *Mystus pelusius* and *S. triostegus* all from Garmat Ali River (3) and from both *M. pelusius* and *S. triostegus* from Garmat Ali River also (5). Internationally, *T. vistulensis* is known only from *S. glanis* (42). So, the records of *T. vistulensis* from the above named fish species (except *S. glanis*) are questionable. However, the occurrence of some introduced freshwater fishes in Iraqi waters may indicate the possibility of lateral transfers of alien parasites between introduced and some native fishes. Seventeen of the 35 monogeneans present in freshwater fishes of Italy should be considered as alien, two as native and the remaining 16 of unknown origin (38).

Family Ancyrocephalidae

This family is represented by four valid species and two unidentified species belonging to two genera.

Ancyrocephalus polymorphus Gussev, 1955 was recorded from *Aphanius dispar* from Garmat Ali River (50, 52) and from *Carassius auratus* from Al-Salihiya canal (18).

Ancyrocephalus sp. was recorded only from *Liza subviridis* (= *Chelon subviridis*) from Khor Al-Zubair lagoon (9).

Haliotrema mugilis (Tripathi, 1959) was recorded from *L. subviridis* (= *C. subviridis*) from Khor Al-Zubair lagoon (9) as well as from the same fish from Khor Abdullah (26, 28).

Haliotrema sp. was recorded only from *S. triostegus* from Al-Hammar marsh (48).

Ligophorus bantingensis Soo & Lim, 2012 was recorded from three fish species: *C. subviridis* from Shatt Al-Arab River near Al-Ashar, Al-Seebah and Nahr Khooz as well as from Shatt Al-Arab Estuary near Al-Fao town (54), *L. abu* from Shatt Al-Arab River near Al-Seebah (54) and *L. klunzingeri* from Shatt Al-Arab River near Al-Ashar, Nahr Khooz and Shatt Al-Arab Estuary near Al-Fao town (54).

Ligophorus fluviatilis (Bychowsky, 1949) Dmitrieva, Gerasev, Gibson, Pronkina & Galli, 2012 was recorded from three fish species: *C. subviridis* from Shatt Al-Arab Estuary near Al-Fao town (54), *L. abu* from Shatt Al-Arab River near Al-Seebah (54) and *L. klunzingeri* from Shatt Al-Arab Estuary near Al-Fao town (54).

Ligophorus lebedevi Dmitrieva, Gerasev, Gibson, Pronkina, & Galli, 2012 was reported only from *C. subviridis* from Shatt Al-Arab River near Al-Ashar and near Nahr Khooz as well as from Shatt Al-Arab Estuary near Al-Fao town (54).

Ligophorus mugilinus (Hargis, 1955) Euzet & Suriano, 1977 was reported as *Haliotrema mugilinus* (Hargis, 1955) from *Liza macrolepis* (= *Chelon macrolepis*) from Khor Al-Zubair lagoon (9), from *L. subviridis* (= *C. subviridis*) from three localities: Khor Al-Zubair lagoon (9), Garmat Ali River (47, 23) and Khor Abdullah (28) and from *L. abu* from Garmat Ali River (47, 23). All *H. mugilinus* reported above (9, 47, 23, 28) may represent *L. fluviatilis* (54).

Ligophorus sagmarius Kritsky, Khamees & Ali, 2013 was reported only from *C. subviridis* from Shatt Al-Arab Estuary near Al-Fao town (54).

Ligophorus sp. was reported only from *L. klunzingeri* from Shatt Al-Arab Estuary near Al-Fao town (54). It is appropriate to mention here that Kritsky *et al.* (54) considered all *Ligophorus* species are belonging to the family Dactylogyridae.

Paradactylogyryrus bati Tripathi, 1959 was recorded from *S. triostegus* from Al-Hammar marsh (48).

Family Dactylogyridae

This family is considered as the largest among all monogeneans of Basrah province as it is represented by 10 valid *Dactylogyrus* species and some unidentified species of this genus.

Dactylogyrus achmerowi Gussev, 1955 was recorded from *Ctenopharyngodon idella* and *Cyprinus carpio* from Basrah University experimental culture station and from *Cyprinus carpio* from the same station as well as from a fish farm in Al-Mdaina shire (46). This parasite was recorded for the first time in Iraq from *C. carpio* from two fish farms (65).

Dactylogyrus anchoratus (Dujardin, 1845) Wagener, 1857 was recorded only from *C. carpio* from Basrah University experimental culture station as well as from a fish farm in Al-Mdaina shire (46). *D. anchoratus* was recorded for the first time in Iraq from *C. carpio* from Tigris River at Al-Zaafaraniya, south of Baghdad city (66).

Dactylogyrus carassobarbi Gussev, Jalali & Molnár, 1993 was recorded only from *Barbus luteus* (= *Carasobarbus luteus*) from Garmat Ali River (7, 22). Its first record from Iraq was from *B. luteus* (= *C. luteus*) from Garmat Ali River (7).

Dactylogyrus cornu Linstow, 1878 was recorded from both *M. pelusius* and *S. triostegus* from Garmat Ali River (5). It was recorded for the first time in Iraq from *Barbus belayewi* (= *Capoeta damascina*), *B. grypus*, *B. xanthopterus* (= *Luciobarbus xanthopterus*), *Carassobarbus luteus* and *Chondrostoma regium* from Diyala River (15). *D. cornu* is known from 11 cyprinid genera as well as two non cyprinid fish genera: *Liza* and *Silurus* (42).

Dactylogyrus extensus Mueller & Van Cleave, 1932 was recorded from *C. carpio* from Basrah University experimental culture station and from a fish farm in Al-Mdaina shire (46). Its first record in Iraq was from *C. carpio* in some fish ponds (71). *D. extensus* is known from five cyprinid genera as well as two non cyprinid fish genera: *Micropterus* and *Misgurnus* (42).

Dactylogyrus fotedari (Jain, 1960) Gussev, 1973 was erroneously reported as *Dactylogyrus calbasi* Jain, 1960 only from *S. triostegus* from Al-Hammar marsh (48). *D. calbasi* was renamed as *D. fotedari* (39).

Dactylogyrus gobii Gvosdev, 1950 was recorded from both *A. dispar* and *Poecilia latipinna* from Garmat Ali River (50). Its first record in Iraq was from *C. carpio* from a fish farm in Babylon province (43).

Dactylogyrus hypophthalmichthys Akhmerov, 1952 was recorded only from *Hypophthalmichthys molitrix* from Basrah University experimental culture station and from a fish farm in Shatt Al-Arab shire (46). Its first record in Iraq was from *H. molitrix* in some fish ponds (71).

Dactylogyrus lamellatus Akhmerov, 1952 was recorded only from *C. idella* from Basrah University experimental culture station and from a fish farm in Shatt Al-Arab shire (46). Its first record in Iraq was from *C. idella* in some fish ponds (71).

Dactylogyrus vastator Nybelin, 1924 was recorded from 16 fish species in Basrah waters. These are *Acanthobrama marmid* from Al-Salihya canal (18), *Acanthopagrus latus* from Garmat Ali River (18), *Alburnus mossulensis* from Al-Salihya canal (18), *A. vorax* from Garmat Ali River (3), *B. luteus* (= *C. luteus*) from Garmat Ali River (3), *B. sharpeyi* (= *M. sharpeyi*) from Garmat Ali River (3, 20), *C. auratus* from Garmat Ali River and Al-Salihya canal (18), *Carassius carassius* from Garmat Ali River (3), *C. sellal* (= *A. sellal*) from Garmat Ali River (3), *C. idella* from Garmat Ali River (3), *C. carpio* from Garmat Ali River (3), *H. fossilis* from Garmat Ali River (3), *L. abu* from Garmat Ali River (47, 3, 23, 18), *L. subviridis* (= *C. subviridis*) from Garmat Ali River (47, 3, 23), *M. mastacembelus* from Garmat Ali River (3) and *S. triostegus* from Garmat Ali River (3). *D. vastator* was reported for the first time in Iraq from *Cyprinion macrostomum* from Tigris River at Baghdad (16). *D. vastator* is known from six cyprinid genera as well as two non cyprinid fish genera: *Esox* and *Misgurnus* (42).

Unidentified *Dactylogyrus* specimens were reported from seven host fishes (with their synonyms) from Basrah waters. These included *A. vorax* from Al-Hammar marsh (8; 10), *C. luteus* and its synonym *B. luteus* from Al-Hammar marsh (8, 10), *C. idella* from Basrah University experimental culture station (4, 44), *C. carpio* from Garmat Ali River (7) and from Basrah University fish farm (12), *L. abu* from Basrah University experimental culture station (12), *Mesopotamichthys sharpeyi* and its synonym *B. sharpeyi* from Al-Hammar marsh (8, 10) and *S. triostegus* and its synonym *Parasilurus triostegus* from Al-Hammar marsh (8, 10).

Family Diplectanidae

This family is represented by only two unidentified species of the genus *Diplectanum*.

Diplectanum species were recorded from *Johnius (Johnieops) sina* (= *Johnius dussumieri*) from Khor Al-Zubair lagoon (9) and from *Triacanthus biaculeatus* by from Khor Abdullah (67).

Family Gyrodactylidae

This family is represented by three valid *Gyrodactylus* species as well as some unidentified species of the same genus.

Gyrodactylus markevitschi Kulakovskaya, 1952 was recorded from *A. dispar* from Garmat Ali River (50). Its first record in Iraq was from *Varicorhinus trutta* (= *Capoeta trutta*) from Tigris River at Baiji town (2).

Gyrodactylus aff. *mugili* Zhukov, 1970 was recorded from *L. subviridis* (= *C. subviridis*) from Shatt Al-Arab estuary near Al-Fao town and from *Valamugil speigleri* from Shatt Al-Basrah canal (53).

Gyrodactylus vimbi Shul'man, 1954 was recorded from *S. triostegus* from Al-Hammar marsh (48). The same author (48) has erroneously stated the year of authority of this parasite as 1953 instead of 1954.

Unidentified *Gyrodactylus* species were reported from 10 host fishes from Basrah waters in addition to the record of the three above identified *Gyrodactylus* species. These fishes included both *A. marmid* and *A. latus* from Al-Salihya canal (18), *Alburnus mossulensis*, *A. vorax* and *B. luteus* (= *C. luteus*) from Garmat Ali River (18), *C. auratus* from both Garmat Ali River and Al-Salihya canal (18), *L. abu* from Garmat Ali River (47, 23, 18) and from Al-Salihya canal (18), *L. subviridis* (= *C. subviridis*) from Garmat Ali River (47, 23), *S. triostegus* from Al-Hammar marsh (48) and *Tenualosa ilisha* from Garmat Ali River (18). A recent detailed checklists of *Gyrodactylus* species so far recorded from fishes of Iraq showed the presence of 25 nominated species of this genus infecting 29 fish hosts (60).

Family Axinidae

This family is represented by two valid species and two unidentified species belonging to two genera.

Axine hemiramphae Unnithan, 1957 was recorded only from *Hemiramphus marginatus* from Khor Abdullah (26, 27).

Axine sp. was recorded only from *Ablennes hians* from Khor Abdullah (26, 27).

Axinoides sp. was recorded only from *A. hians* from Khor Al-Zubair lagoon (9).

Loxuroides sasikala (Unnithan, 1957) Price, 1962 was recorded from *A. hians* from Khor Abdullah (26, 27) under its synonym *Axine sasikala* Unnithan, 1957. The specific name of this parasite was misspelled as *saskala* by both above references.

Family Chauhaneidae

This family is represented by one species belonging to the genus *Pseudomazocraes*.

Pseudomazocraes sp. was recorded only from *Sillago sihama* from Khor Abdullah (26). *Pseudomazocraes* Caballero y Caballero & Bravo-Hollis, 1955 belongs to the family Chauhaneidae (35, 68). However, it is considered to belong to the family Discocotylidae (45). On 27th September 2012, Dr. David I. Gibson (personal communication in litt.) altered the database and now this genus, with the above authority, belongs to the family Chauhaneidae (73).

Family Diplozoidae

This family is represented by two valid species and some unidentified species belonging to the genus *Diplozoon*.

Diplozoon kasimii Rahemo, 1980 was recorded from eight fish species from Basrah waters. These fishes are *A. vorax* from Garmat Ali River (3, 18), *B. sharpeyi* (= *M. sharpeyi*) from Garmat Ali River (3), *C. luteus* and its synonym *B. luteus* from

Mehaijeran creek (51, 63), from Al-Hammar marsh (8, 10) and from Garmat Ali River (3), *C. carassius* from Garmat Ali River (3), *C. sellal* (= *A. sellal*) from Garmat Ali River (3), *C. carpio* from Garmat Ali River (3, 19), *L. abu* from Al-Salihya canal (18) and *L. subviridis* (= *C. subviridis*) from Garmat Ali River (3). *D. kasimii* was recorded for the first time in Iraq from *C. macrostomum* from Tigris River at Mosul (36) and then was published (70).

In addition to *D. kasimii*, unidentified *Diplozoon* species were recorded from six fish hosts from Basrah waters. These included *A. vorax* from Mehaijeran creek (51) and from Garmat Ali River (3), *C. carpio*, *H. fossilis*, *L. abu* and *M. mastacembelus* all from Garmat Ali River (3) and *Periophthalmus waltoni* from Khor Al-Zubair lagoon (61). *Diplozoon* lives on cyprinid fishes but also on some non cyprinid fishes such as *Lota lota* and *Perca fluviatilis* which are considered as secondary hosts (6). Diporpa larvae of *Diplozoon* sp. were also reported from *A. vorax* from Basrah waters (8, 7, 22).

Paradiplozoon pavlovskii (Bychowsky & Nagibina, 1959) was firstly recorded in Iraq from *A. vorax* from Mehaijeran creek (51, 63) under its previous name *Diplozoon pavlovskii*. *P. pavlovskii* was reported from both *A. vorax* and *C. luteus* (and its synonym *B. luteus*) from Al-Hammar marsh (8; 10). It was also reported from both *B. luteus* (= *C. luteus*) and *C. carassius* from Garmat Ali River (3).

Family Discocotylidae

This family is represented by two valid species as well as one unidentified species of the genus *Pseudodiscocotyla*.

Allodiscocotyla chorinemi Yamaguti, 1953, misspelled as *Allodiscocotyle*, was recorded only from *S. sihama* from Khor Abdullah (26). According to some electronic sites (35, 73), *Allodiscocotyla* belongs to the family Allodiscocotylidae.

Pseudodiscocotyla sp. was recorded only from *S. triostegus* from Al-Hammar marsh (1).

Vallisia chorinemi Yamaguti, 1953 was recorded only from *S. sihama* from Khor Abdullah (26).

Family Heteraxinidae

This family is represented in Basrah fishes by only two species belonging to two genera.

Crotalaxine serpentina Unnithan, 1957 was recorded only from *A. hians* from Khor Abdullah (26). Both generic and specific names of this parasite were misspelled as *Crotalaxina sepentina* by the same researcher (26).

Metamicrocotyla mugilis Yamaguti, 1968 was recorded only from *L. subviridis* (= *C. subviridis*) from Khor Abdullah (28). According to some electronic sites (35, 45, 73), *Metamicrocotyla* belongs to the family Microcotylidae.

Family Mazocraeidae

This family is represented by four valid species belonging to four genera.

Leptomazocraes indica Agrawal & Sharma, 1988 was recorded only from *Hilsa ilisha* (= *Tenuilosa ilisha*) from Khor Al-Zubair lagoon (9). The authority of this fish was stated as Hamilton-Buchanan, 1822 instead of Hamilton, 1822 by the same researcher (9).

Mazocraeoides dorosomata (Yamaguti, 1938) Sproston, 1946 was recorded only from *L. abu* from Garmat Ali River (47, 23). This species was originally described as *Pseudocotyle dorosomatis* (42).

Neomazocraes dorosomatis (Yamaguti, 1938) Price, 1943 was recorded only from *Nematalosa nasus* from Khor Al-Zubair lagoon (9). This species was originally described as *Discocotyle dorosomatis* (42).

Paramazocraes thrissocles Mamaev, 1975 was recorded only from *Thryssa mystax*, which is a misapplied name for *T. whiteheadi* (31), from Khor Al-Zubair lagoon (9). The authority of this parasite was given as Tripathi, 1959 by the above researcher (9).

Family Microcotylidae

This family is represented by two valid species belonging to genera *Microcotyle* and *Polylabris* as well as unidentified species of the genus *Microcotyle*.

Microcotyle donavini van Beneden & Hesse, 1863 was recorded from nine fish species in Basrah waters. These are *A. vorax* from Al-Hammar marsh (10) and from Garmat Ali River (3), *B. luteus* (= *C. luteus*), *B. sharpeyi* (= *M. sharpeyi*), *C. carassius*, *C. sellal* (= *A. sellal*), *C. idella* and *C. carpio* all from Garmat Ali River (3), *L. abu* from Garmat Ali River (47, 3, 23, 24, 18) and *L. subviridis* (= *C. subviridis*) from Garmat Ali River (47, 3, 23). This parasite was recorded for the first time in Iraq from *L. abu* in a fish farm at Babylon province (17).

In addition to *M. donovani*, unidentified *Microcotyle* species were also recorded from three fish species from Basrah waters. These included *A. vorax* from Al-Hammar marsh (8), *Chirocentrus nudus* from Khor Al-Zubair lagoon (9) and *L. abu* from Al-Majjidiah River (56). *Microcotyle* species reported from *A. vorax* (8) was later identified as *M. donavini* (10).

Polylabris mamaevi Ogawa & Egusa, 1980 was recorded only from *A. latus* from Khor Al-Zubair lagoon (9) and from the same fish from Khor Abdullah (11).

Fishes of Basrah with Monogenean Infections

Monogenean infections were reported from 33 species of bony fishes from Basrah province. These fishes belong to nine orders, 19 families and 30 genera (Table 2). Among these fishes, 18 were freshwater fishes, 11 marine fishes and four marine fishes entering fresh waters. In addition to the synonyms of some marine fishes explained

earlier in this article, the following remarks are needed to be stated here in connection with some of the freshwater fishes.

Barbus luteus reported by some Iraqi researchers (10, 7, 3, 22, 18) is considered as a synonym of *Carasobarbus luteus* (37). Also, *B. sharpeyi*, reported by some other researchers (3, 10, 20) is now considered as a synonym of *Mesopotamichthys sharpeyi* (37). *Chalcalburnus sellal* reported by one researcher (3) is considered as a synonym of *Alburnus sellal* (37). The presence of *Chalcalburnus mossulensis* is documented in the Tigris-Euphrates basin (32, 33). However, *Chalcalburnus* may be a synonym of *Alburnus* (32). The problem of the relationship of *C. sellal* remains to be resolved (34). *C. mossulensis*, reported in some Iraqi literature, is considered as *Alburnus mossulensis* (37). The Crucian carp *Carassius carassius* reported by one researcher from Basrah (3) is believed to be not distributed in Basrah waters (14) and this was probably a misidentification of *Carassius auratus*. However, the first record of *C. carassius* from Basrah waters was documented during September 1993 and later from some fish markets at cities of Baghdad, Samarra and Tikreet (13). Six reports are so far published on the parasitic fauna of *C. carassius* from mid Iraq (59).

Host-Parasite List

Names of all fish hosts infected with monogeneans in Basrah province are alphabetically arranged. For each host, the monogenean species are also alphabetically arranged. For each parasite species, the references are chronologically arranged but references of the same year are alphabetically arranged. The present host list included the valid as well as the synonymous names.

Ablennes hians: *Axine* sp. (26, 27), *Axinoides* sp. (9), *Crotalaxine serpentina* (26) and *Loxuroides sasikala* which was reported as *Axine sasikala* (26, 27).

Acanthobrama marmid: *Dactylogyrus vastator* (18) and *Gyrodactylus* sp. (18).

Acanthopagrus latus: *Dactylogyrus vastator* (18), *Gyrodactylus* sp. (18) and *Polylabris mamaevi* (9, 11).

Alburnus mossulensis: *Dactylogyrus vastator* (18) and *Gyrodactylus* sp. (18).

Alburnus sellal, reported as *Chalcalburnus sellal*: *Dactylogyrus vastator* (3), *Diplozoon kasimii* (3), *Microcotyle donavini* (3) and *Thaparocleidus vistulensis* which was reported as *Ancyloisocoides vistulensis* (3).

Aphanius dispar: *Ancyrocephalus polymorphus* (50, 52), *Dactylogyrus gobii* (50) and *Gyrodactylus markewitschi* (50).

Arius bilineatus: See *Netuma bilineata*.

Aspius vorax: *Dactylogyrus vastator* (3), *Dactylogyrus* sp. (8, 10), *Diplozoon kasimii* (3, 18), *Diplozoon* sp. as adult (51, 3) and as diporpa larva (8, 7, 22), *Gyrodactylus* sp. (18), *Microcotyle donavini* (10, 3), *Paradiplozoon pavlovskii* which was reported as *Diplozoon pavlovskii* (51, 63, 8, 10, 3) and *Thaparocleidus vistulensis* which was reported as *Ancyloisocoides vistulensis* (3).

Barbus luteus: See *Carasobarbus luteus*.

Barbus sharpeyi: See *Mesopotamichthys sharpeyi*.

Carasobarbus luteus, reported as *Barbus luteus* by all the following references cited for this fish except three references (51, 8, 63): *Dactylogyrus carassobarbi* (7, 22), *D. vastator* (3), *Dactylogyrus* sp. (8, 10), *Diplozoon kasimii* (51, 8, 63, 10, 3), *Gyrodactylus* sp. (18), *Microcotyle donavini* (3) and *Paradiplozoon pavlovskii* (8, 10, 3).

Carassius auratus: *Ancyrocephalus polymorphus* (18), *Dactylogyrus vastator* (18) and *Gyrodactylus* sp. (18).

Carassius carassius: *Dactylogyrus vastator* (3), *Diplozoon kasimii* (3), *Microcotyle donavini* (3) and *Paradiplozoon pavlovskii* (3).

Chalcalburnus sellal: See *Alburnus sellal*.

Chelon macrolepis, reported as *Liza macrolepis*: *Ligophorus mugilinus* which was reported as *Haliotrema mugilinus* (9).

Chelon subviridis, reported as *Liza subviridis*: *Ancyrocephalus* sp. (9), *Dactylogyrus vastator* (47, 3, 23), *Diplozoon kasimii* (3), *Gyrodactylus* aff. *mugili* (53), *Gyrodactylus* sp. (47, 23), *Haliotrema mugilis* (9, 26, 28), *Ligophorus bantingensis* (54), *L. fluviatilis* (54), *L. lebedevi* (54), *L. mugilinus* which was reported as *Haliotrema mugilinus* (9, 47, 23, 28), *L. sagmarius* (54), *Metamicrocotyla mugilis* (28) and *Microcotyle donavini* (47, 3, 23).

Chirocentrus nudus: *Microcotyle* sp. (9).

Ctenopharyngodon idella: *Dactylogyrus achmerowi* (46), *D. lamellatus* (46), *D. vastator* (3), *Dactylogyrus* sp. (4, 44) and *Microcotyle donavini* (3).

Cyprinus carpio: *Dactylogyrus achmerowi* (46), *D. anchoratus* (46), *D. extensus* (46), *D. vastator* (3), *Dactylogyrus* sp. (7, 12), *Diplozoon kasimii* (3, 19), *Diplozoon* sp. (3) and *Microcotyle donavini* (3).

Hemiramphus marginatus: *Axine hemiramphae* (26, 27).

Heteropneustes fossilis: *Dactylogyrus vastator* (3), *Diplozoon* sp. (3) and *Thaparocleidus vistulensis* which was reported as *Ancyloisocoides vistulensis* (3).

Hilsa ilisha: See *Tenualosa ilisha*.

Hypophthalmichthys molitrix: *Dactylogyrus hypophthalmichthys* (46).

Johnius dussumieri, reported as *Johnius (Johnieops) sina*: *Diplectanum* sp. (9).

Johnius (Johnieops) sina: See *Johnius dussumieri*.

Liza abu: *Dactylogyrus vastator* (47, 3, 23, 18), *Dactylogyrus* sp. (12), *Diplozoon kasimii* (18), *Diplozoon* sp. (3), *Gyrodactylus* sp. (47, 23, 18), *Ligophorus bantingensis* (54), *L. fluviatilis* (54), *L. mugilinus* which was reported as *Haliotrema mugilinus* (47, 23), *Mazocraeoides dorosomata* (47, 23), *Microcotyle donavini* (47, 3, 23, 24, 18), *Microcotyle* sp. (56) and *Thaparocleidus vistulensis* which was reported as *Ancyloisocoides vistulensis* (3).

Liza kluzingeri (Day, 1888): *Ligophorus bantingensis* (54), *L. fluviatilis* (54) and *Ligophorus* sp. (54).

Liza macrolepis: See *Chelon macrolepis*.

Liza subviridis: See *Chelon subviridis*.

Mastacembelus mastacembelus: *Dactylogyrus vastator* (3), *Diplozoon* sp. (3) and *Thaparocleidus vistulensis* which was reported as *Ancyloisocoides vistulensis* (3).

Mesopotamichthys sharpeyi, reported as *Barbus sharpeyi* by all the following references cited for this fish except one reference (8): *Dactylogyrus vastator* (3, 20), *Dactylogyrus* sp. (8, 10), *Diplozoon kasimii* (3), *Microcotyle donavini* (3) and *Thaparocleidus vistulensis* which was reported as *Ancyloisoides vistulensis* (3).

Mystus pelusius: *Dactylogyrus cornu* (5) and *Thaparocleidus vistulensis* which was reported as *Ancyloisoides vistulensis* (3, 5).

Nematalosa nasus: *Neomazocraes dorosomatis* (9).

Netuma bilineata, reported as *Arius bilineatus*: *Chauhanellus australis* which was reported as *Hamatopeduncularia australis* (9) and *Hamatopeduncularia* sp. (9, 49).

Parasilurus triostegus: See *Silurus triostegus*.

Periophthalmus waltoni: *Diplozoon* sp. (61).

Poecilia latipinna: *Dactylogyrus gobii* (50).

Sillago sihama: *Allodiscocotyla chorinemi* (26), *Pseudomazocraes* sp. (26) and *Vallisia chorinemi* (26).

Silurus triostegus: *Ancylodiscoides parasiluri* (48, 1), *Bychowkyella gharui* (48), *Cleidodiscus* sp. (48), *Dactylogyrus. cornu* (5), *D. fotedari* which was reported as *D. calbasi* (48), *D. vastator* (3), *Dactylogyrus* sp. (8, 10), *Gyrodactylus vimbi* (48), *Gyrodactylus* sp. (48), *Haliotrema* sp. (48), *Hamatopeduncularia arii* (48), *Paradactylogyrus bati* (48), *Pseudodiscocotyla* sp. (1) and *Thaparocleidus vistulensis* which was reported as *Ancylodiscoides vistulensis* (3, 5).

Tenualosa ilisha, reported as *Hilsa ilisha* (9): *Gyrodactylus* sp. (18) and *Leptomazocraes indica* (9).

Thryssa mystax: See *Thryssa whiteheadi*.

Thryssa whiteheadi, reported as *T. mystax*: *Paramazocraes thrissocles* (9).

Triacanthus biaculeatus: *Diplectanum* sp. (67).

Valamugil speigleri: *Gyrodactylus* aff. *mugili* (53).

Finally, it is appropriate to mention here that the 54 monogenean taxa so far recorded from fishes of Basrah province represent 31.8% of the total number of monogenean taxa from freshwater and marine fishes of whole Iraq (59). Such high percentage is due to the presence of marine monogeneans from fishes of Basrah province in addition to the freshwater monogeneans.

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Table (1). List of monogeneans of fishes of Basrah province*.

Class Monogenea

Subclass Monopisthocotylea

Order Dactylogyridea

Family Ancylo-discoididae

Ancylo-discoides parasiluri Yamaguti, 1937 {1/1}

Bychowskyella gharui (Tripathi, 1959) Gusev, 1961 {1/1}

Chauhanellus australis (Young, 1967) Bychowsky & Nagibina, 1969 {1/1}

Cleidodiscus sp. {1/1}

Hamatopeduncularia arii Yamaguti, 1953 {1/1}

Hamatopeduncularia sp. {1/1}

Thaparocleidus vistulensis (Siwak, 1932) Lim, 1996 {8/9}

Family Ancyrocephalidae

Ancyrocephalus polymorphus Gussev, 1955 {2/2}

Ancyrocephalus sp. {1/1}

Haliotrema mugilis (Tripathi, 1959) {1/1}

Haliotrema sp. {1/1}

Ligophorus bantingensis Soo & Lim, 2012 {3/3}

Ligophorus fluviatilis (Bychowsky, 1949) Dmitrieva, Gerasev, Gibson, Pronkina & Galli, 2012 {3/3}

Ligophorus lebedevi Dmitrieva, Gerasev, Gibson, Pronkina & Galli, 2012 {1/1}

Ligophorus mugilinus (Hargis, 1955) Euzet & Suriano, 1977 {3/3}

Ligophorus sagmarius Kritsky, Khamees & Ali, 2013 {1/1}

Ligophorus sp. {1/1}

Paradactylogyrus bati Tripathi, 1959 {1/1}

Family Dactylogyridae

Dactylogyrus achmerowi Gussev, 1955 {2/11}

Dactylogyrus anchoratus (Dujardin, 1845) Wagener, 1857 {1/4}

Dactylogyrus carassobarbi Gussev, Jalali & Molnár, 1993 {1/3}

Dactylogyrus cornu Linstow, 1878 {2/13}

Dactylogyrus extensus Mueller & Van Cleave, 1932 {1/16}

Dactylogyrus fotedari (Jain, 1960) Gussev, 1973 {1/1}

Dactylogyrus gobii Gvosdev, 1950 {2/3}

Dactylogyrus hypophthalmichthys Akhmerov, 1952 {1/1}

Dactylogyrus lamellatus Akhmerov, 1952 {1/3}

Dactylogyrus vastator Nybelin, 1924 {16/33}

Dactylogyrus spp. {7/9}

Family Diplectanidae

Diplectanum spp. {2/2}

Order Gyrodactylidea

Family Gyrodactylidae

Gyrodactylus markevitschi Kulakovskaya, 1952 {1/5}

Gyrodactylus aff. *mugili* Zhukov, 1970 {2/2}

Gyrodactylus vimbi Shul'man, 1954 {1/1}

Gyrodactylus spp. {10/15}

Subclass Polyopisthocotylea

Order Mazocraeidea

Family Axinidae

Axine hemiramphae Unnithan, 1957 {1/1}

Axine sp. {1/1}

Axinoides sp. {1/1}

Loxuroides sasikala (Unnithan, 1957) Price, 1962 {1/1}

Family Chauhaneidae

Pseudomazocraes sp. {1/1}

Family Diplozoidae

Diplozoon kasimii Rahemo, 1980 {8/13}

Diplozoon spp. {6/11}

Paradiplozoon pavlovskii (Bychowsky & Nagibina, 1959) {3/11}

Family Discocotylidae

Allodiscocotyla chorinemi Yamaguti, 1953 {1/1}

Pseudodiscocotyla sp. {1/1}

Vallisia chorinemi Yamaguti, 1953 {1/1}

Family Heteraxinidae

Crotalaxine serpentina Unnithan, 1957 {1/1}

Metamicrocotyla mugilis Yamaguti, 1968 {1/1}

Family Mazocraeidae

Leptomazocraes indica Agrawal & Sharma, 1988 {1/1}

Mazocraeoides dorosomata (Yamaguti, 1938) {1/1}

Neomazocraes dorosomatis (Yamaguti, 1938) Price, 1943 {1/1}

Paramazocraes thrissocles Mamaev, 1975 {1/1}

Family Microcotylidae

Microcotyle donavini van Beneden & Hesse, 1863 {9/10}

Microcotyle spp. {3/3}

Polylabris mamaevi Ogawa & Egusa, 1980 {1/1}

* Numbers in curly brackets occurring after the authority of each parasite refer to number of host species recorded for that parasite in Basrah province/ number of hosts recorded for the same parasite from the whole inland waters of Iraq based on data obtained from the index-catalogue of parasites of fishes of Iraq (59).

Table (2). List of Basrah fishes and their richness with the monogeneans^s.

Order Clupeiformes

Family Chirocentridae

* *Chirocentrus nudus* Swainson, 1839 {1/1}

Family Clupeidae

* *Nematalosa nasus* (Bloch, 1795) {1/1}

** *Tenuialosa ilisha* (Hamilton, 1822) {2/2}

Family Engraulidae

* *Thryssa whiteheadi* Wongratana, 1983 {1/1}

Order Cypriniformes

Family Cyprinidae

Acanthobrama marmid Heckel, 1843 {2/5}

Alburnus mossulensis Heckel, 1843 {2/4}

Alburnus sellal Heckel, 1843 {4/5}

Aspius vorax Heckel, 1843 {8/19}

Carasobarbus luteus (Heckel, 1843) {7/34}

Carassius auratus (Linnaeus, 1758) {2/12}

Carassius carassius (Linnaeus, 1758) {4/12}

Ctenopharyngodon idella (Valenciennes, 1844) {5/14}

Cyprinus carpio Linnaeus, 1758 {8/51}

Hypophthalmichthys molitrix (Valenciennes, 1844) {1/10}

Mesopotamichthys sharpeyi (Günther, 1874) {5/25}

Order Siluriformes

Family Ariidae

* *Netuma bilineata* (Valenciennes, 1840) {2/2}

Family Bagridae

Mystus pelusius (Solander, 1794) {2/3}

Family Heteropneustidae

Heteropneustes fossilis (Bloch, 1794) {3/4}

Family Siluridae

Silurus triostegus Heckel, 1843 {14/15}

Order Beloniformes

Family Belontiidae

* *Ablennes hians* (Valenciennes, 1846) {4/4}

Family Hemiramphidae

* *Hemiramphus marginatus* (Forsskål, 1775) {1/1}

Order Cyprinodontiformes

Family Cyprinodontidae

Aphanius dispar (Rüppell, 1829) {3/3}

Family Poeciliidae

Poecilia latipinna (Lesueur, 1821) {1/1}

Order Perciformes

Family Gobiidae

- * *Periophthalmus waltoni* Koumans, 1941 {1/1}
Family Sciaenidae
* *Johnius dussumieri* (Cuvier, 1830) {1/1}
Family Sillaginidae
* *Sillago sihama* (Forsskål, 1775) {3/3}
Family Sparidae
** *Acanthopagrus latus* (Houttuyn, 1782) {3/3}
- Order Synbranchiformes
Family Mastacembelidae
Mastacembelus mastacembelus (Banks & Solander, 1794) {3/6}
- Order Mugiliformes
Family Mugilidae
* *Chelon macrolepis* (Smith, 1846) {1/1}
** *Chelon subviridis* (Valenciennes, 1836) {12/12}
Liza abu (Heckel, 1843) {12/27}
** *Liza klunzingeri* (Day, 1888) {3/3}
** *Valamugil speigleri* (Bleeker, 1858) {1/1}
- Order Tetraodontiformes
Family Triaacanthidae
* *Triacanthus biaculeatus* (Bloch, 1786) {1/1}

§ Numbers in curly brackets occurring after the authority of each fish species refer to number of monogeneans recorded in that fish in Basrah province/ number of monogeneans recorded from that fish from the whole inland waters of Iraq, based on data obtained from the index-catalogue of parasites and disease agents of fishes of Iraq (59).

* Marine fishes, ** marine fishes entering fresh water and the remaining fishes are freshwater fishes.

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قوائم مرجعية للديدان المسطحة أحادية المنشأ المتطفلة على أسماك المياه العذبة والبحرية في محافظة البصرة، العراق

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الخلاصة. أظهر العرض المرجعي للديدان المسطحة أحادية المنشأ المتطفلة على أسماك المياه العذبة والبحرية في محافظة البصرة، العراق وجود 54 نوعا من هذه الديدان على 18 نوعا من أسماك المياه العذبة، 11 نوعا من الأسماك البحرية وخمسة أنواع من الأسماك البحرية الداخلة إلى المياه العذبة. من بين هذه الديدان، تمثلت مجموعة أحادية المحاجم الخلفية بـ 26 نوعا شرعيا مع ثمانية طفيليات مشخصة لمرتبة الجنس فقط، في حين تمثلت مجموعة متعددة المحاجم الخلفية بـ 14 نوعا شرعيا مع ستة طفيليات مشخصة لمرتبة الجنس فقط. تراوح عدد أنواع هذه الديدان لكل نوع سمكي من نوع واحد من الطفيليات في 11 مضيفا من الأسماك إلى 14 نوعا في أحد المضيفات (الجري الآسيوي). تراوح غنى أنواع المونوجينيا من خلال إصابتها لمضيف واحد في حالة 33 نوعا من تلك الطفيليات إلى إصابة 16 مضيفا في حالة الإصابة بالطفيلي *Dactylogyrus vastator*.