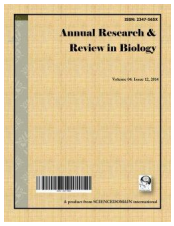

Annual Research & Review in Biology
7(2): 126-132, 2015, Article no.ARRB.2015.115
ISSN: 2347-565X

SCIENCEDOMAIN *international*
www.sciencedomain.org

A Second Collection of Monogeneans and Trematodes (Phylum Platyhelminthes) Parasitic on Some Fishes from Tigris River at Baghdad Province, Iraq

Jawdat Majeed Al-Jawda[1*] and Kassim Radhawye Asmar[1]

[1]Animal and Fish Research Center, Agriculture Research Directorate, Ministry of Science and Technology, P.O.Box 765, Al-Jadiriya, Baghdad, Iraq.

Authors' contributions

This work was carried out in collaboration between both authors. Both of them designed the study, wrote the protocol, interpreted the data, anchored the field study, gathered the initial data, performed preliminary data analysis, managed the literature searches and produced the initial draft. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ARRB/2015/17797
Editor(s):
(1) George Perry, Dean and Professor of Biology, University of Texas at San Antonio, USA.
Reviewers:
(1) Anonymous, University of Campinas, Brazil.
(2) Anonymous, Instituto Federal de Educação, Ciência e Tecnologia do Amazonas, Brazil.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=974&id=32&aid=9347

Original Research Article

Received 26th March 2015
Accepted 27th April 2015
Published 22nd May 2015

ABSTRACT

Aims: This works aims to report on the monogeneans and trematodes that infect some species of fishes from Tigris River in Baghdad Province, Iraq.
Place and Duration of Study: Tigris River in Baghdad Province at three sites in Baghdad province: Al-Taji in the north of Baghdad city, Al-Shawaka in the center of Baghdad city and Al-Zaafaraniya in the south of Baghdad city during the period from January to December 2011.
Methodology: Monthly samples were collected from three stations from Tigris River in Baghdad province with the aid of gill and cast nets. Fishes were examined for external and internal parasites. For each parasite species, prevalence of infection was calculated.
Statistical Analysis: A comparison of parasitic infections of fishes from the three stations was investigated.
Results and Discussion: Result of inspection showed that five (out of eight) fish species were

**Corresponding author: E-mail: jaljawda@gmail.com*

infected with 13 species of monogeneans and four species of trematodes. The monogeneans included one species each of *Paradiplozoon* and *Thaparocleidus*, two species of *Gyrodactylus* and nine species of *Dactylogyrus*, while the trematodes included one species each of *Ascocotyle* and *Clinostomum* and two species of *Diplostomum*. Among all these parasites, *A. coleostoma* infected the highest number of hosts (five host species), while 13 parasite species infected only one host each.

Among these fishes, *Carassius carassius* was infected with the highest number of parasite species (nine species), followed by *Carasobarbus luteus* (eight species) and *Chondrostoma regium* (four species) while no infection was detected from three fish species (*Alburnus caeruleus*, *Cyprinus carpio* and *Leuciscus vorax*).

In addition, a total of seven new host records in Iraq were reported for seven species of these parasites.

Conclusion: Host specificity is clear in monogeneans as 12 out of the 11 monogenean species infected one fish species each. All the trematodes were as metacercariae which later infect piscivorous aquatic birds.

Keywords: Monogenea; Trematoda; freshwater fishes; Tigris River; Baghdad; Iraq.

1. INTRODUCTION

The study of fish parasites is necessary to increase the productivity of pond 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 [1].

The class Monogenea, used to be known as monogenetic trematodes, includes skin and gill flat worms with direct life cycles [2]. These are important fish pathogens, especially for carp fingerlings under extensive fish culture practice. Their direct life cycles and fish crowding are good conditions for their easy spread among fishes [3].

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 [4]. Monogeneans cause irritation and excessive mucus production and their infection creates an open window for bacterial invasion [5].

With very few exceptions, trematodes include endoparasitic flat worms with non-segmented body, closed digestive system, oral and ventral suckers and indirect life cycles. As adults, trematodes live inside various vertebrates and spend their larval stages in intermediate hosts, mainly snails but also in some fishes [6]. Adult trematodes of fishes usually live in the digestive systems of their hosts but few live in the circulatory system [7]. Some trematodes live as larvae (metacercariae) in fish eyes [8] or gills and skin [2]. They are responsible for important fish diseases such as worm cataract, yellow grub and black spot disease [2,9]. Some trematodes can infect humans that eat metacercaria- infected fishes if such fishes are inadequately cooked [10].

The first published work on fish parasites in Iraq was done by Herzog [11]. After that, extensive surveys were done which resulted in the record of 162 valid monogenean and 46 trematode species from freshwater fishes of Iraq [12]. The present work, which is a continuation of a previous one [13], aimed to investigate monogenean and trematode infections among eight species of fishes from three different sampling sites along Tigris River at Baghdad province.

2. MATERIALS AND METHODS

Fishes were sampled from three sites in Tigris River at Baghdad province: Al-Taji in the north of Baghdad city, Al-Shawaka in the center of Baghdad city and Al-Zaafaraniya in the south of Baghdad city, during the period from January to December 2011. These fishes were captured by gill and cast nets of different mesh sizes. Fishes were brought to the laboratory with containers filled with ice. These fishes (Table 1) were identified according to Coad [14] and their scientific names followed Froese and Pauly [15].

Total length and weight of each fish specimen were recorded. Smears from the skin, gills, buccal cavity and eye lenses were examined under a compound microscope. Parasite identification was done according to some major

taxonomical books [4,16,17,18]. The prevalence of infection was calculated according to Margolis *et al.* [19]. The index-catalogue of parasites and disease agents of fishes of Iraq [12] was followed to indicate number of previous host records for each parasite in order to minimize list of references for each parasite species.

3. RESULTS AND DISCUSSION

A total of 98 fish specimens were captured from the three stations of collection (Table 1). The result of fish inspection showed that five species of these fishes were infected with 13 species of the class Monogenea and four species of the class Trematoda (Table 2).

The recorded monogeneans included one species each of *Paradiplozoon* of the family Diplozoidae and *Thaparocleidus* of the family Ancylodiscoididae, two species of *Gyrodactylus* of the family Gyrodactylidae and nine species of *Dactylogyrus* of the family Dactylogyridae. The trematodes included one species each of *Ascocotyle* of the family Heterophyidae and *Clinostomum* of the family Clinostomidae as well as two species of *Diplostomum* of the family Doplostomidae.

Data on monogenean and trematode infections of fishes of the sampling areas, site of infection and percentage incidence of infection for each parasite species are shown in Table (2). The following is brief account on the occurrence of these parasites.

3.1 Class Monogenea

A total of 13 monogenean species were reported from fishes of the present investigation. Nine of these monogeneans belong to the genus *Dactylogyrus*, two to the genus *Gyrodactylus* and one species each to the genera *Paradipolzoon* and *Thaparocleidus*. These monogeneans are alphabetically arranged in the following account.

3.1.1 *Dactylogyrus achmerowi* Gusev, 1955

This parasite was recorded from gills of *C. luteus*. The first record of this parasite in Iraq was from gills of *C. carpio* from Al-Wahda Fish Hatchery at Suwairah and Babylon (now Al-Furat) Fish Farm [20]. After that, it was reported from 10 other hosts in different inland waters and fish farms in Iraq [12] which included *C. luteus*.

3.1.2 *Dactylogyrus anchoratus* (Dujardin, 1845)

This parasite was recorded from gills of *C. carassius* and *C. regium*. The first report of this parasite in Iraq was from *C. carpio* from Tigris River at Al-Zaafaraniya, south of Baghdad [21]. Later on, it was reported from five other fish species which included *C. carassius* but not *C. regium* [12] which now represents the seventh host for *D. anchoratus* in Iraq.

3.1.3 *Dactylogyrus arcuatus* Yamaguti, 1942

This parasite was recorded from gills of *C. carassius*. Salih *et al.* [22] recorded this parasite for the first time in Iraq from skin, gills and buccal cavity of *C. carpio* from Al-Suwaira and Al-Latifiya fish farms. Later on, it was reported from five other hosts in Iraq which did not include *C. carassius* [12] and hence *C. carassius* represents a new host (the seventh) for *D. arcuatus* in Iraq.

3.1.4 *Dactylogyrus dulkeiti* Bychowsky, 1936

This parasite was recorded from gills of *C. carassius*. The first report of this parasite in Iraq was from gills of *C. carpio* from Al-Zaafaraniya Fish Farm, south Baghdad [23]. Later on, it was reported from four other fish species which included *C. carassius* [12].

3.1.5 *Dactylogyrus formosus* Kulwiec, 1927

This species was found from the gills of *C. carassius*. Asmar *et al.* [24] recorded it for the first time in Iraq on gills of *Carassius auratus* from a fish farm in south of Baghdad. Later on, it was recorded from another host which did not include *C. carassius* [12] and hence *C. carassius* represents a new host (the third) for *D. formosus* in Iraq.

3.1.6 *Dactylogyrus minutus* Kulwiec, 1927

This parasite was found on the gills of *C. carassius*. *D. minutus* was recorded for the first time in Iraq on the gills of *C. carpio* from Tigris River at Al-Zaafaraniya, south of Baghdad as well as from Al-Qadisia Dam Lake, west of Baghdad [21]. After that, it was reported from gills of 11 other fish hosts which included *C. carassius* [12].

3.1.7 *Dactylogyrus skrjabini* Achmerow, 1958

This parasite was reported from gills of *C. luteus*. Its first report in Iraq was from gills and buccal cavity of *Hypophthalmichthys molitrix* from Al-Suwaira and Al-Latifiya fish farms [22]. Later on, it was reported from five other hosts which included *C. luteus* [12].

3.1.8 *Dactylogyrus varicorhini* Bychowsky, 1957

This parasite was recorded from gills of *C. luteus*. The first report of this parasite in Iraq was from gills of both *B. luteus* (= *C. luteus*) and *Varicorhinus trutta* (= *Capoeta trutta*) from Tigris River at Baiji town of Salah Al-Deen province, Iraq [25]. Later on, it was reported from only one other host [12].

3.1.9 *Dactylogyrus vastator* Nybelin, 1924

This parasite was recorded from gills of *C. luteus*. Its first report from Iraq was from gills of *Cyprinion macrostomum* from Tigris River at Baghdad city and Al-Rashidiah town [26]. *D. vastator* is the commonest fish monogenean in Iraq as it has so far 33 fish hosts which included *C. luteus* [12].

3.1.10 *Gyrodactylus elegans* Nordmann, 1832

This parasite was recorded from gills of *C. carassius*. The first report on this parasite in Iraq was from gill arches of both *C. carpio* and *Liza abu* from Al-Zaafaraniya Fish Farm [27]. Later on, it was reported from 21 other fish hosts in north and mid Iraq which included *C. carassius* [12]. *G. elegans* is the commonest gyrodactylid species in fishes of Iraq [28].

3.1.11 *Gyrodactylus medius* Kathariner, 1895

This parasite was recorded from gills of *C. carassius*. The first report of this parasite in Iraq was from skin and gills of *C. carpio* from Babylon (now Al-Furat) Fish Farm near Hilla city [29]. Later on, it was reported from another host which was not *C. carassius* [12] and hence *C. carassius* represents a new host (the third) for this parasite in Iraq.

3.1.12 *Paradiplozoon pavlovskii* Bychowsky *et* Nagibina, 1959

This monogenean was found in the gills of *Liza abu*. It was reported for the first time in Iraq as *Diplozoon pavlovskii* from gills of *Aspius vorax* (= *L. vorax*) from Mehaijeran creek, Basrah [30]. Later on, it was recorded from nine other fish hosts from different locations in north, mid and south Iraq which did not include *L. abu* [12] and hence *L. abu* represents a new host for this parasite in Iraq.

3.1.13 *Thaparocleidus vistulensis* (Siwak, 1932)

This monogenean was found in the gills of *Silurus triostegus*. Its first report from Iraq, as *Ancylodiscoides vistulensis*, was from gills of *S. triostegus* from Tigris River at Baiji town of Salah Al-Dien province [25]. According to Lim *et al.* [31], *A. vistulensis* is a synonym of *T. vistulensis*. Later on, this parasite (as *A. vistulensis*) was reported from seven other hosts from north, mid and south Iraq [12].

3.2 Class Trematoda

The trematodes of the present study included one species each of genera *Ascocotyle* and *Clinostomum* and two species of *Diplostomum* (Table 2). These are alphabetically arranged in the following account.

3.2.1 *Ascocotyle coleostoma* (Looss, 1896)

Metacercariae of this trematode were recorded from gills and skin of *C. luteus*, *C. carassius*, *C. regium*, *L. abu* and *S. triostegus*. This metacercaria was reported for the first time in Iraq from gills of both *Heteropneustes fossilis* and *L. abu* from Diyala River, south of Baghdad [32]. This is the commonest trematode infecting freshwater fishes of Iraq as it has so far 34 host species [12] which included the five above-named hosts of the present study. Adults of *A. coleostoma* infect some piscivorous birds such as the grey heron *Ardea cinerea* in Babylon (now Al-Furat) Fish Farm, mid Iraq [33].

3.2.2 *Clinostomum complanatum* (Rud., 1814)

Metacercariae of this parasite were recorded from gills of *C. luteus*. This metacercaria was reported for the first time in Iraq from gills of *C. luteus* from Mehaijeran creek, Basrah [30]. Later on, it was reported from 21 different fish hosts [12]. Adults of this worm live in the mouth and pharynx of some fish-eating birds [9].

3.2.3 *Diplostomum commutatum* (Diesing, 1850)

Metacercariae of this parasite were recorded from eye lenses of *C. luteus* and *C. regium*. The

first report of *D. commutatum* in Iraq was from eye lenses of *A. vorax* (= *L. vorax*) from Tigris River at Baghdad [34]. Later on, it was reported from three other hosts which included *C. luteus* but not *C. regium* [12] and hence *C. regium* now represents a new host (the fifth) for *D. commutatum* in Iraq.

3.2.4 *Diplostomum spathaceum* (Rud., 1819)

Metacercariae of this trematode were recorded from eye lenses of *C. luteus*, *C. regium* and *C. carassius*. This parasite was reported for the first time in Iraq from eye lenses of *B. luteus* (= *C. luteus*), *C. macrostomum* and *C. carpio* from

Table 1. Number of the examined fishes from three stations at Tigris River

Fish scientific name	No. fish examined from:			
	Al-Taji	Al-Shawaka	Al-Zaafaraniya	Total
Alburnus caeruleus Heckel, 1843	-	1	1	2
Carasobarbus luteus (Heckel, 1843)	9	20	5	34
Carassius carassius (Linnaeus, 1758)	12	2	5	19
Chondrostoma regium (Heckel, 1843)	8	9	-	17
Cyprinus carpio Linnaeus, 1758	-	-	1	1
Leuciscus vorax (Heckel, 1843)	-	-	1	1
Liza abu (Heckel, 1843)	7	1	11	19
Silurus triostegus Heckel, 1843	-	5	-	5
Total	36	38	24	98

Table 2. Infection of fishes from Tigris River at Al-Taji (T), Al-Shawaka (S) and Al-Zaafaraniya (Z) with monogeneans and trematodes with their site of infection and percentage incidence

Parasite species	Host species	Site of infection*	% Incidence	Sampling area		
				T	S	Z
Monogenea:						
D. achmerowi	*C. luteus*	G	5.9	√	√	
D. anchoratus	*C. carassius***	G	5.3	√		
	C. regium	G	5.9	√		
D. arcuatus	*C. carassius***	G	10.5		√	√
D. dulkeiti	*C. carassius*	G	5.3			√
D. formosus	*C. carassius***	G	15.8	√		√
D. minutus	*C. carassius*	G	10.5	√	√	
D. skrjabini	*C. luteus*	G	32.4	√	√	√
D. varicorhini	*C. luteus*	G	76.5	√	√	√
D. vastator	*C. luteus*	G	2.9		√	
G. elegans	*C. carassius*	G	5.3			√
G. medius	*C. carassius***	G	10.5	√		√
P. pavlovskii	*L. abu***	G	10.5			√
T. vistulensis	*S. triostegus*	G	80.0		√	
Trematoda:						
A. coleostoma	*C. luteus*	S, G	14.7		√	√
	C. carassius	S, G	5.3	√		
	C. regium	S, G	5.9		√	
	L. abu	G	5.3			√
	S. triostegus	S, G	40.0		√	
C. complanatum	*C. luteus*	G	2.9		√	
D. commutatum	*C. luteus*	El	2.9		√	
	*C. regium***	El	11.8	√	√	
D. spathaceum	*C. luteus*	El	2.9		√	
	*C. carassius***	El	5.3	√		
	C. regium	El	23.5		√	

** Site of infection: G= Gills, S= Skin, El= Eye lenses; ** New host record in Iraq*

Dokan Dam Lake [35]. Later on, it was reported from 29 other hosts which did not include *C. carassius* [12]. So, *C. carassius* now represents a new host for *D. spathaceum* in Iraq. The adult worms live in the intestine of fish-eating birds such as some gulls like *L. canus* and *L. ichthyaetus* from Shatt Al-Arab River [36].

4. CONCLUSION

To conclude on the monogenean and trematode infections of fishes of the present study, *A. coleostoma* was the prevalent parasite among these fishes as it was recorded from five fish hosts, followed by *D. spathaceum* which was recorded from three fish species. On the other hand, all the monogeneans were detected from one host each, except *D. anchoratus* which was recorded from two host species.

In connection with fish hosts, *C. carassius* was infected with the highest number of parasite species (nine species), followed by *C. luteus* (eight species), *C. regium* (four species), *L. abu* and *S. triostegus* (two parasite species each) while no infection was reported from *A. caeruleus*, *C. carpio* and *L. vorax.* The absence of infection from these fish species might be attributed to the few samples of such fishes in comparison with those of other fish species (Table 1). In addition, seven new host records in Iraq were reported for seven species of these parasites.

Differences in the infection among fishes from the three sampling areas indicated that fishes of Al-Shawaka were infected with 15 species, those of Al-Taji with 11 species while those of Al-Zaafaraniya were infected with 10 species. These numbers are, to some extent, in accordance with number of fishes sampled (Table 1).

All the four recorded trematodes of the present study were reported as metacercariae which develop to adults when the infected fishes are predated by piscivorous aquatic birds.

ACKNOWLEDGEMENTS

Thanks are due to Dr. F. T. Mhaisen for providing us with previous records of monogeneans and trematodes of fishes of Iraq.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Shul'man SS. Specificity of fish parasites. In: Dogiel VA, Petrushevski GK, Polyanski YuI, editors. Parasitology of fishes (English translation). Edinburgh and London: Oliver and Boyd; 1961.
2. Amlacher E. Textbook of fish diseases (English translation). Jersey City: TFH Publ; 1970.
3. Bauer ON, Musselius VA, Strelkov YuA. Diseases of pond fishes. Moscow: Izdat. Kolos; 1969. (Russian).
4. Gussev AV. Parasitic metazoans: Class Monogenea. In: Bauer, ON. Editor. Key to the parasites of freshwater fish fauna of U.S.S.R. Petersburg: Nauka; 1985;2. Russian.
5. Reed P, Francis-Floyd R, Klinger RE, Petty D. Monogenean parasites of fish. (FA28, Ser. Fish. Aquat. Sci., Dept, Florida Coop. Exten. Serv.), Inst. Food Agric. Sci., Univ. Florida; 1996.
6. Olsen OW. Animal parasites: Their life cycles and ecology. 3rd ed. Baltimore: Univ. Park Press; 1974.
7. Kirk RS. *Sanguinicola inermis* and related species. In: Woo PTK, Buchmann K editors. Fish parasites: Pathobiology and protection. Wallingford: CAB International; 2012.
8. Karvonen A. *Diplostomum spathaceum* and related species. In: Woo PTK, Buchmann K. editors. Fish parasites: Pathobiology and protection. Wallingford: CAB International; 2012.
9. Duijn van C. Jnr. Diseases of fishes, 3rd ed. London: Iliffe Books; 1973.
10. Noga EJ. Fish disease: Diagnosis and treatment, 2nd ed. New Jersey: Wiley-Blackwell Publ; 2010.
11. Herzog PH. Untersuchungen über die parasiten der süßwasserfische des Irak. Arch Fischereiwis. 1969;20(2/3):132-147.
12. Mhaisen FT. Index-catalogue of parasites and disease agents of fishes of Iraq. (Unpublished).
13. Al-Jawda JM, Asmar KR. Monogeneans and trematodes of some fishes from Tigris River at north, mid and south of Baghdad province, Iraq. Iraqi J Agric. (Special Issue). 2014;19(1):193-202.
14. Coad BW. Freshwater fishes of Iraq. Moscow: Pensoft Publ; 2010.
15. Froese R, Pauly D. editors. FishBase. World Wide Web electronic publication. Available:www.fishbase.org (Accessed March 2015)

16. Bykhovskaya-Pavlovskaya IE, Gusev AV, Dubinina MN, Izyumova NA, Smirnova TS, Sokolovskaya IL, Shtein, GA, Shul'man SS, Epshtein, VM. Key to parasites of freshwater fish of the U.S.S.R. Moscow: Akad Nauk SSSR; 1962. (Russian).
17. Yamaguti S. Systema helminthum Vol. IV. Monogenea and Aspidocotylea. New York: Intersci. Publ; 1963.
18. Hoffman GL. Parasites of North American freshwater fishes, 2nd ed. London: Cornell Univ. Press; 1998.
19. Margolis L, Esch GW, Holmes JC, Kuris AM, Schad GA. The use of ecological terms in parasitology (Report of *ad hoc* committee of the American Society of Parasitologists). J Parasitol. 1982;68(1): 131-133.
20. Mhaisen FT, Ali NM, Abul-Eis ES, Kadim LS. First record of *Dactylogyrus achmerowi* Gussev, 1955 with an identification key for the dactylogyrids of fishes of Iraq. J Biol Sci Res. 1988;19(Suppl.):887-900.
21. Mhaisen FT, Balasem AN, Al-Khateeb GH, Asmar KR. Recording of five monogenetic trematodes for the first time from fishes of Iraq. Bull Iraq Nat Hist Mus. 2003;10(1): 31-38.
22. Salih NE, Ali NM, Abdul-Ameer KN. Helminthic fauna of three species of carp raised in ponds in Iraq. J Biol Sci Res. 1988;19(2):369-386.
23. Mohammad-Ali NR, Balasem AN, Mhaisen FT, Salih AM, Waheed IK. Observations on the parasitic fauna in Al-Zaafaraniya Fish Farm, south of Baghdad. Vet. 1999;9(2): 79-88.
24. Asmar KR, Balasem AN, Al-Jawda JM, Adday TK. Recording of parasitic and fungal infections in three fish farms, south of Baghdad. Iraqi J Aquacult. 2004;2:117-132. Arabic.
25. Abdul-Ameer KN. Study of the parasites of freshwater fishes from Tigris River in Salah Al-Dien province, Iraq. M Sc Thesis, Coll Sci, Univ Baghdad; 1989. (Arabic).
26. Ali NM, Salih NE, Abdul-Ameer KN. Parasitic fauna of some freshwater fishes from Tigris River, Baghdad, Iraq. II: Trematoda. J Biol Sci Res. 1987;18(2):19-27.
27. Ali MD, Shaaban F. Some species of parasites of freshwater fish rose in ponds and in Tigris- Al-Tharthar canal region. Seventh Sci Conf Iraqi Vet Med Assoc, Mosul: 23-25 Oct. 1984;44-46.
28. Mhaisen FT, Abdul-Ameer KN. Checklists of *Gyrodactylus* species (Monogenea) from fishes of Iraq. Basrah J Agric Sci. 2013;26 (Special Issue 1):8-25.
29. Al-Zubaidy AB. Studies on the parasitic fauna of carps in Al-Furat Fish Farm, Babylon province, Iraq. Ph D Thesis, Coll Sci, Univ Babylon; 1998. (Arabic).
30. Khamees NR. Study of the parasites of *Carasobarbus luteus* (Heckel), *Liza abu* (Heckel) and *Aspius vorax* Heckel from Mehaijeran canal, south of Basrah. M Sc Thesis, Coll Agric, Univ Basrah; 1983. (Arabic).
31. Lim LHS, Timofeeva TA, Gibson DI. Dactylogyridean monogeneans of the siluriform fishes of the Old World. Syst Parasitol. 2001;50:159-197.
32. Ali NM, Al-Jafery AR, Abdul-Ameer KN. New records of three digenetic trematodes on some freshwater fishes from Diyala River, Iraq. Proc 4th Sci Conf, Sci Res Counc. 1986;5(1):10-19.
33. Mhaisen FT, Abul-Eis ES. Parasitic helminths of eight species of aquatic birds in Babylon Fish Farm, Hilla, Iraq. Zool Mid East. 1992;7:115-119.
34. Al-Moussawi AA. A taxonomic comparison between some species of family Cyprinidae and family Bagridae and their infection with endoparasites. M Sc Thesis, Coll Sci, Univ Baghdad; 1997. (Arabic).
35. Abdullah SMA. Survey of the parasites of fishes of Dokan Lake. M Sc Thesis, Coll Sci, Univ Salahaddin; 1990. (Arabic).
36. Mhaisen FT, Khamees NR, Al-Sayab AA. Flat worms (Platyhelminthes) of two species of gulls (*Larus ichthyaetus* and *L. cains*) from Basrah, Iraq. Zool Mid East. 1990;4:113-116.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=974&id=32&aid=9347