Abstract: Between January and December 2019, a total of 368 fish specimens were collected from Lake Hamrin in Diyala province, Iraq. Eight species of these fishes belonged to the family Cyprinidae, five to the family Leuciscidae as well as one species each to Bagridae, Heteropneustidae, Siluridae, Mugilidae and Mastacembelidae. After the laboratory examination these fishes were found to be infected with 30 monogeneans and two trematode species. The monogeneans included one species each of Mastacembelocleidus, Paradiplozoon, Solostamenides, and Thaparocleidus, two species of Dogielius, four species of Gyrodactylus and 20 species of Dactylogyrus, while the trematodes included one species each of Ascocotyle which infects eight fish species and Clinostomum which infect nine fish species. Clinostomum complanatum infected nine host species, also, the results of the present study revealed that 15 parasite species infect only one host species each. Carassius auratus was infected with 18 parasite species and Cyprinus carpio with nine species. Eight fish species are reported here as new host records in Iraq for 13 parasite species.

Keywords: Monogenea, Trematoda, Freshwater fishes, Diyala province, Lake Hamrin, Iraq.

Introduction

The study of fish parasites is necessary to increase the productivity of pond fish farms, to improve the stocks of valuable commercial fisheries in the natural waters and to the possibility of fish acclimatization in new sites or localities (Shulman, 1961). Monogenea is one of the largest classes within the phylum Platyhelminthes. Monogeneans usually possess anterior and posterior attachment apparatus that are used for settlement, feeding, locomotion and transfer from host to host (Bychowsky, 1957; Yamaguti, 1968; Kearn, 1998). The class Monogenea, used to be known as monogenetic trematodes, includes skin and gill flat worms with direct life cycles (Amlacher, 1970). Monogeneans are common in carp culture practices (Bauer et al., 1969). 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 (Gussev, 1985). It is interesting to state here that the name Monogeneidea, instead of Monogenea, is applied for this class with two subclasses: Polynchoinea and Heteronchoinea instead of Monopisthocotyliidea and Polyopisthocotyliidea, respectively (Boeger & Kritsky, 2001).
The trematodes live parasitically on fishes either as larval forms (metacercaria) in tissues of fish skin, gills and eyes or as adults in their digestive system (Hoffman, 1999). Most trematodes include endoparasitic flat worms with non-segmented body, closed digestive system, oral and ventral suckers and indirect life cycles. As adults, they live inside various vertebrates and spend their larval stages in intermediate hosts, mainly snails but also in some fishes (Olsen, 1974).

Lake Hamrin is located in Diyala province at about 10 km away from Al-Muqdadya city and at about 120 km east north of Baghdad city. This Lake was found after the compilation of Lake Hamrin on Diyala river in 1981. The present report on the monogenean and trematode infections in fishes of this lake was done because only one survey was achieved on infection of fishes of this lake by Balasem et al. (2000) in which two ciliophorans, seven myxozoans, nine monogeneans, two trematodes, one cestode, two nematodes and one crustacean were reported from 14 inspected fish species.

Materials & Methods

Fish samples were collected from the south part of Lake Hamrin in Diyala province, during the period from January to December 2019. These fishes were captured alive by using gill nets of different mesh sizes as well as cast nets. Fishes were brought to the laboratory in plastic containers filled with ice. These fishes were identified according to Coad (2010). Total length and weight was recorded for each fish. Smears from the skin, gills, buccal cavity and eye ball were taken and examined under a compound microscope. 

Parasite identification was done according to some text books (Bykhovskaya-Pavlovskaya et al., 1962; Yamaguti, 1968; Gussev, 1985; Hoffman, 1999; Pugachev et al., 2009). The prevalence of infection was calculated according to Margolis et al. (1982). The index-catalogue of parasites and disease agents of fishes of Iraq (Mhaisen, 2020) was followed to indicate number of previous host records for each parasite species in order to minimize list of references for each parasite species. The valid scientific names of these fish species, are based on Fricke et al. (2020), as shown in the following systematic account.

Class Actinopterygii
Order Cypriniformes
Family Cyprinidae
Arabibarbus grypus (Heckel, 1843)
Carasobarbus luteus (Heckel, 1843)
Carassius auratus (Linnaeus, 1758)
Cyprinion kais Heckel, 1843
Cyprinion macrostomum Heckel, 1843
Cyprinus carpio Linnaeus, 1758
Garra rufa (Heckel, 1843)
Luciobarbus xanthopterus Heckel, 1843
Family Leuciscidae
Acanthobrama marmid Heckel, 1843
Alburnus caeruleus Heckel, 1843
Alburnus sellal Heckel, 1843
Chondrostoma regium (Heckel, 1843)
Leuciscus vorax (Heckel, 1843)
Family Leuciscidae
Acanthobrama marmid Heckel, 1843
Alburnus caeruleus Heckel, 1843
Alburnus sellal Heckel, 1843
Chondrostoma regium (Heckel, 1843)
Leuciscus vorax (Heckel, 1843)
Order Siluriformes
Family Bagridae
Mystus pelusius (Solander, 1794)
Family Heteropneustidae
Heteropneustes fossilis (Bloch, 1794)
Family Siluridae
Silurus triostegus Heckel, 1843
Order Mugiliformes
Family Mugilidae
Planiliza abu (Heckel, 1843)
Order Synbranchiformes
Family Mastacembelidae
Mastacembelus mastacembelus (Banks & Solander, 1794)
Results & Discussion

A total of 368 fish specimens were captured. The parasitological investigation of these fishes revealed the presence of 30 monogenean species and two trematode species. The following is a brief account on the occurrence of these parasites which are alphabetically arranged under their classes. The first record of each parasite species in Iraq will be given. The total number of host species in Iraq and any new host record will be declared depending on Mhaisen (2020) without mentioning this reference each time.

Class Monogenea

The recorded monogeneans included one species each of Mastacenbelocleidus, Paradiplozoon, Solostamenides and Thaparocleidus, two species of Dogielus, four species of Gyrodactylus and 20 species of Dactylogyrus. These are alphabetically arranged in the following account.

Dactylogyrus achmerowi Gusev, 1955 was recorded from gills of C. carpio and G. rufa. Mhaisen et al. (1988) recorded this parasite for the first time in Iraq from C. carpio. A total of 16 other host species from different inland waters and fish farms in Iraq which did not include G. rufa, and hence G. rufa represents a new host for this parasite in Iraq.

Dactylogyrus anchoratus (Dujardin, 1845) Wagener, 1857 was reported from gills of C. auratus. Mhaisen et al. (1997) in a conference abstract reported this parasite for the first time in Iraq from C. carpio, but the full paper was published later by Mhaisen et al. (2003). Later on, it was reported from 12 other fish species which included C. auratus.

Dactylogyrus barbioides Gusev, Ali, Abdul-Ameer, Amin & Molnár, 1993 was recorded from gills of A. grypus. Gussev et al. (1993) described this parasite from Iraq as a new species from A. grypus (reported as Barbus grypus). After that, it was recorded in Iraq from six other host species.

Dactylogyrus barbula Gusev, Ali, Abdul-Ameer, Amin & Molnár, 1993 was recorded from gills of L. xanthopterus. Abdullah (1990) reported this parasite in Iraq from Luciobarbus barbula (as Barbus barbula) as D. dokani in an unpublished M. Sc. Thesis and then, it was nominated as D. barbli by Gussev et al. (1993). After that, it was reported from seven other host species which included L. xanthopterus.

Dactylogyrus baueri Gusev, 1955 was recorded from gills of C. auratus and C. regium. Al-Aubaidi et al. (1999) gave the first record of this parasite in Iraq from C. carpio. Later on, it was reported from eight other fish species inclusive of C. auratus but excluded C. regium, and hence C. regium represents a new host for this monogenean.

Dactylogyrus carasobarbi Gusev, Jalali & Molnár, 1993 was recorded from gills of C. luteus, C. auratus, C. regium, C. carpio and L. xanthopterus. Al-Ali (1998) gave the first record of this parasite in Iraq from C. luteus (as Barbus luteus). Nine other fish species, inclusive of C. luteus, C. regium and L. xanthopterus but exclusive of C. auratus and C. carpio were recorded from Iraq and hence both C. auratus and C. carpio represent new hosts in Iraq for this parasite.

Dactylogyrus deziensioides Gusev, Jalali & Molnár, 1993 was recorded from gills of C. regium and L. xanthopterus. Abdullah (2002) documented the first record of this parasite in Iraq from both L. barbula (reported as Barbus barbula) and L. xanthopterus (as B. xanthopterus). After that, it was reported from 13 other hosts which included C. regium.
Dactylogyrus dulkeiti Bychowsky, 1936 was reported from gills of C. auratus. Mohammad-Ali et al. (1999) represented its first record in Iraq from C. carpio. Later on, it was reported from nine other fish species which included C. auratus.

Dactylogyrus ergensi Molnár, 1964 was reported from gills of A. caeruleus, C. auratus and C. regium. Al-Zubaidy (1998) gave the first report on this monogenean in Iraq from C. carpio. Later on, it was reported from C. regium by Hameed (2019). So, A. caeruleus and C. auratus now represent new hosts in Iraq for this parasite.

Dactylogyrus extensus Mueller & Van Cleave, 1932 was recorded from gills of C. auratus and C. carpio. Salih et al. (1988) documented its first record in Iraq from C. carpio. After that, it was reported from 22 other host species inclusive of C. auratus. This parasite was also reported as D. solidus Akhmerov, 1948 which is a synonym of D. extensus as stated by Pugachev et al. (2009).

Dactylogyrus fallax Wagener, 1857 was reported from gills of L. vorax. Abdullah (2008) documented its first report in Iraq from Alburnus sellal (reported as Chalcalburnus mossauleensis). Later on, it was reported from two other fish species which included L. vorax.

Dactylogyrus formosus Kulwiec, 1927 was recorded from gills of C. auratus and C. carpio. Asmar et al. (2004) published its first report in Iraq from C. auratus. After that, it was recorded from six other fish species, inclusive of C. carpio.

Dactylogyrus inexpectatus Izjumova, in Gusev, 1955 was reported from gills of C. auratus. Salih et al. (1988) gave its first record in Iraq from Ctenopharyngodon idella. Later on, it was reported from six other fish species which included C. auratus.

Dactylogyrus kersini Gusev, Jalali & Molnár, 1993 was recorded from gills of L. xantheropterus. Abdullah (2002) demonstrated its first record in Iraq from L. kersin (reported as Barbus kersin). Later on, it was reported from four other fish species, inclusive of L. xantheropterus.

Dactylogyrus macrostomi Gusev, Ali, Abdul-Ameer, Amin & Molnár, 1993 was reported from gills of C. auratus and C. macrostomum. Abdullah (1990) reported this monogenean for the first time in Iraq from C. macrostomum as D. erbilensis in an unpublished M. Sc. Thesis, then, it was nominated as a new species (Dactylogyrus macrostomi) by Gussev et al. (1993). After that, it was reported from one more fish species (C. carpio). So, C. auratus now represents a new host species in Iraq for this parasite.

Dactylogyrus minutus Kulwiec, 1927 was recorded from gills of C. auratus, C. macrostomum and C. carpio. Mhaisen et al. (1997) declared its first record in Iraq from C. carpio by in a conference abstract and the full paper published was by Mhaisen et al. (2003). So far, it was reported from 14 other fish species inclusive of C. auratus and C. macrostomum.

Dactylogyrus pavlovskyi Bychowsky, 1949 was recorded from gills of A. grypus and L. vorax. Abdullah (1990) firstly described it in Iraq from A. grypus as D. tigrae in an unpublished M. Sc. Thesis, but then, it was nominated as a new species (D. pavlovskyi) by Gussev et al. (1993). After that, it was reported from 11 other fish species which did not include L. vorax and hence L. vorax represents a new host record in Iraq for this parasite.
Dactylogyrus persis Bychowsky, 1949 was reported from gills of C. luteus and C. auratus. Abdullah (2013) gave its first record in Iraq from C. luteus. Later on, it was reported from six other fish species exclusive of C. auratus. So, this fish now represents a new host record in Iraq for this parasite in Iraq.

Dactylogyrus polyepidis Alvarez-Pellitero, Simon Vicente & Gonzales Lanza, 1981 was recorded from gills of C. regium. Abdullah (2002) showed its first record in Iraq from C. regium. So, C. regium is so far considered as the only fish host species in Iraq for this parasite.

Dactylogyrus wegeneri Kulwiec, 1927 was recorded from gills of C. auratus and G. rufa. Abdul-Ameer (2006) published its first record in Iraq from C. carpio. Later on, it was recorded from three other fish species exclusive of C. auratus but exclusive of G. rufa and hence G. rufa represents a new host in Iraq for this parasite.

Dogielius molnari Jalali, 1992 was recorded from gills of C. auratus. Abdullah (2002) firstly recorded it in Iraq from C. macrostomum. After that, it was reported from two other fish species exclusive of C. auratus, so, C. auratus is considered as a new host in Iraq for this parasite.

Dogielius persicus Jalali & Molnár, 1990 was recorded from gills of C. luteus, C. auratus and C. kais. Abdullah (2002) showed its first report in Iraq from C. luteus. Later on, it was recorded from six other fish species exclusive of C. auratus. So, this fish is considered as a new host in Iraq for this parasite in Iraq.

Gyrodactylus baicalensis Bogolepova, 1950 was recorded from gills of P. abu. Salih et al. (1988) demonstrated its first report from Iraq from C. carpio. Later on, it was reported from 11 other fish species inclusive of P. abu.

Gyrodactylus cyprini Diarova, 1964 was reported from gills of C. auratus, C. regium, C. carpio and G. rufa. Ali & Shaaban (1984) documented its first report in Iraq from C. carpio and P. abu (as Liza abu). Later on, it was reported from 22 other fish species inclusive of A. grypus, C. auratus, C. regium, C. carpio and G. rufa.

Gyrodactylus elegans Nordmann, 1832 was reported from gills of A. grypus, C. auratus, C. regium, C. carpio and G. rufa. Ali & Shaaban (1984) documented its first report in Iraq from C. carpio and P. abu (as Liza abu). Later on, it was recorded from 22 other fish species inclusive of A. grypus, C. auratus, C. regium, C. carpio and G. rufa.

Gyrodactylus sprostonae Ling, 1962 was recorded from gills of C. auratus, C. carpio, H. fossilis and P. abu. Al-Zubaidy (1998) indicated its first record in Iraq from C. carpio. Later on, it was recorded from 12 other fish species inclusive of C. auratus and P. abu but exclusive of H. fossilis. So, this fish is considered as a new host in Iraq for this parasite.

Mastacembelocleidus heteranchorus (Kulkami, 1969) Kritsky, Pandey, Agrawal & Abdullah, 2004 was reported from gills of M. mastacembelus. Kritsky et al. (2004) described it as a new species from M. mastacembelus. No more reports for this parasite in Iraq are so far available. This species appears to be specific for M. mastacembelus in Asia (Kritsky et al., 2004).

Paradiplazoon iraqensis Al-Nasiri & Balbuena, 2016 was recorded from gills of P. abu. Al-Nasiri & Balbuena (2016) described it as a new species from C. macrostomum. One more host species in Iraq was reported, exclusive of P. abu, and hence P. abu is considered as a new host in Iraq for this parasite.
Solostamenides paucitesticulatus Kritsky & Öktener, 2015 was reported from gills of P. abu. Al-Nasiri & Balbuena (2018) indicated its first report in Iraq, as S. iraensis, from P. abu. As stated by Al-Helli et al. (2019), S. iraensis is a synonym of S. paucitesticulatus. No more hosts are so far known in Iraq.

Thaparocleidus vistulensis (Sivak, 1932) Lim, 1996 was reported from gills of S. triostegus. Abdul-Ameer (1989) stated its first report from Iraq, as Ancylodiscoides vistulensis, from S. triostegus. According to Lim et al. (2001), A. vistulensis is a synonym of T. vistulensis. Later on, this parasite (as A. vistulensis) was reported from eight other host species from Iraq.

Class Trematoda
The trematodes of the present study included one species of Ascocotyle and one species of Clinostomum. These are alphabetically arranged in the following account.

Ascocotyle coleostoma (Looss, 1896) Looss, 1899 metacercariae of this trematode were recorded from gills and skin of A. sellal, C. luteus, C. regium and L. vorax, as well as from gills of C. auratus, H. fossilis, M. pelusius and P. abu. Its first report from Iraq was by Ali et al. (1986) from H. fossilis and P. abu (as Liza abu). This is the commonest trematode infecting freshwater fishes of Iraq as it has infects 34 host species which included the eight above-named hosts of the study. Adults of this trematode infect the grey heron Ardea cinerea in Babylon fish farm, Babylon province (Mhaisen & Abul-Eis, 1992).

Clinostomum complanatum (Rudolphi, 1814) metacercariae of this parasite was recorded from gills of A. sellal, C. luteus, C. auratus, C. regium, C. kais, C. carpio, G. rufa, H. fossilis and P. abu. Its first record from Iraq was by Khamees (1983) from C. luteus and L. vorax (reported as Aspius vorax). Later on, it was reported from 24 other fish host species exclusive of G. rufa. So, this fish represents a new host in Iraq for this trematode. Adults of these metacercariae live in mouth and pharynx of some fish-eating birds (Duijn, 1973).

The list of monogeneans and trematodes of fishes of Lake Hamrin is demonstrated in table (1). These monogenean and trematode species are alphabetically arranged. The valid fish host species are also alphabetically arranged for each parasite species.

Table (1): Monogenean and trematode species with their site of infection and percentage incidence.

| Parasite species       | Host species | Site of infection* | % Incidence |
|------------------------|--------------|--------------------|-------------|
| Class Monogenea        |              |                    |             |
| Dactylogyrus achmerowi | C. carpio    | G                  | 5.7         |
|                        | G. rufa**    | G                  | 5           |
| D. anchoratus          | C. auratus   | G                  | 4.2         |
| D. barbliodes          | A. grypus    | G                  | 20          |
| D. barbioides          | L. xanthopterus | G               | 18.7        |
| D. baueri              | C. auratus   | G                  | 17          |
|                        | C. regium**  | G                  | 8.6         |
| D. carasobarbi         | C. luteus    | G                  | 73.5        |
|                        | C. auratus** | G                  | 4.2         |
|                        | C. regium    | G                  | 8.6         |
|                        | C. carpio**  | G                  | 1.9         |
|                        | L. xanthopterus | G               | 6.2         |
| Species                                    | Parasite                          | Hosts                                      | Prevalence | Intensity |
|--------------------------------------------|-----------------------------------|--------------------------------------------|------------|-----------|
| *D. deziensioides*                         | *C. regium*                       | G                                          | 4.3        |           |
|                                            | *L. xanthonpterus*                | G                                          | 50         |           |
| *D. dulkeiti*                              | *C. auratus*                      | G                                          | 6.3        |           |
| *D. ergensi*                               | *A. caeruleus**                   | G                                          | 33.3       | 2.1       |
|                                            | *C. auratus**                      | G                                          | 2.1        |           |
|                                            | *C. regium*                       | G                                          | 4.3        |           |
| *D. extensus*                              | *C. auratus*                      | G                                          | 4.2        |           |
|                                            | *C. carpio*                       | G                                          | 3.8        |           |
| *D. fallax*                                | *L. vorax*                        | G                                          | 8.3        |           |
| *D. formosus*                              | *C. auratus*                      | G                                          | 29.7       |           |
|                                            | *C. carpio*                       | G                                          | 1.9        |           |
| *D. inexpectatus*                          | *C. auratus*                      | G                                          | 6.3        |           |
| *D. kersini*                               | *L. xanthonpterus*                | G                                          | 6.2        |           |
| *D. macrostomi*                            | *C. auratus**                     | G                                          | 8.5        |           |
|                                            | *C. macrostomum*                  | G                                          | 25         |           |
| *D. minutus*                               | *C. auratus*                      | G                                          | 10.6       |           |
|                                            | *C. macrostomum*                  | G                                          | 25         |           |
|                                            | *C. carpio*                       | G                                          | 67.3       |           |
| *D. pavlovskyi*                            | *A. grypus*                       | G                                          | 100        |           |
|                                            | *L. vorax**                       | G                                          | 8.3        |           |
| *D. persis*                                | *C. luteus*                       | G                                          | 58.8       |           |
|                                            | *C. auratus**                     | G                                          | 2.1        |           |
| *D. polyplepidis*                          | *C. regium*                       | G                                          | 4.3        |           |
| *D. wegeneri*                              | *C. auratus*                      | G                                          | 4.2        |           |
|                                            | *G. rufa**                        | G                                          | 10         |           |
| *Dogielius molnari*                        | *C. auratus**                     | G                                          | 2.1        |           |
| *D. persicus*                              | *C. luteus*                       | G                                          | 14.7       |           |
|                                            | *C. auratus**                     | G                                          | 2.1        |           |
|                                            | *C. kais*                         | G                                          | 25         |           |
| *Gyrodactylus baicalensis*                 | *P. abu*                         | G                                          | 1          |           |
| *G. cyprini*                               | *C. carpio*                       | G                                          | 3.8        |           |
| *G. elegans*                               | *A. grypus*                       | G                                          | 40         |           |
|                                            | *C. auratus*                      | G                                          | 2.1        |           |
|                                            | *C. regium*                       | G                                          | 8.6        |           |
|                                            | *C. carpio*                       | G                                          | 3.8        |           |
|                                            | *G. rufa*                         | G                                          | 5          |           |
| *G. sprostonae*                            | *C. auratus*                      | G                                          | 2.1        |           |
|                                            | *C. carpio*                       | G                                          | 1.9        |           |
|                                            | *H. fossilis**                    | G                                          | 28.5       |           |
|                                            | *P. abu*                          | G                                          | 2          |           |
| *Mastacembelocleidus heteranchorus*         | *M. mastacembelus*                | G                                          | 100        |           |
| *Paradiplozoon iraqensis*                  | *P. abu**                        | G                                          | 1          |           |
| *Solostamenides paucitesticulatus*         | *P. abu*                         | G                                          | 10.3       |           |
| *Thaparocleidus vistulensis*               | *S. triostegus*                   | G                                          | 100        |           |

Class Trematoda

| Species                                    | Hosts                                      | Prevalence | Intensity |
|--------------------------------------------|--------------------------------------------|------------|-----------|
| *Ascocotyle coleostoma*                    | *A. sellal*                                | G, S       | 100       |
|                                            | *C. luteus*                                | G, S       | 17.6      |
|                                            | *C. auratus*                               | G          | 14.8      |
|                                            | *C. regium*                                | G, S       | 39.1      |
|                                            | *L. vorax*                                 | G, S       | 50        |
|                                            | *M. pelusius*                              | G          | 5.5       |
Conclusions
To sum up on the monogenean and trematode infections of fishes of the present study, *Clinostomum complanatum* was the prevalent parasite among these fishes due to its record from nine fish host species. *A. coleostoma* came in the second rank in this respect as it was recorded from eight fish species, while 15 monogeneans were monoxenous, i.e., was recorded from one host species each (Table 1). This is explained on the basis of host specificity which is known for most monogeneans (Gussev, 1985). Recently, Mhaisen & Abdul-Ameer (2019) in their checklists of *Dactylogyrus* species infecting fishes of Iraq demonstrated that 29 out of 82 *Dactylogyrus* species infected only one host species each. In connection with host infections, *C. auratus* was infected with 18 different parasite species, followed by *C. carpio* which was infected with nine species. Finally, many fishes are reported here as a new host record in Iraq for each parasite species: *A. caeruleus* for *D. ergensi*, *C. regium* for *D. baueri*, *C. carpio* for *D. carasobarbi*, *H. fossilis* for *G. sprostonae*, *L. vorax* for *D. pavlovskyi*, and *P. abu* for *P. iraqensis*. *G. rufa* was recorded as a new host for three for *D. achmerowi*, *D. wegeneri* and *C. complanatum*, while *C. auratus* was reported as a new host for *D. carasobarbi*, *D. ergensi*, *D. macrostomi*, *D. persis*, *Dogielius molnari* and *D. persicus*.

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Conflicts of interest
The authors declare that they have no conflict of interests.

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مونوجينيا ومخرّمات بعض الأسماك من بحيرة حمرين عند محافظة ديالى، العراق

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المستخلص: مابين شهر كانون الثاني وكانون الأول 2019، تم جمع 368 نموذجا سمكيا من بحيرة حمرين في محافظة ديالى، العراق. ثمانية أنواع، آثارت الكثافة الشبوطية، خمسة أنواع تعود إلى عائلة الشلق ونوع واحد فقط يعود لكل من عوائل الصقنقور، الجرّي اللاسع، الجرّي، البياح والمرمريج. هذه الأسماك كانت مصابة بثلاثين نوعا من المونوجينيا ونوعين من المخرّمات. أشتملت مجموعة المونوجينيا على نوع واحد من كل من الجنس Mastacembelocleidus والجنس Dogielius وأربعة أنواع من Thaparocleididae والجنس Solostamnides. ونوعين من الجنس Dactylogyrus، في حين أشتملت المخرّمات على نوع واحد لكل من الجنس Clinostomum، الجنس Ascocotyle، وأربعة أنواع من Ascometaria ونوعين من Clinostomum. ونوعات متعددة من Clinostomum complanatum. ونوعات متعددة من Clinostomum Ascocotyle. يشير هذا التحليل إلى حدوث نشاط للمؤثرات البيئية ولم الأسماك في بحيرة حمرين.

الكلمات المفتاحية: مونوجينيا، مخرّمات، أسماك المياه العذبة، محافظة ديالى، بحيرة حمرين، العراق.