PARASITES AND DISEASE AGENTS OF CULTURED FISHES OF BASRAH PROVINCE, IRAQ: THE PRESENT STATUS

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SUMMARY

Literature review on parasites and disease agents of cultured fishes of Basrah province showed that this field is so neglected in comparison with that of the freshwater fishes of the same province. So far, 25 parasite species (nine protozoans, seven monogeneans, two cestodes, two nematodes, one acanthocephalan and four crustaceans) as well as eight bacterial and two fungal species were recorded from the three main cultured fishes: common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*) and silver carp (*Hypophthalmichthys molitrix*), as well as four species of wild fishes found in some fish farms. *C. carpio* harbored 21 species of parasites, eight bacterial and two fungal species, *C. idella* harbored eight parasite species, while *H. molitrix* harbored three parasite species and one fungal species. Wild fishes found in some farms included *Barbus sharpeyi*, *Carassius auratus*, *Gambusia affinis*, *Aphanius dispar* and *Liza abu* which all showed slight parasitic infections. Information on marine fish farms included only the infection of *Liza carinata* with two protozoans. Inspection of some aquarium fishes in Basrah showed the infection of *C. auratus* with two parasitic species and one fungal as well as the infection of *Poecilia sphenops* with one fungal species.

Keywords: Parasites, Bacteria, Fungi, Cultured fishes, Basrah

Fish Culture in Basrah Province

Fish culture industry in Basrah province is affected by some factors which alter this sector to less beneficial one in comparison with that in other parts of Iraq. The high level of the ground water, salinity and price competition of both marine fishes from the Arab Gulf and freshwater fishes from the marshy area are among the problems facing fish farming in this province. Despite of such problems, some difficulties can be dissolved by achieving some management alteration in the culture system, especially in polyculture system (7). Carps and goldfish were introduced and raised for the first time in Iraq in1955 in Al-Zaafaraniya fish station, south of Baghdad (6). The first batch of these fishes was cultured in Basrah in 1967 at the experimental station of Basrah Natural History Museum (10). At the present time, 80 fish farms are, so far, established in this province (18) with a total area of 733.5 donums. Such farms are distributed in Al-Mdaina sector (21.3%), Al-Qurna sector (20.5%), Al-Hartha sector (15.9%), Shatt Al-Arab sector (20.4%), Abul-Khaseeb sector (19%) and 2.9% for Al-Fao sector (18). According to a latest report (18), during 2007, the common carp constituted 63.7% of the cultured fishes in the province against 22.6% for the grass carp, 10.8% for the silver carp, 2.8% for the yellowfin seabream (*Acanthopagrus latus*) and less than 1% for both mullets and the cyprinid fish *Barbus sharpeyi*.

Fishes Surveyed for Parasitological and Microbiological Investigations

Fishes inspected for parasites and other disease agents in Basrah province are grouped into the following four categories:

Group A- Freshwater cultured fishes:

1. *Cyprinus carpio* L., 1758
2. *Ctenopharyngodon idella* (Val. in Cuv. *et* Val., 1844)
3. *Hypophthalmichthys molitrix* (Val. in Cuv. *et* Val., 1844).
4. *Barbus sharpeyi* Günther, 1874

Group B- Freshwater fishes found in fish farms:

1. *Aphanius dispar* (Rüppell, 1828)
2. *Carassius auratus* (L., 1758)
3. *Gambusia affinis* (Baird *et* Girard, 1853)
4. *Liza abu* (Heckel, 1843)

Group C- Marine cultured fishes:

1. *Liza carinata* (Val. in Cuv. *et* Val., 1836)

Group D- Freshwater aquarium fishes:

1. *Carassius auratus* (L., 1758).
2. *Poecilia sphenops* Val., 1846

It is appropriate to mention here that some authors (15) considered *G. affinis* is not distributed in Iraq, and from their opinion *Gambusia holbrooki* (Girard, 1859) is the concerned species. Also, some other authors (14) are of the opinion that *Liza carinata* is not available in the region of the Arab Gulf, and. *L. klunzingeri* (Day, 1888) is the concerned species.

Parasitological and Microbiological Investigations

Only few studies and observations were done on determination of the parasitic fauna and flora of cultured fishes of Basrah province. The parasitic fauna received more attention in comparison with the parasitic flora.Some of the parasitological investigations dealt with only one parasitic species (3, 11, 22), but others dealt with more than one species (1, 2, 4, 8, 17, 23). Some of the microbiological investigations were concerned with the bacterial species (12, 27, 28, 29), while others were concerned with the fungal species (2, 5, 8, 9, 26). Reports on experimental infections are excluded in the present review. Conference abstracts, whose full texts were published later, are also excluded from this review.

The Parasitic Fauna

The parasitic fauna, so far recorded from cultured fishes of Basrah province, included nine species of the Kingdom Protista (subkingdom Protozoa) and 16 species of the Kingdom Animalia.

Due to the presence of contradicted information concerning the taxonomy and classification of protozoans in Iraqi literature in general, the present review is intended to provide a uniform systematic account for the so far recorded protozoans from cultured fishes of Basrah province. The internationally accepted classification (20) was followed for the taxa down to the family rank. Families are arranged here according to another systematic account (19) as the previously mentioned classification (20) did not include the family rank. For phyla of kingdom Animalia, some main systematic accounts were followed (13, 16, 30, 31, 32, 33).

The following is the systematic survey of parasites of cultured fishes of Basrah province.

Kingdom Protista
Subkingdom Protozoa
Phylum Sarcomastigophora
Class Opalinatea
Order Opalinida
Family Opalinidae
Opalina ranarum Metcalf, 1932
Class Lobosea
Order Amoebida
Family Endamoebidae
Entamoeba histolytica Schaudinn, 1903
Phylum Apicomplexa
Class Sporozoea
Order Eucoccidiida
Family Haemogregarinidae
Haemogregarina cyprini Smirnova, 1971
Phylum Myxozoa
Class Myxosporea
Order Bivalvulida
Family Myxobolidae
Myxobolus punctatus Raychandhuri *et* Chakravarty, 1970
Phylum Ciliophora
Class Kinetofragminophorea
Order Trichostomatida
Family Balantidiidae
Balantidium coli Malmsten, 1857
Class Oligohymenophorea
Order Hymenostomatida
Family Ophryoglenidae
Ichthyophthirius multifiliis Fouquet, 1876
Family Tetrahymenidae
Tetrahymena corlissi Thompson, 1955
Order Peritrichida
Family Urceolariidae
Trichodina domerguei (Wallengren, 1897)
Class Polymenophorea
Order Heterotrichida
Family Plagiotomidae
Nyctotherus cordiformis (Ehrenberg, 1838)
Kingdom Animalia
Phylum Platyhelminthes

Class Monogenea
Order Dactylogyrida
Family Dactylogyridae
Dactylogyrus achmerowi Gussev, 1955
Dactylogyrus anchoratus (Dujardin, 1845)
Dactylogyrus extensus Müller *et* Van Cleave, 1932
Dactylogyrus hypophthalmichthys Achmerow, 1952
Dactylogyrus lamellatus Achmerow, 1952
Dactylogyrus vastator Nybelin, 1924
Dactylogyrus spp.
Class Cestoidea
Order Pseudophyllidea
Family Bothriocephalidae
Bothriocephalus acheilognathi Yamaguti, 1934
Order Nippotaeniidea
Family Nippotaeniidae
Nippotaenia spp.
Phylum Nemathelminthes
Class Nematoda
Order Enoplida
Family Capillaridae
Pseudocapillaria tomentosa (Dujardin, 1843)
Order Spirurida
Family Physalopteridae
Proleptinae sp.
Phylum Acanthocephala
Class Eoacanthocephala
Order Neoechinorhynchida
Family Neoechinorhynchidae
Neoechinorhynchus iraqensis Amin, Al-Sady, Mhaisen *et* Bassat, 2001
Phylum Arthropoda
Class Crustacea
Order Argulidea
Family Argulidae
Argulus foliaceus (L., 1758)
Order Copepoda
Family Lernaeidae
Lernaea cyprinacea L., 1761
Family Ergasilidae
Ergasilus mosulensis Rahemo, 1982
Ergasilus rostralis Ho, Jayarajan *et* Radhakrishnan, 1992

Some of the parasitic species were ectoparasites, being recorded from skin, fins and gills of infected fishes (*I. multifiliis*, *T. domerguei* and *L. cyprinacea*). However, some ectoparasites were restricted to the gills only (*Dactylogyrus* spp. and *Ergasilus* spp.), skin (*A. foliaceus)* and eyes (*T. corlissi* and *L. cyprinacea*). In connection with the endoparasites, only one species was reported from the blood (*H. cyprini*) and one from the intestinal epithelium (*M. punctatus*). Intestinal parasites were represented by cestodes (*B. acheilognathi* and *Nippotaenia* spp.), nematodes (*P. tomentosa* and Proleptinae sp.) and one acanthocephalan (*N. iraqensis*).

It is appropriate to indicate here that the occurrence of *E. histolytica*, *B. coli*, *O. ranarum* and *N. cordiformis* reported from the intestine of some cultured fishes in Basrah province (4) is doubtful as the first two species are known to infect humans and some mammals, while the last two species are known to infect the amphibians (19). Also, one reference (3) had erroneously reported the authority of *T. corlissi* as "Hoffman *et* Glenn, 1978" instead of Thompson, 1955.

The Parasitic Flora

Only few bacterial and fungal species were reported from some cultured fishes of Basrah province. Reports on the experimental infections with bacterial or fungal species are not included in this review.

The bacterial species belonged to the followings genera:

1. *Aeromonas*, especially *A. hydrophila*
2. *Alcaligenes*
3. *Bacillus*
4. *Micrococcus*
5. *Pseudomonas*
6. *Streptococcus*
7. Some species of the family Enterbacteriacea

Some of these bacteria were reported from skin, gills, blood, intestine, spleen, liver, kidneys and muscles of *C. carpio* (12, 27, 28, 29).

Fungal species included *Saprolegnia parasitica* from *C. carpio* (2, 25, 26) as well as non identified species of *Saprolegnia* (1, 8, 9). In addition to *C. carpio* and *C. idella*, two fish species found in fish farms (*L.abu* and *G. affinis*) were also infected with *Saprolegnia* sp. (8, 9). This infection also included two aquarium fish species (*C. auratus* and *P. sphenops*) from the aquaria of College of Agriculture, University of Basrah as well as from some private sector aquaria in Basrah city (8).

Parasite - Host List

The following parasite- host list indicates host or hosts that harbor each parasite. The parasites are arranged according to their phylogenetic rank (given earlier in this review), while hosts are alphabetically arranged according to their generic and specific names. References are chronologically arranged.

Parasite group and species	Host	Reference
Protozoa - Sarcomastigophora		
Opalina ranarum	*Cyprinus carpio*	4
	Liza abu	4
Entamoeba histolytica	*Cyprinus carpio*	4
Protozoa - Apicomplexa		
Haemogregarina cyprini	*Cyprinus carpio*	11
Protozoa - Myxozoa		
Myxobolus punctatus	*Cyprinus carpio*	4
Protozoa - Ciliophora		
Balantidium coli	*Cyprinus carpio*	4
	Liza abu	4
	Liza carinata	4
Ichthyophthirius multifiliis	*Ctenopharyngodon idella*	17
	Cyprinus carpio	4, 17
Tetrahymena corlissi	*Barbus sharpeyi*	4
	Cyprinus carpio	4
Trichodina domerguei	*Ctenopharyngodon idella*	17
	Cyprinus carpio	23, 17
	Hypophthalmichthys molitrix	17
Nyctotherus cordiformis	*Cyprinus carpio*	4
	Liza abu	4
	Liza carinata	4
Platyhelminthes - Monogenea		
Dactylogyrus achmerowi	*Ctenopharyngodon idella*	17
	Cyprinus carpio	17
Dactylogyrus anchoratus	*Cyprinus carpio*	17

Dactylogyrus extensus	*Cyprinus carpio*	17
Dactylogyrus hypophthalmichthys	*Hypophthalmichthys molitrix*	17
Dactylogyrus lamellatus	*Ctenopharyngodon idella*	17
Dactylogyrus vastator	*Cyprinus carpio*	17
Dactylogyrus spp.	*Ctenopharyngodon idella*	1
	Cyprinus carpio	2
	Liza abu	2
Platyhelminthes - Cestoidea		
Bothriocephalus acheilognathi	*Ctenopharyngodon idella*	17
	Cyprinus carpio	17
Nippotaenia spp.	*Cyprinus carpio*	17
Nemathelminthes		
Pseudocapillaria tomentosa	*Ctenopharyngodon idella*	17
Proleptinae sp.	*Cyprinus carpio*	17
Acanthocephala		
Neoechinorhynchus iraqensis	*Cyprinus carpio*	8
	Liza abu	8
Arthropoda - Crustacea		
Argulus foliaceus	*Carassius auratus*	8
Lernaea cyprinacea	*Aphanius dispar*	23
	Carassius auratus	22, 23, 8
	Ctenopharyngodon idella	17
	Cyprinus carpio	22, 23, 26, 1, 6, 17
	Gambusia affinis	23, 8
	Hypophthalmichthys molitrix	17
Ergasilus mosulensis	*Cyprinus carpio*	1
	Liza abu	1, 8
Ergasilus rostralis	*Cyprinus carpio*	8
	Liza abu	1, 8
Bacteria		
Aeromonas hydrophila	*Cyprinus carpio*	27, 29
Aeromonas spp.	*Cyprinus carpio*	27, 28
Alcaligenes spp.	*Cyprinus carpio*	27, 28
Bacillus spp.	*Cyprinus carpio*	27, 28
Enterobacteriaceae	*Cyprinus carpio*	27, 28

Micrococcus spp.	*Cyprinus carpio*	27, 28
Pseudomonas spp.	*Cyprinus carpio*	27, 28
Streptococcus spp.	*Cyprinus carpio*	27, 28, 12
Fungi		
Saprolegnia parasitica	*Barbus sharpeyi*	5
	Cyprinus carpio	26, 2
	Liza abu	2
Saprolegnia spp.	*Carassius auratus*	8
	Cyprinus carpio	8
	Gambusia affinis	8, 9
	Hypophthalmichthys molitrix	1
	Liza abu	8
	Poecilia sphenops	8

Host - Parasite List

The following host- parasite list indicates what parasites are found in each host. Hosts are alphabetically arranged according to their generic and specific names. Parasites are alphabetically arranged and abbreviated. To avoid repetition and economize space, reference citation is not given in this list. However, references can be obtained from the previous parasite- host list.

1. *Aphanius dispar*: *L. cyprinacea*.
2. *Barbus sharpeyi*: *S. parasitica* and *T. corlissi*.
3. *Carassius auratus*: *A. foliaceus*, *L. cyprinacea* and *Saprolegnia* sp.
4. *Ctenopharyngodon idella*: *B. acheilognathi*, *D. achmerowi*, *D. lamellatus*, *Dactylogyrus* sp., *I. multifiliis*, *L. cyprinacea*, *P. tomentosa* and *T. domerguei*.
5. *Cyprinus carpio*: *A. hydrophila*, *Aeromonas* spp., *Alcaligenes* spp., *Bacillus* spp., *B. coli*, *B. acheilognathi*, *D. achmerowi*, *D. anchoratus*, *D. extensus*, *D. vastator*, *Dactylogyrus* sp., *E. histolytica*, Enterobacteriaceae, *E. mosulensis*, *E. rostralis*, *H. cyprini*, *I. multifiliis*, *L. cyprinacea*, *Micrococcus* spp., *M. punctatus*, *N. iraqensis*, *Nippotaenia* spp., *N. cordiformis*, *O. ranarum*, Proleptinae sp., *Pseudomonas* spp., *S. parasitica*, *Saprolegnia* sp., *Streptococcus* spp., *T. corlissi* and *T. domerguei*.
6. *Gambusia affinis*: *L. cyprinacea* and *Saprolegnia* sp.
7. *Hypophthalmichthys molitrix*: *D. hypophthalmichthys*, *L. cyprinacea*, *Saprolegnia* sp. and *T. domerguei*.

8. *Liza abu*: *B. coli*, *Dactylogyrus* sp., *E. mosulensis*, *E. rostralis*, *N. iraqensis*, *N. cordiformis*, *O. ranarum*, *S. parasitica* and *Saprolegnia* sp.
9. *Liza carinata*: *B. coli* and *N. cordiformis*.
10. *Poecilia sphenops*: *Saprolegnia* sp.

Finally, to conclude on the subject of parasites and disease agents of cultured fishes of Basrah province, it is reliable to state here that this field is so neglected in comparison with that of cultured fishes of whole Iraq. Fish culture industry in Basrah province is recently established and hence only scattered information are available on the parasites and disease agents of cultured fishes their. The first review work on fish parasites of Iraq (21) revealed no data on parasites of cultured fishes in Basrah province, while the next two reviews (25, 26) showed the presence of two parasitic species and one fungal species in cultured fishes of Basrah province. In fact, only three detailed accounts are available on the parasitic fauna of some cultured fishes (1, 8, 17) and one detailed account on the bacteria of the common carp (27). The remaining literature is so brief and restricted to few parasitic species. More detailed and extended surveys on this field would reveal more items of the parasitic fauna and flora of cultured fishes in this province. The following table of comparison, compiled from the index-catalogue of parasites and disease agents of fishes of Iraq (24), shows how this field in Basrah province is so neglected as indicated by number of items of the parasitic fauna and flora of cultured fishes in Basrah in comparison with those in whole farm fishes of Iraq and those of freshwater concerned fishes in Iraq. Fish species are alphabetically arranged here as shown in the previous host- parasite list of this review.

Fish species	Number of parasite species and disease agents in:		
	Farms of Basrah	Farms of Iraq (except Basrah)	Whole freshwater fishes of Iraq
A. dispar	1	-	5
B. sharpeyi	2	17	56
C. auratus	3	11	17
C. idella	8	34	39
C. carpio	31	119	151
G. affinis	2	1	6
H. molitrix	4	31	31
L. abu	9	36	79
L. carinata	2	-	3 (marine)
P. sphenops	1	1	2

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الطفيليات والعوامل المرضية لأسماك التربية في محافظة البصرة، العراق: الوضع الحالي

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الخلاصة

أظهرت مراجعة المصادر حول الطفيليات والعوامل المرضية لأسماك التربية في محافظة البصرة أن هذا الحقل مهمل جدا مقارنة مع هذا الحقل لأسماك المياه العذبة في المحافظة ذاتها. تم لحد الآن تسجيل 25 نوعا من الطفيليات (تسعة من الحيوانات الإبتدائية، سبعة من المخرّمات أحادية المنشأ، نوعين من الديدان الشريطية، نوعين من الديدان الخيطية، نوع واحد من الديدان شوكية الرأس وأربعة أنواع من القشريات) فضلا عن ثمانية أنواع من البكتريا ونوعين من الفطريات في الأنواع الرئيسة الثلاثة من أسماك التربية وهي الكارب الإعتيادي *Cyprinus carpio* والكارب العشبي *Ctenopharyngodon idella* والكارب الفضي *Hypophthalmichthys molitrix* فضلا عن أربعة أنواع من الأسماك المتواجدة في بعض حقول الأسماك. إشتملت قائمة الكارب الإعتيادي على 21 نوعا من الطفيليات وثمانية أنواع من البكتريا ونوعين من الفطريات. أما الكارب العشبي فكان مصابا بثمانية أنواع من الطفيليات، في حين سجلت في الكارب الفضي ثلاثة أنواع من الطفيليات ونوع واحد من الفطريات. أما الأسماك الغريبة (الدخيلة) المتواجدة في بعض المزارع والتي شملت أسماك البني *Barbus sharpeyi* والكرسين الذهبي (السمكة الذهبية) *Carassius auratus* وسمكة البعوض *Gambusia affinis* وسمكة الطرخين *Aphanius dispar* والخشني *Liza abu* فكانت إصاباتها الطفيلية طفيفة. إشتملت المعلومات عن مزارع الأسماك البحرية على إصابة البياح الذهبي *Liza carinata* بنوعين من الحيوانات الإبتدائية. أظهر فحص بعض أسماك الزينة في البصرة إصابة السمكة الذهبية بنوعين من الطفيليات ونوع واحد من الفطريات فضلا عن إصابة سمكة المولي السوداء *Poecilia sphenops* بنوع واحد من الفطريات.