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Checklists of Species of Ancylodiscoidid and Ancyrocephalid Monogeneans from Fishes of Iraq

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Abstract: Surveying 59 references concerning the occurrence of the monogeneans of the families Ancylodiscoididae and Ancyrocephalidae parasitizing fishes of Iraq showed the occurrence of 11 taxa of the family Ancylodiscoididae (genera *Ancylodiscoides*, *Bychowskyella*, *Chauhanellus*, *Hamatopeduncularia* and *Thaparocleidus*) and 19 taxa of the family Ancyrocephalidae (genera *Ancyrocephalus*, *Cichlidogyrus*, *Cleidodiscus*, *Haliotrema*, *Ligophorus* and *Mastacembelocleidus*). These monogeneans were reported from 19 valid fish host species in Iraq. Apart from five parasite species which were recorded from marine habitats (*Ancyrocephalus* sp., *Chauhanellus australis*, *Haliotrema mugilis*, *Hamatopeduncularia* sp. and *Ligophorus mugilinus*), the remaining parasite species were recorded from freshwater habitats. Among the infected fishes with these parasites, the Tigris catfish *Silurus triostegus* was infected with the highest number of parasite species (11 species), the mugilid fishes (*Planiliza abu* and *P. subviridis*) were infected with eight and seven parasite species, respectively, while 11 fish species were infected with only one parasite species each. Among the parasite species, *Thaparocleidus vistulensis* was reported from nine fish host species, while 22 parasite species were reported from one host species each. So far, eight synonymous names were applied for seven valid names of parasites of these two families in Iraq.

Keywords: Ancylodiscoididae, Ancyrocephalidae, Monogenea, Fishes, Iraq.

Introduction

The class Monogenea (previously used to be small worms that parasitize aquatic animals such as fishes and frogs. One of the most exciting things about this group of animals is the large number of species that exist (MonoDb, 2019). This group is also known as the Monogenoidea and the naming of the Monogenea/ Monogenoidea remains confusing, partly because there is no clear answer to the problem as indicated in the historical account given by MonoDb (2019). The class Monogenea includes 5567 species belonging to 62 families of which the family Ancylodiscoididae includes 417 species and

the family Ancyrocephalidae includes 1349 species (GBIF, 2019). According to a personal communication between the first author of the present article (FTM) and Dr. David I. Gibson of the British Museum (Natural History) on 15 September 2019, the classification of monogeneans is 'up in air', waiting on molecular biologists to sort it out.

According to their attachment organs that are found in the posterior part of their bodies (haptor), monogeneans are divided into two subclasses: Monopisthocotylea which are provided either with hooks and hooklets and Polyopisthocotylea which are provided with clamps (Gusev, 1985). These two subclasses can be thought as hookers and clampers (MonoDb, 2019).) According to Pugachev *et al.* (2009), who considered the name as Monogenoidea, these two subclasses are considered as Polyonchoinea and Oligo-nchoinea, respectively.

In Iraq, Herzog (1969) published the first article on fish parasites, but that article included no mention of any monogeneans. Fattohy (1975) described the first monogenean from fishes of Iraq which was *Paradiplozoon kasimii* (as *Diplozoon kasimii*). Later on, many researchers detected different monogeneans from fishes of Iraq which now reach a total of 239 species, constituting 28.8% of the total items of the parasitic fauna of fishes of Iraq (Mhaisen, 2019). Among the ancylodiscoidids, Abdul-Ameer (1989) was the first one to report on this group as she described *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*). Among the ancyrocephalids, Al-Daraji (1995) was the first one to report on this group as he recorded *Ancyrocephalus* sp., *Haliotrema mugilis* and *Ligophorus mugilinus* (as *Haliotrema mugilinus*).

The present checklist is the fourth checklist on monogeneans of fishes of Iraq, as a continuation to previous checklist concerned with *Gyrodactylus* species (Mhaisen & Abdul-Ameer, 2013), diplozoid species (Mhaisen & Abdul-Ameer, 2014) and *Dactylogyrus* species (Mhaisen & Abdul-Ameer, 2019). The aims of the present article are to revise Iraqi data on members of the families Ancylodiscoididae and Ancyro-cephalidae parasitizing fishes as such monogeneans and their hosts exhibited various synonyms and to provide updated parasite-host list and host-parasite list.

Materials & Methods

Fifty-nine references (29 research papers, 20 unpublished M. Sc. theses, five Ph. D. theses and five conference abstracts) dealing with these two families of monogenean parasites of fishes of Iraq were used to prepare the present article. Data from such references were gathered to provide parasite-fish list and fish-parasite list based on EOL (2019), GBIF (2019) and WoRMS (2019). For fishes, the scientific names were reported as they appeared in their original references but then they were checked with an account on freshwater fishes of Iraq (Coad, 2010). Fish valid names and their authorities were corrected according to well-known specialized electronic site (Fricke *et al.*, 2019).

Results & Discussion

Surveys achieved on ancylodiscoidids and ancyrocephalids from fishes of Iraq

The present article of available literature concerning the occurrence of ancylodiscoidid and ancyrocephalid monogeneans of fishes of Iraq indicated that the first record of such families was that of *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*) by

Abdul-Ameer (1989). After that, some surveys were achieved in different waters in Iraq which contributed in recording more species of these two families. The records of these parasites from fishes of Iraq can be grouped into seven major categories according to localities of collection of the infected fishes. For each category, references are chronologically listed. These categories are:

1- Tigris river at Nineveh province (Al-Niaeemi, 1997; Rahemo & Al-Neemi, 1999; Rahemo & Al-Niaeemi, 2001), Salah Al-Din province (Abdul-Ameer, 1989; Esmaeel, 2018; Owaied *et al.*, 2018) and Baghdad province (Mhaisen *et al.*, 1997; Adday *et al.*, 1999; Mhaisen *et al.*, 2003; Mansor *et al.*, 2012; Al-Saadi, 2013a; Al-Jawda & Asmar, 2014, 2015; Abdul-Ameer & Atwan, 2016; Atwan, 2016; Rasheed, 2016; Abdul-Ameer, 2017; Hammood, 2017; Abbas, 2019) as well as some tributaries of Tigris river which included Greater Zab river (Abdullah, 2002; Abdullah & Mhaisen, 2004; Kritsky *et al.*, 2004; Bashê, 2008; Shwani, 2009; Abdullah & Shwani, 2010; Bashê & Abdullah, 2010a, b; Bilal, 2016), Lesser Zab river (Abdullah, 2002; Abdullah & Mhaisen, 2004) and Diyala river (Abdul-Ameer & Obaid, 2011; Mohammed, 2017).

2- Euphrates river and its branches at Babylon province (Al-Sa'adi, 2007; Mhaisen *et al.*, 2015) and Al-Muthanna province (Al-Helli, 2019).

3- Shatt Al-Arab river (Kritsky *et al.*, 2013) and its branches at Basrah province which included Garmat Ali river (Jori, 1998; Abdul-Rahman, 1999; Al-Salim & Jori, 2000; Adday, 2001; Kadhim, 2009; Khamees *et al.*, 2012) and Al-Salihiya river (Al-Janae'e, 2010).

4- Some lakes and marshes: These included Darbandikhan lake at Sulaymaniyah province (Abdullah, 2013; Abdullah & Abdullah, 2015a, b), Hemrin dam lake at Diyala province (Balasem *et al.*, 2000) and Al-Hammar marsh at Basrah province (Jori, 2006; Abbas, 2007; Awad *et al.* (2007a, b, c).

5- Man-made lake at Baghdad province (Al-Nasiri, 2000; Al-Nasiri *et al.*, 2003).

6- Fish markets at Baghdad province (Abdul-Ameer, 2012; Al-Saadi, 2013b).

7- Marine waters of Khor Al-Zubair lagoon and Khor Abdullah, northwest of the Arab Gulf (Al-Daraji, 1995; Bannai, 2002; Bannai *et al.*, 2005; Jori & Mohamad, 2008).

Surveying literature concerning the ancylodiscoidid and ancyrocephalid monogeneans of fishes of Iraq showed the infection of 19 valid fish species with 30 parasite taxa. The full authority of each valid fish host species is shown in table (1).

Parasite-host list

Species of the ancylodiscoidid and ancyro-cephalid monogeneans so far parasitic on fishes of Iraq are listed in table (2).

The following is a brief account on the occurrence of these parasites in fishes of Iraq. They are alphabetically listed within their two families (Ancylodiscoididae and Ancyro-cephalidae). Names of valid fish host species for each monogenean species are also alphab-

betically arranged.

Family Ancylodiscoididae

The family Ancylodiscoididae is represented in fishes of Iraq with 11 species. These are: one species each of the genera *Ancylodiscoides*, *Bychowskyella*, *Chauhane-llus* and *Hamatopeduncularia*, six species of *Thaparocleidus* as well as one unidentified species of *Hamatopeduncularia*.

Ancylodiscoides parasiluri Yamaguti, 1937 was recorded only from gills of *Silurus triostegus* by Jori (2006), who considered it as a member of the subfamily Ancyrocephalinae of the family Dactylogyridae and by Abbas (2007), who also considered it as a member of the same subfamily and family. Awad *et al.* (2007b, c) also reported this parasite from the same fish and locality. GBIF (2019) listed two valid species of the genus *Ancylodiscoides* Yamaguti, 1937, inclusive of *A. parasiluri*. However, both EOL (2019) and WoRMS (2019) listed three valid species of this genus, inclusive of *A. parasiluri*.

Table (1): Valid fish species of Iraq with ancylodiscoidid and ancyrocephalid infections.

Class Actinopterygii
Order Cypriniformes
Family Cyprinidae
Carasobarbus luteus (Heckel, 1843)
Carassius auratus (Linnaeus, 1758)
Cyprinus carpio Linnaeus, 1758
Mesopotamichthys sharpeyi (Günther, 1874)
Family Leuciscidae
Alburnus sellal Heckel, 1843
Leuciscus vorax (Heckel, 1843)
Order Siluriformes
Family Ariidae
Netuma bilineata (Valenciennes, 1840)
Family Bagridae
Mystus pelusius (Solander, 1794)
Family Heteropneustidae
Heteropneustes fossilis (Bloch 1794)
Family Siluridae
Silurus glanis Linnaeus, 1758
Silurus triostegus Heckel, 1843
Order Synbranchiformes
Family Mastacembelidae
Mastacembelus mastacembelus (Banks & Solander, 1794)
Order Cichliformes
Family Cichlidae
Coptodon zillii (Gervais, 1848)
Oreochromis aureus (Steindachner, 1864)
Order Cyprinodontiformes
Family Aphaniidae
Aphanius stoliczkanus (Day 1872)
Order Mugiliformes
Family Mugilidae
Liza klunzingeri (Day, 1888)
Planiliza abu (Heckel, 1843)
Planiliza macrolepis (Smith, 1846)
Planiliza subviridis (Valenciennes, 1836)

Table (2): Valid species of Ancylodiscoididae and Ancyrocephalidae from fishes of Iraq.

Phylum Platyhelminthes
Class Monogenea
Subclass Monopisthocotylea
Order Dactylogyridea
Family Ancylodiscoididae
Ancylodiscoides parasiluri Yamaguti, 1937 {1}*
Bychowskyella gharui (Tripathi, 1959) Gusev, 1961 {3}
Chauhanellus australis (Young, 1967) Bychowsky & Nagibina, 1969 {1}
Hamatopeduncularia arii Yamaguti, 1953 {1}
Hamatopeduncularia sp. {1}
Thaparocleidus gomtius (Jain, 1952) Lim, 1996 {1}
Thaparocleidus macracanthus (Akhmerow, 1952) Lim, 1996 {1}
Thaparocleidus magnicirrus (Gusev & Strelkow, 1960) Lim, 1996 {1}
Thaparocleidus mediacanthus (Achmerow, 1952) Lim, 1996 {2}
Thaparocleidus siluri (Zandt, 1924) Lim, 1996 {1}
Thaparocleidus vistulensis (Sivak, 1932) Lim, 1996 {9}
Family Ancyrocephalidae
Ancyrocephalus polymorphus Gusev, 1955 {2}
Ancyrocephalus sp. {1}
Cichlidogyrus sclerosus Paperna & Thurston, 1969 {2}
Cichlidogyrus tiberianus Paperna, 1960 {1}
Cichldidogyrus tilapiae Paperna, 1960 {1}
Cleidodiscus sp. {1}
Haliotrema mugilis (Tripathi, 1959) Yamaguti, 1963{1}
Haliotrema sp. {1}
Ligophorus acuminatus Euzet & Suriano, 1977 {1}
Ligophorus bantingensis Soo & Lim, 2012 {3}
Ligophorus fluviatilis (Bychowsky, 1949) Dmitrieva, Gerasev, Gibson, Pronkina & Galli, 2012 {3}
Ligophorus heteronchus Euzet & Suriano, 1977 {1}
Ligophorus imitans Euzet & Suriano, 1977 {1}
Ligophorus lebedevi Dmitrieva, Gerasev, Gibson, Pronkina & Galli, 2012 {1}
Ligophorus mugilinus (Hargis, 1955) Euzet & Suriano, 1977 {3}
Ligophorus sagmarius Kritsky, Khamees & Ali, 2013 {1}
Ligophorus vanbenedenii (Parona & Perugia, 1890) Euzet & Suriano, 1977 {1}
Ligophorus sp. {1}
Mastacembelocleidus heteranchorus (Kulkarni, 1969) Kritsky, Pandey, Agrawal & Abdullah, 2004 {1}

* Numbers in curly brackets occurring after the authority of each parasite species refer to number of host species recorded for that parasite from the whole waters of Iraq based on Mhaisen (2019).

Bychowskyella gharui (Tripathi, 1959) Gusev, 1961 was recorded from gills of three fish species: *Carasobarbus luteus* (as *Barbus luteus*) by Esmaeel (2018), *Cyprinus carpio* by Esmaeel (2018) and Owaied *et al.* (2018) as well as *S. triostegus* by Jori (2006). It is reliable to state here that both Esmaeel (2018) and Owaied *et al.* (2018) had misspelled the generic name of this parasite as *Bychowskylla* instead of *Bychowskyella*, its specific name as *qhauri* instead of *gharui*, its authority as Tripathi, 1959 instead of the

above corrected authority and its family as Gyrodactylidae instead of Ancylodiscoididae. On the other hand, Jori (2006) considered this parasite as a member of the subfamily Ancyrocephalinae of the family Dactylogyridae. WoRMS (2019) listed five synonyms of *B. gharui*: *Bychowskyella gussevi* Agrawal & Sharma, 1990 nec Majumdar & Agarwal, 1989; *Silonditrema chauhani* Agrawal & Singh, 1981; *Silonditrema gharui* Tripathi, 1959; *Silonditrema lucknowensis* Agrawal & Singh, 1981 and *Silonditrema yogendrai* Agrawal & Singh, 1981. GBIF (2019) also considered these as synonyms, except *B. gussevi* which was considered as a valid species. According to GBIF (2019), the genus *Bychowskyella* Akhmerov, 1952 includes 29 species. EOL (2019) listed seven valid species of this genus, inclusive of *B. gharui*, while WoRMS (2019) listed 25 valid species of this genus, inclusive of *B. gharui*. As species of *Bychowskyella* are parasites of silurid fishes (Lim *et al.*, 2001), so their records from non silurid fishes might be as a result of misidentification.

Chauhanellus australis (Young, 1967) Bychowsky & Nagibina, 1969 was reported as *Hamatopeduncularia australis* Young, 1967 from gills of *Netuma bilineata* (as *Arius bilineatus*) by Al-Daraji (1995). GBIF (2019) and WoRMS (2019) recognized *H. australis* as a synonym of *C. australis.* The genus *Chauhanellus* Bychowsky & Nagibina, 1969 includes 30 accepted species (GBIF, 2019; WoRMS, 2019) while EOL (2019) listed only seven accepted species. According to a personal communication of the senior author on 15 September 2019 with Dr. David I. Gibson, the classification of Ancylodiscoididae in WoRMS (2019) is following Lim *et al.* (2001).

Hamatopeduncularia arii Yamaguti, 1953 was recorded only from gills of *S. triostegus* by Jori (2006) and Awad *et al.* (2007a). Jori (2006) considered this parasite as a member of the subfamily Ancyrocephalinae of the family Dactylogyridae. EOL (2019), GBIF (2019) and WoRMS (2019) listed *H. arii* among the valid species of the genus *Hamatopeduncularia* of the family Ancylodiscoididae.

Hamatopeduncularia sp. was recorded from gills of the marine fish *Netuma bilineata* (as *Arius bilineatus*) by Al-Daraji (1995) and Jori & Mohamad (2008). According to GBIF (2019), the genus *Hamatopeduncularia* Yamaguti, 1953 includes 34 valid species, while WoRMS (2019) listed 26 valid species and EOL (2019) listed 24 species.

Thaparocleidus gomtius (Jain, 1952) Lim, 1996 was reported as *Ancylodiscoides gomtius* from gills of *S. triostegus* by Mhaisen *et al.* (1997, 2003) and Al-Sa'adi (2007), as *Haplocleides gomtius* by Adday *et al.* (1999) and as *Thaparocleidus gomtius* by Mhaisen *et al.* (2015). It is reliable to state here that all these five above-named references had erroneously misspelled the specific name of this parasite as *gomitus* instead of *gomtius*. According to GBIF (2019) and WoRMS (2019), *Haplocleides gomtius* Jain, 1952; *Paradiscocoides gomtius* (Jain, 1952) Dubey, Gupta & Agarwal, 1992 and *Silurodiscoides gomtius* (Jain, 1952) Gusev, 1976 are all synonyms of *T. gomtius*. EOL (2019), GBIF (2019) and WoRMS (2019) listed 128, 121 and seven species, respectively of *Thaparocleidus* Jain, 1952 inclusive of *T. gomtius*.

Thaparocleidus macracanthus (Akhmerow, 1952) Lim, 1996 was recorded from gills of *S. triostegus* by Mohammed (2017). This is, so far, the only record of this

parasite from fishes of Iraq. *T. macracanthus* is considered as a valid species within the genus *Thaparocleidus* Jain, 1952 according to EOL (2019), GBIF (2019) and WoRMS (2019).

Thaparocleidus magnicirrus (Gusev & Strelkow, 1960) Lim, 1996 was recorded from gills of *S. triostegus* by Mohammed (2017). This is so far, the only record of this parasite from fishes of Iraq. *T. magnicirrus* is considered as a valid species within the genus *Thaparocleidus* according to EOL (2019), GBIF (2019) and WoRMS (2019).

Thaparocleidus mediacanthus (Achmerow, 1952) Lim, 1996 was recorded from gills of *Carasobarbus luteus* (as *Barbus luteus*) by Abdul-Ameer & Obaid (2011) as *Silurodiscoides mediacanthus* and from gills of *S. triostegus* and as *T. mediacanthus* by Mohammed (2017). GBIF (2019) and WoRMS (2019) recognized *Ancylodiscoides mediacanthus* Achmerow, 1952; *Parancylodiscoides mediacanthus* (Achmerow, 1952) Achmerow, 1964 and *Silurodiscoides mediacanthus* (Achmerow, 1952) Gusev, 1985 as synonyms of *T. mediacanthus*. EOL (2019) also listed *T. mediacanthus* as a valid species.

Thaparocleidus siluri (Zandt, 1924) Lim, 1996 was recorded from gills of *S. triostegus* as *Ancyrocephalus siluri* by Balasem *et al.* (2000) and by Al-Jawda & Asmar (2014) as *T. siluri*. Mansor *et al.* (2012) also reported this parasite, as *A. siluri*, without naming its host. According to a personal communication with J. M. Al-Jawda, this host is likely to be *S. triostegus* as N. T. Mansor (who is working with Al-Jawda) took the related data from him. GBIF (2019) and WoRMS (2019) recognized *Ancylodiscoides siluri* (Zandt, 1924) Yamaguti, 1963; *Ancyrocephalus siluri* Zandt, 1924; *Parancylodiscoides siluri* (Zandt, 1924) Achmerow, 1964; *Silurodiscoides siluri* (Zandt, 1924) Gusev, 1976 and *Urocleidus siluri* (Zandt, 1924) Mizelle & Hughes, 1938 as synonyms of *T. siluri*. EOL (2019) also listed *T. siluri* as a valid species.

Thaparocleidus vistulensis (Sivak, 1932) Lim, 1996 was reported from gills of *Alburnus sellal* (as *Chalcalburnus sellal*), *Heteropneustes fossilis*, *Leuciscus vorax* (as *Aspius vorax*), *Mastacembelus mastacembelus* and *Mesopotamichthys sharpeyi* (as *Barbus sharpeyi*) by Abdul-Rahman (1999) as well as from *Mystus pelusius* by both Abdul-Rahman (1999) and Adday (2001), *Planiliza abu* (as *Liza abu*) by Abdul-Rahman (1999), *Silurus glanis* by Al-Niaeemi (1997), Rahemo & Al-Neemi (1999), Rahemo & Al-Niaeemi (2001), Abdullah (2002) and Abdullah & Mhaisen (2004) and *S. triostegus* by Abdul-Ameer (1989), Abdul-Rahman (1999), Adday (2001), Al-Sa'adi (2007), Shwani (2009), Abdullah & Shwani (2010), Abdullah (2013), Abdullah & Abdullah (2015a, b), Al-Jawda & Asmar (2015), Mhaisen *et al.* (2015), Bilal (2016) and Al-Helli (2019). It is reliable to state here that all the above named references, concerning this monogenean, referred to it with its synonymous name *Ancylodiscoides vistulensis*, except Abdullah (2013), Abdullah & Abdullah (2015a, b), Al-Jawda & Asmar (2015), Mhaisen *et al.* (2015), Bilal (2016) and Al-Helli (2019) who referred to it with its valid name *T. vistulensis*. GBIF (2019) and WoRMS (2019) recognized four synonyms for *T. vistulensis* which are: *Ancylodiscoides vistulensis* (Sivak, 1932) Yamaguti, 1963; *Ancyrocephalus vistulensis* Sivak, 1932; *Silurodiscoides vistulensis* (Sivak, 1932) Gusev, 1985 and *Urocleidus vistulensis* (Sivak, 1932) Mizelle & Hughes, 1938. EOL (2019) also listed *T. vistulensis* as a valid

species. In connection with the presence of this parasite on nine fish host species in Iraq, inclusive of non siluriform fishes, it is possible that misidentification might occur as this parasite is known to infect only silurid fishes (Lim *et al.*, 2001; Pugachev *et al.*, 2009; EOL, 2019).

Family Ancyrocephalidae

The family Ancyrocephalidae is represented in fishes of Iraq with 19 species. These are: one species each of the genera *Ancyrocephalus*, *Haliotrema* and *Mastacembelocleidus*, three species of *Cichlidogyrus*, nine species of *Ligophorus* as well as unidentified species of the genera *Ancyrocephalus*, *Cleidodiscus*, *Haliotrema* and *Ligophorus*.

Ancyrocephalus polymorphus Gusev, 1955 was reported from gills of both *Aphanius stoliczkanus* (misidentified as *Aphanius dispar*) by Kadhim (2009) and Khamees *et al.* (2012) and *Carassius auratus* by Al-Janae'e (2010). *A. polymorphus* is considered as a valid species by EOL (2019), GBIF (2019) and WoRMS (2019). According to WoRMS (2019), the subspecies *Ancyrocephalus polymorphus typica* Gusev, 1955 is considered as a synonym of *A. polymorphus*.

Ancyrocephalus species was recorded from gills of *Planiliza subviridis* (as *Liza subviridis*) by Al-Daraji (1995). WoRMS (2019) listed 39 valid species of the genus *Ancyrocephalus* Creplin, 1839, while GBIF (2019) listed 45 accepted species of this genus.

Cichlidogyrus sclerosus Paperna & Thurston, 1969 was reported from gills of *Coptodon zillii* by Abdul-Ameer & Atwan (2016), Atwan (2016), Rasheed (2016), Abbas (2019) and Al-Helli (2019) as well as from gills of *Oreochromis aureus* by Abdul-Ameer & Atwan (2016), Atwan (2016), Abbas (2019) and Al-Helli (2019). According to GBIF (2019) and WoRMS (2019), *C. sclerosus* has one synonym which is *Cichlidogyrus bangladeshi* Ferdousi & Chandra, 2002.

Cichlidogyrus tiberianus Paperna, 1960 was reported from gills of *Coptodon zillii* by Atwan (2016), Rasheed (2016), Abdul-Ameer (2017) and Mohammed (2017). *C. tiberianus* is considered as a valid species according to EOL (2019), GBIF (2019) and WoRMS (2019).

Cichldidogyrus tilapiae Paperna, 1960 was reported from gills of *Coptodon zillii* by Abdul-Ameer & Atwan (2016) and Atwan (2016). According to GBIF (2019) and WoRMS (2019), *C. tilapiae* has two synonyms: *Cleidodiscus tilapiae* (Paperna, 1960) Price, 1967 and *Cichlidogyrus chandrai* Ferdousi & Chandra, 2002. GBIF (2019) listed 126 species of the genus *Cichlidogyrus* Paperna, 1960, while WoRMS (2019) listed 123 species, and in both sites, *C. tilapiae* is considered as a valid species.

Cleidodiscus species was reported from gills of *S. triostegus* by Jori (2006) who considered this species within the subfamily Ancyrocephalinae of the family Dactylogyridae. GBIF (2019) listed 15 species of the genus *Cleidodiscus* Mueller, 1934, while EOL (2019) listed six species and WoRMS (2019) listed seven accepted species for this genus. It is appropriate to mention here that the genus *Cleidodiscus* is considered within the family Ancylodiscoididae only by MonoDb (2019). The first author of this article received no any answer from eight concerned scientists (see the acknowledgement section of this article for their names) in MonoDb (2019) about this consideration.

Haliotrema mugilis (Tripathi, 1959) Yamaguti, 1963 was reported from gills of *Planiliza subviridis* (as *Liza subviridis*) by Al-Daraji (1995) and Bannai (2002) who both considered this parasite within the subfamily Ancyrocephalinae and the family Dactylogyridae. This is a valid species according to EOL (2019), GBIF (2019) and WoRMS (2019). The two latter electronic sites recognized *Ancylodiscoides mugilis* Tripathi, 1959 as a synonym of *H. mugilis*.

Haliotrema species was reported from gills of *S. triostegus* by Jori (2006) who considered this species within the subfamily Ancyrocephalinae of the family Dactylogyridae. According to Lim *et al.* (2001), members of the genus *Haliotrema* infect non-siluriform hosts. GBIF (2019) listed 145 species of the genus *Haliotrema* Johnston & Tiegs, 1922, while WoRMS (2019) listed 141 valid species of this genus.

Ligophorus acuminatus Euzet & Suriano, 1977 was reported only from gills of *Planiliza abu* (as *Liza abu*) by Abdul-Ameer (2012). *L. acuminatus* is considered as a valid species according to EOL (2019), GBIF (2019) and WoRMS (2019).

Ligophorus bantingensis Soo & Lim, 2012 was reported by Kritsky *et al.* (2013) from gills of three mullet species: *Liza klunzingeri*, *Planiliza abu* (as *Liza abu*) and *Planiliza subviridis* (as *Chelon subviridis*). This is a valid species according to GBIF (2019) and WoRMS (2019).

Ligophorus fluviatilis (Bychowsky, 1949) Dmitrieva, Gerasev, Gibson, Pronkina & Galli, 2012 was reported from gills of three fish species: *Liza klunzingeri* by Kritsky *et al.* (2013), *Planiliza abu* (also as *Liza abu*) by Kritsky *et al.* (2013), Atwan (2016) and Hammood (2017) and *Planiliza subviridis* (as *Chelon subviridis*) by Kritsky *et al.* (2013). This is a valid species according to EOL (2019), GBIF (2019) and WoRMS (2019). The two latter electronic sites recognized *Ancyrocephalus fluviatilis* as a synonym of *L. fluviatilis*.

Ligophorus heteronchus Euzet & Suriano, 1977 was recorded from gills of only *Planiliza abu* (as *Liza abu*) by Al-Saadi (2013b). *L. heteronchus* is a valid species according to EOL (2019), GBIF (2019) and WoRMS (2019).

Ligophorus imitans Euzet & Suriano, 1977 was recorded from gills of only *Planiliza abu* (as *Liza abu*) by Al-Saadi (2013a). This parasite is a valid species according to EOL (2019), GBIF (2019) and WoRMS (2019).

Ligophorus lebedevi Dmitrieva, Gerasev, Gibson, Pronkina & Galli, 2012 was recorded from gills of only *Planiliza subviridis* (as *Chelon subviridis*) by Kritsky *et al.* (2013). *L. lebedvi* is a valid species according to EOL (2019), GBIF (2019) and WoRMS (2019).

Ligophorus mugilinus (Hargis, 1955) Euzet & Suriano, 1977 was reported as *Haliotrema mugilinus* Hargis, 1955 from gills of three mullet species: *Planiliza abu* (as *L. abu*) by Jori (1998) and Al-Salim & Jori (2000), *Planiliza macrolepis* (as *Liza macrolepis*) by Al-Daraji (1995) and *Planiliza subviridis* (as *Liza subviridis*) by Al-Daraji (1995), Jori (1998), Al-Salim & Jori (2000) and Bannai *et al.* (2005). According to GBIF (2019) and WoRMS (2019), both *Haliotrema mugilinus* (Hargis, 1955) and *Pseudohaliotrema mugilinus* Hargis, 1955 are considered as synonyms of *L. mugilinus*.

Ligophorus sagmarius Kritsky, Khamees & Ali, 2013 was reported from gills of *Planiliza subviridis* (as *Chelon subviridis*) by Kritsky *et al.* (2013). *L. sagmarius* is a valid species according to EOL (2019), GBIF (2019) and WoRMS (2019).

Ligophorus vanbenedenii (Parona & Perugia, 1890) Euzet & Suriano, 1977 was reported from gills of *Planiliza abu* (as *Liza abu*) by Mhaisen *et al.* (1997), Adday *et al.* (1999), Al-Nasiri (2000) Al-Nasiri *et al.* (2003), Mhaisen *et al.* (2003), Al-Sa'adi (2007), Al-Jawda & Asmar (2014) and Mhaisen *et al.* (2015). All these references, except Al-Jawda & Asmar (2014) and Mhaisen *et al.* (2015) had reported this parasite as *Ancyrocephalus vanbenedenii*. According to GBIF (2019) and WoRMS (2019), *L. vanbenedenii* has six synonyms: *Ancyrocephalus vanbenedenii* (Parona & Perugia, 1890) Johnston & Tiegs, 1922; *Dactylogyrus benedeni* Saint-Remy, 1898; *Dactylogyrus vanbenedenii* Parona & Perugia, 1895, *Haliotrema vanbenedeni* (Parona & Perugia, 1890) Young, 1968; *Haplolcleidus vanbenedenii* (Parona & Perugia, 1890) Palombi, 1949 and *Tetraonchus vanbenedenii* Parona & Perugia, 1890. EOL (2019) also considered *L. vanbenedenii* as a valid species.

Ligophorus species was reported from gills of *Liza klunzingeri* by Kritsky *et al.* (2013). GBIF (2019) listed 68 accepted species within the genus *Ligophorus* Euzet & Soriano, 1977 while WoRMS (2019) listed 60 accepted species within this genus.

Mastacembelocleidus heteranchorus (Kulkarni, 1969) Kritsky, Pandey, Agrawal & Abdullah, 2004 was reported from gills of *Mastacembelus mastacembelus* by Kritsky *et al.* (2004), Al-Sa'adi (2007), Bashê (2008), Bashê & Abdullah (2010a, b), Abdullah (2013), Abdullah & Abdullah (2015a, b), Mhaisen *et al.* (2015), Atwan (2016), Mohammed (2017) and Al-Helli (2019). This parasite was described as species de novo by Kritsky *et al.* (2004) who considered it within the family Dactylogyridae. According to GBIF (2019) and WoRMS (2019), *M. heteranchorus* has one synonym which is *Urocleidus heteranchorus* Kulkarni, 1969. The genus *Mastacembelocleidus* Kritsky, Pandey, Agrawal & Abdullah, 2004 has two valid species, inclusive of *M. heteranchorus* according to EOL (2019), GBIF (2019) and WoRMS (2019).

The previous parasite-host list of the present article identified eight synonyms for seven species of both ancylodiscoidids and ancyrocephalids infecting fishes of Iraq. These are:

1- *Ancylodiscoides gomtius* as a synonym of *Thaparocleidus gomtius*.

2- *Haplocleides gomtius* as a synonym of *Thaparocleidus gomtius*.

3- *Silurodiscoides mediacanthus* as a synonym of *Thaparocleidus mediacanthus*.

4- *Ancylodiscoides siluri* as a synonym of *Thaparocleidus siluri*.

5- *Ancylodiscoides vistulensis* as a synonym of *Thaparocleidus vistulensis*.

6- *Hamatopeduncularia australis* as a synonym of *Chauhanellus australis*.

7- *Haliotrema mugilinus* as a synonym of *Ligophorus mugilinus*.

8- *Ancyrocephalus vanbenedenii* as a synonym of *Ligophorus vanbenedenii*.

The list of valid ancylodiscoidid and ancyrocephalid monogeneans infecting valid fish species of Iraq is demonstrated in table (3).

Host-parasite list

Names of all fish host species of Iraq, infected with ancylodiscoidid and ancyrocephalid mmonogeneans (19 valid fish names and ten synonyms) are alphabetically arranged in the following list. For each valid host species, parasite species are alphabetically arranged

according to the sequence of their families. For fishes, the scientific names were reported as they appeared in their original references but they were then checked with an account on freshwater fishes of Iraq (Coad, 2010). As indicated earlier in the section of Sources and Methods, fish valid scientific names were checked according to Fricke *et al.* (2019).

Table (3): Species of Ancylodiscoididae and Ancyrocephalidae with their fish host species.

Family Ancylodiscoididae	
Ancylodiscoides parasiluri	*Silurus triostegus*
Bychowskyella gharui	*Carasobarbus luteus, Cyprinus carpio, Silurus triostegus*
Chauhanellus australis	*Netuma bilineata*
Hamatopeduncularia arii	*Silurus triostegus*
Hamatopeduncularia sp.	*Netuma bilineata*
Thaparocleidus gomtius	*Silurus triostegus*
Thaparocleidus macracanthus	*Silurus triostegus*
Thaparocleidus magnicirrus	*Silurus triostegus*
Thaparocleidus mediacanthus	*Carasobarbus luteus, Silurus triostegus*
Thaparocleidus siluri	*Silurus triostegus*
Thaparocleidus vistulensis	*Alburnus sellal, Heteropneustes fossilis, Leuciscus vorax, Mastacembelus mastacembelus, Mesopotamichthys sharpeyi, Mystus pelusius, Planiliza abu, Silurus glanis, S. triostegus*
Family Ancyrocephalidae	
Ancyrocephalus polymorphus	*Aphanius stoliczkanus, Carassius auratus*
Ancyrocephalus sp.	*Planiliza subviridis*
Cichlidogyrus sclerosus	*Coptodon zillii, Oreochromis aureus*
Cichlidogyrus tiberianus	*Coptodon zillii*
Cichldidogyrus tilapiae	*Coptodon zillii*
Cleidodiscus sp.	*Silurus triostegus*
Haliotrema mugilis	*Planiliza subviridis*
Haliotrema sp.	*Silurus triostegus*
Ligophorus acuminatus	*Planiliza abu*
Ligophorus bantingensis	*Liza klunzingeri, Planiliza abu, P. subviridis*
Ligophorus fluviatilis	*Liza klunzingeri, Planiliza abu, P. subviridis*
Ligophorus heteronchus	*Planiliza abu*
Ligophorus imitans	*Planiliza abu*
Ligophorus lebedevi	*Planiliza subviridis*
Ligophorus mugilinus	*Planiliza abu, P. macrolepis, P. subviridis*
Ligophorus sagmarius	*Planiliza subviridis*
Ligophorus vanbenedenii	*Planiliza abu*
Ligophorus sp.	*Liza klunzingeri*
Mastacembelocleidus heteranchorus	*Mastacembelus mastacembelus*

Alburnus sellal (reported as *Chalcalburnus sellal*)
Family Ancylodiscoididae: *Thaparocleidusus vistulensis* (as *Ancylodiscoides vistulensis*).

Aphanius dispar: See *Aphanius stoliczkanus*.

Aphanius stoliczkanus
Family Ancyrocephalidae: *Ancyrocephalusus polymorphus*.

Arius bilineatus: See *Netuma bilineata*.

Aspius vorax: See *Leuciscus vorax*.

Barbus luteus: See *Carasobarbus luteus*.

Barbus sharpeyi: See *Mesopotamichthys sharpeyi*.

Carasobarbus luteus (reported as *Barbus luteus*)
Family Ancylodiscoididae: *Bychowskyella gharui*, *Thaparocleidus mediacanthus* (as *Silurodiscoides mediacanthus*).

Carassius auratus
Family Ancyrocephalidae: *Ancyrocephalusus polymorphus*.

Chalcalburnus sellal: See *Alburnus sellal*.

Coptodon zillii
Family Ancyrocephalidae: *Cichlidogyrus sclerosus*, *C. tiberianus*, *C. tilapiae*.

Cyprinus carpio
Family Ancylodiscoididae: *Bychowskyella gharui*.

Chelon subviridis: See *Planiliza subviridis*.

Heteropneustes fossilis
Family Ancylodiscoididae: *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*).

Leuciscus vorax (reported as *Aspius vorax*)
Family Ancylodiscoididae: *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*).

Liza abu: See *Planiliza abu*.

Liza klunzingeri
Family Ancyrocephalidae: *Ligophorus bantingensis*, *L. fluviatilis*, *Ligophorus* sp.

Liza macrolepis: See *Planiliza macrolepis*.

Liza subviridis: See *Planiliza subviridis*.

Mastacembelus mastacembelus
Family Ancylodiscoididae: *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*).
Family Ancyrocephalidae: *Mastacembelocleidus heteranchorus*.

Mesopotamichthys sharpeyi (reported as *Barbus sharpeyi*)
Family Ancylodiscoididae: *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*).

Mystus pelusius
Family Ancylodiscoididae: *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*).

Netuma bilineata (reported as *Arius bilineatus*)
Family Ancylodiscoididae: *Chauhanellus australis* (as *Hamatopeduncularia australis*), *Hamatopeduncularia* sp.

Oreochromis aureus
Family Ancyrocephalidae: *Cichlidogyrus sclerosus*.

Planiliza abu (also reported as *Liza abu*)
Family Ancylodiscoididae: *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*).
Family Ancyrocephalidae: *Ligophorus acuminatus*, *L. bantingensis*, *L. fluviatilis*, *L. heteronchus*, *L. imitans*, *L. mugilinus* (as *Haliotrema mugilinus*), *L. vanbenedenii* (also as *Ancyrocephalus vanbenedenii*).

Planiliza macrolepis (as *Liza macrolepis*)
Family Ancyrocephalidae: *Ligophorus mugilinus* (as *Haliotrema mugilinus*).

Planiliza subviridis (reported also as *Chelon subviridis* and *Liza subviridis*)
Family Ancyrocephalidae: *Ancyrocephalus* sp., *Haliotrema mugilis*, *Ligophorus bantingensis*, *L. fluviatilis*, *L. lebedevi*, *L. mugilinus* (as *Haliotrema mugilinus*), *L. sagmarius*.

Silurus glanis
Family Ancylodiscoididae: *Thaparocleidus vistulensis* (as *Ancylodiscoides vistulensis*).

Silurus triostegus

Family Ancylodiscoididae: *Ancylodiscoides parasiluri*, *Bychowskyella gharui*, *Hamatopeduncularia arii*, *Thaparocleidus gomtius* (also as *Ancylodiscoides gomtius* and as *Haplocleides gomtius*), *T. macracanthus*, *T. magnicirrus*, *T. mediacanthus*, *T. siluri* (also as *Ancylodiscoides siluri*), *T. vistulensis* (also as *Ancylodiscoides vistulensis*).

Family Ancyrocephalidae: *Cleidodiscus* sp., *Haliotrema* sp.

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Conflicts of interest

The authors declare that they have no conflict of interests.

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