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Observations on Fishes and Their Parasites of Darbandikhan Lake, Kurdistan Region in North Iraq

Younis S. Abdullah[1, *], Shamall M. A. Abdullah[2]

[1]Medical Laboratory Department, Technical College of Health, Sulaimani Polytechnic University, Sulaimani, Iraq
[2]Fish Resource and Aquatic Animal Department, College of Agriculture, University of Salahaddin, Erbil, Iraq

Email address

younis10002004@yahoo.com (Y. S. Abdullah), shamal_m_a_abdullah@yahoo.com (S. M. A. Abdullah)

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Abstract

A total of 255 freshwater fishes, belonging to 17 species, namely: *Barbus barbulus*, *B. grypus, Capoeta trutta, Capoeta umbla, Carasobarbus luteus, Carassius auratus, Chondrostoma regium, Cyprinion macrostomum, Cyprinus carpio, Garra rufa, Hemiculter leucisculus, Hypophthalmichthys molitrix, Luciobarbus esocinus, Squalius lepidus* (Family Cyprinidae), *Mystus pelusius* (Bagridae), *Silurus triostegus* (Siluridae) and *Mastacembelus mastacembelus* (Mastacembelidae), were collected from Darbandikhan Lake, southeast of Sulaimani City, Kurdistan Region, Iraq, from March 2012 to the end of October 2012. The fishes were examined for ectoparasites and endoparasites. The study revealed the existence of 45 species of parasites including: seven species of protozoans, 29 species of monogeneans, two species of trematodes, one species each of cestode and nematode, two species of acanthocephalans and three species of crustaceans. The present study revealed that *Dactylogyrus suchengtaii* and D. *carassobarbi* were the most parasites prevalent (100% and 90.90%, respectively) in the lake, while *Scyphidia arctica* was scarce (1.44%). The fish *C. trutta* was highly infected with parasites (nine species), followed by *S. lepidus* (eight species) and both *C. luteus* and *M. mastacembelus* (six species each), while *G. rufa* and *H. molitrix* were less infected (one species each). The ciliated protozoan *Ichthyophthirius multifiliis* was recorded on seven species of fishes with prevalence ranged between 2.89% and 23.52%, followed by the crustacean *Lernaea cyprinacea* which was recorded on four species of fishes (5% - 27.27%).

Keywords

Fishes, Parasites, Darbandikhan Lake, Kurdistan Region, Iraq

1. Introduction

With the increases of interest in fish population and the farming of fishes, there has been an increased interest in parasites of fishes and the diseases associated with them (Shotter, 1972). Therefore, any attempt to increase the productivity of pond farms or to improve the stocks of valuable commercial fisheries in the natural waters, requires detailed knowledge of the parasites inhabiting the localities involved (Shul′man, 1961).

This paper is a continuation in the series of trials done by the same authors (Abdullah and Abdullah, 2013a; b) in which they dealt with major groups (Protozoa, Monogenea, Trematoda, Cestoda, Nemetoda, Acanthcephala and Crustacea) of parasites which infecting fishes in Darbandikhan Lake, Kurdistan Region in north Iraq. The present investigation deals to knowledge by describing the distribution and abundance of fishes in the Darbandikhan Lake and with infections of these fishes with different parasites.

2. Materials and Methods

2.1. Description of the Sampling Area

Darbandikhan Lake is located at about 60 km southeast of Sulaimani City. It is situated between 35º-36º north latitude and 45º-46º east longitude, with the altitude of 511 meters of the sea's level. The surface area is about 121km^2 and the lake capacity is 3 million m^3 (Al-Saudi, 1967).

2.2. Water Temperature

Surface water temperature of Darbandikhan Lake at different sites during the sampling periods was 15.7°C as a minimum value during March while the maximum value was 33.5 °C recorded during July.

2.3. Collection and Examination of Fishes

A total of 255 freshwater fishes were collected from Darbandikhan Lake, from March 2012 to the end of October 2012. The fish specimens were collected by gill netting, cast netting and electro fishing by local commercial fishermen. In the laboratory, the fish was identified according to Coad (2010) and their scientific names were checked according to Froese and Pauly (2014). The fishes were examined externally and internally for parasites. Smears from skin, fins and buccal cavity were prepared by slight scraping and examined under a light compound microscope at 40-100X magnification. The gill arches from both sides were separated, placed in Petri dish containing tap water and then examined for ectoparasite under dissecting microscope at 40-100X magnification. Whole eyes were removed, and then the lens was dissected out and then inspected under dissecting microscope for parasites. To study of the internal parasites, the fishes were dissected from the ventral side. The body cavity, stomach, intestine, spleen, liver, kidneys, heart, muscles, swim bladder and gonads were separated and examined carefully under a dissecting microscope for the presence of parasites or cysts (Amlacher, 1970). Parasite fixation and preservation was done according to Hoffman (1998). Parasite identification was done according to major taxonomic accounts (Bykhovskaya-Pavlovskaya *et al.*, 1962; Gussev, 1985; Hoffman, 1998; Pugachev *et al*., 2010).

The ecological terms were used here based on terminology of Margolis *et al.* (1982):

1- *Prevalence of infection:* The percentage of number of individuals of a host species infected with particular parasite species per number of host examined.

2- *Mean intensity of infection*: Mean number of particular parasite species per infected host in a sample.

3. Results and Discussion

A total of 255 specimens of fishes were collected from Darbandikhan Lake during the period from March to the end of October 2012. Table (1) shows different species of fishes with their total length and their abundance in this lake. The fish fauna of this lake included four exotic species namely *Carassius auratus*, *Cyprinus carpio*, *Hemiculter leucisculus* and *Hypophthalmichthys molitrix*. The native species belong to families Cyprinidae (10 species), Bagridae, Siluridae and Mastacembelidae (one species for each family). Coad (2010) mentioned that there are thirteen species of exotic fishes in the Tigris-Euphrates Basins including the four recorded species in the present study.

It appears that most species recorded in this study belong to Family Cyprinididae (14 species), followed by other families (Bagridae, Siluridae and Mastacembelidae) with one species for each family. It was clarified that the fish *Capoeta trutta* is the most abundant and wide spread, followed by *Cyprinion macrostomum*, then in the third rank *H. leucisculus* while *Mystus pelusius* and *H. molitrix* were scarce. Abdullah (2005) indicated that *B. grypus* and *C. carpio* were the most abundant species in Darbandikhan Lake. Also, Abdullah *et al*. (2007) showed that *Capoeta damascinus* was the most abundant species followed by *C. carpio* and *B. grypus* in Darbandikhan Lake.

It seems from the present study that the distribution of fish populations in the Darbandikhan Lake is changing, due to the period, place, and way of fishing, besides the nature of the lake itself which is characterized by changing its water level from year to year and season to season, thus affecting the fishes distribution (Abdullah *et al*., 2007). Moreover, the reason might belong to the introduction of some fish (*C. auratus*, *C. carpio* and *H. molitrix*) into this environment at the end of seventies of the previous century and still there culturing process continues leading to their quick spread that affects the density of the rest of species. The evidence supporting this idea is the increase of their fishing and marking into the local markets nearby the lake. It is inevitable that the increase of these fishes is at the expense of the other species that are similar in their nutrition to the carp like *B. grypus* and *Luciobarbus xanthopterus* (Al-Saadi *et al*., 1986; Abdullah *et al*., 2007).

As it is shown in Table (2), the parasitological examination of the fish species in the present study indicated that these fishes were infected with 45 species of parasites which included seven species of protozoans, 29 species of monogeneans, two trematodes, one species each of cestode and nematode, two acanthocephalans and three crustaceans.

It seems that parasites with direct life cycles (Protozoa and Monogenea) were the most prevalent in this lake in comparison with parasites with indirect life cycles (Trematodes, Cestodes and Acanthocephalans). This can be attributed to the closed environment which leads to the accumulation of eggs and larval stages of parasites, especially these organisms have a short life-span and high rate of reproduction (Hoffman, 1998). This fact helps their accumulation especially in a closed environment and their infection to new fish in the same location, whereas in the open environment (river), the water flow and the fish diversity lead to the reduction in infection prevalence. This fact is confirmed by Amin (1986a; b), Paperna (1996) and Hoffman (1998).

The same Table (2) shows that *C. trutta* was more infected with parasites (nine species), followed by *S. lepidus* (eight species) and both *C. luteus* and *M. mastacembelus* (six species each). However, *G. rufa a*nd *H. molitrix* were less infected (one species each), if we neglected *M. pelusius* as it was not infected with any parasites. Also, the present study revealed that *Dactylogyrus suchengtaii* and *D. carassobarbi* were the most prevalent parasites (100% and 90.90%, respectively) in the lake, while *Scyphidia arctica* was scarce 1.44% (Table 2). Generally, the parasitic infection in fishes depends on many factors which are ideal for the propagation and development of parasitic population. These factors are: the density of fish population, differences in the environmental factors, physical condition, genetic resistances as well as fish age and sex which also play a part in determining the susceptibility of fishes to diseases (Dogiel, 1961). Also, the appearance of new fish parasites, along with their host species, has resulted in

increasing the parasite fauna of the lake. The new species composition has affected both ichthyofauna and parasitofauna. The above facts indicate that comprehensive studies are absolutely necessary before the introduction of any new fish species to any lake. In addition, sanitary methods for the transfer of fish should be precisely taken account of otherwise new parasites can be transmitted to lakes causing the possibility for a mass outbreak of parasitic diseases, especially among native fishes which are often more sensitive to introduced parasites than the exotic ones (Jalali and Barzegar, 2006). Table (2) also shows that the ciliated protozoan *I. multifiliis* was recorded on the skin and gills of seven species of fishes (*B. grypus*, *C. trutta, C. luteus, C. regium, L. esocinus, S. lepidus* and *M. mastacembelus*) with the prevalence ranged between 2.89% - 23.52%, followed by the crustacean *L. cyprinacea* which was recorded on the gills of four species of fishes (*B. barbulus*, *C. carpio*, *H. leucisculus* and *L. esocinus*) with the prevalence ranged between 5% - 27.27%. However, many parasites (especially monogeneans) were recorded on one or two species of fishes for example, *D. barbioides* on the gills of *B. grypus*, *G. molnari* on the skin of *C. carpio* and *M. heteranchorus* on the gill of *M. mastacembelus*. It is known that many of the fish parasites, including monogeneans, have strict host and site specificity, but in protozoans and crustaceans, they lack this trait (Shul′man, 1961).

Table (1). *Scientific names of fishes collected from Darbandikhan Lake, and their numbers.*

Family and scientific name	Total Length (cm)	Number
Cyprinidae		
Barbus barbulus Heckel, 1847	28-32.5	10
Barbus grypus Heckel, 1843	33-88	10
Capoeta trutta (Heckel, 1843)	19-35.5	69
Capoeta umbla (Heckel, 1843)	25-40	12
Carasobarbus luteus (Heckel, 1843)	23-27.5	11
Carassius auratus (Linnaeus, 1758)	20-28	13
Chondrostoma regium (Heckel, 1843)	18-25.5	14
Cyprinion macrostomum Heckel, 1843	21.5-23	22
Cyprinus carpio Linnaeus, 1758	23.5-41	13
Garra rufa (Heckel, 1843)	14-16	6
Hemiculter leucisculus (Basilewsky, 1855)	9.5-12.5	20
Hypophthalmichthys molitrix (Valenciennes, 1844)	40-67	4
Luciobarbus esocinus Heckel, 1843	24.5-51	11
Squalius lepidus Heckel, 1843	21.5-33	17
Bagridae		
Mystus pelusius (Solander, 1794)	20-25	2
Siluridae		
Silurus triostegus Heckel, 1843	54.5-80	7
Mastacembelidae		
Mastacembelus mastacembelus (Banks and Solander, 1794)	49-64	14
Total	-	255

Table (2). *The distribution of parasites in different sites of fish hosts from Darbandikhan Lake.*

Parasites	Hosts	No. of fishes		Prevalence (%)	Mean intensity	Site of infection
		examined	infected			
Chilodonella cyprini	*Capoeta trutta*	69	2	2.89	5.5	Gill
	Carassius auratus	13	1	7.69	3	Gill
Ichthyophthirius multifiliis	*Barbus grypus*	10	1	10	5	Gill, Skin
	Capoeta trutta	69	2	2.89	3.5	Gill, Skin
	Carasobarbus luteus	11	1	9.09	8	Gill, Skin
	Chondrostoma regium	14	1	7.14	5	Gill, Skin
	Luciobarbus esocinus	11	1	9.09	3	Gill, Skin
	Squalius lepidus	17	4	23.52	7.25	Gill, Skin
	Mastacembelus mastacembelus	14	2	14.28	5.5	Gill, Skin
Scyphidia arctica	*Capoeta trutta*	69	1	1.44	3	Skin
Tetrahymena pyriformis	*Silurus triostegus*	7	1	14.28	3	Skin
Trichodina pediculus	*Silurus triostegus*	7	2	28.57	8	Gill
Myxobolus amurensis	*Squalius lepidus*	17	2	11.76	5	Skin, Gill, Caudal fin
Myxobolus pfeifferi	*Carasobarbus luteus*	11	1	9.09	3	Gill
	Cyprinion macrostomum	22	1	4.54	4	Gill
Dactylogyrus anchoratus	*Carassius auratus*	13	4	30.76	8	Gill
	Luciobarbus esocinus	11	1	9.09	5	Gill

Parasites	Hosts	No. of fishes		Prevalence (%)	Mean intensity	Site of infection
		examined	infected			
Dactylogyrus barbioides	*Barbus grypus*	10	2	20	3.5	Gill
Dactylogyrus baueri	*Carassius auratus*	13	4	30.76	6	Gill
Dactylogyrus carassobarbi	*Capoeta trutta*	69	5	7.24	7	Gill
	Carasobarbus luteus	11	10	90.90	5.7	Gill
Dactylogyrus deziensioides	*Barbus barbulus*	10	5	50	4.2	Gill
Dactylogyrus deziensis	*Barbus barbulus*	10	2	20	7.5	Gill
	Luciobarbus esocinus	11	5	45.45	8.6	Gill
Dactylogyrus dyki	*Squalius lepidus*	17	1	5.88	3	Gill
Dactylogyrus elegantis	*Chondrostoma regium*	14	12	85.71	9	Gill
	Squalius lepidus	17	2	11.76	2.5	Gill
Dactylogyrus formosus	*Carassius auratus*	13	4	30.76	8.75	Gill
Dactylogyrus inutilis	*Luciobarbus esocinus*	11	1	9.09	5	Gill
Dactylogyrus lenkorani	*Capoeta trutta*	69	2	2.89	5	Gill
	Capoeta umbla	12	10	83.33	12	Gill
Dactylogyrus macrostomi	*Cyprinion macrostomum*	22	10	45.45	13	Gill
Dactylogyrus mascomai	*Cyprinion macrostomum*	22	2	9.09	2.5	Gill
Dactylogyrus microcirrus	*Capoeta trutta*	69	17	24.63	9	Gill
Dactylogyrus pavlovskyi	*Barbus grypus*	10	8	80	21	Gill
Dactylogyrus persis	*Carasobarbus luteus*	11	3	27.27	3.33	Gill
Dactylogyrus pulcher	*Capoeta trutta*	69	46	66.66	18	Gill
	Capoeta umbla	12	2	16.66	6.5	Gill
Dactylogyrus rectotrabus	*Garra rufa*	6	1	16.66	5	Gill

Table (2). *Continued.*

Parasites	Hosts	No. of fishes		Prevalence (%)	Mean intensity	Site of infection
		examined	infected			
Dactylogyrus suchengtaii	*Hypophthalmichthys molitrix*	4	4	100	25	Gill
Dactylogyrus vistulae	*Squalius lepidus*	17	4	23.52	4.5	Gill
	Mastacembelus mastacembelus	14	1	7.14	2	Gill
Dogielius mokhayeri	*Capoeta trutta*	69	22	31.88	10.45	Gill
	Carasobarbus luteus	11	1	9.09	7	Gill
Dogielius molnari	*Cyprinion macrostomum*	22	1	4.54	3	Gill
Dogielius persicus	*Barbus grypus*	10	1	10	3	Gill
Mastacembelocleidus heteranchorus	*Mastacembelus mastacembelus*	14	10	71.42	17	Gill
Thaparocleidus vistulensis	*Silurus triostegus*	7	5	71.42	6.8	Gill
Gyrodactylus molnari	*Cyprinus carpio*	13	1	7.69	17	Gill
Gyrodactylus sprostonae	*Carassius auratus*	13	2	15.38	14.5	Gill
	Cyprinus carpio	13	1	7.69	27	Gill
Paradiplozoon leucisci	*Hemiculter leucisculus*	20	2	10	3.5	Gill
	Squalius lepidus	17	4	23.52	4	Gill
Paradiplozoon pavlovskii	*Chondrostoma regium*	14	2	14.28	3.5	Gill
Clinostomum complanatum	*Capoeta umbla*	12	3	25	4.66	Branchial cavity
	Carasobarbus luteus	11	1	9.09	2	Branchial cavity
Diplostomum spathaceum	*Chondrostoma regium*	14	10	71.42	12	Eye
	Mastacembelus mastacembelus	14	2	14.28	8.5	Eye
Senga sp.	*Mastacembelus mastacembelus*	14	3	21.42	3.33	Intestine
Procamallanus viviparus	*Mastacembelus mastacembelus*	14	1	7.14	1	Intestine
Neoechinorhynchus zabensis	*Capoeta trutta*	69	7	10.14	2.62	Intestine
Pomphoryhnchus spindletruncatus	*Squalius lepidus*	17	2	11.76	6.5	Intestine
	Silurus triostegus	7	1	14.28	11	Intestine
Ergasilus mosulensis	*Squalius lepidus*	17	2	11.76	3	Gill
Copepodal satge of *Lernaea cyprinacea*	*Barbus barbulus*	10	1	10	3	Gill
	Cyprinus carpio	13	2	15.38	2.25	Gill
	Hemiculter leucisculus	20	1	5	2	Gill
	Luciobarbus esocinus	11	3	27.27	2.33	Gill
Pseudolamprolgena annulata	*Cyprinion macrostomum*	22	1	4.54	1	Gill

4. Conclusion

In the view of the results of the present study, the following conclusions are drawn:

1. During the external and internal examination of fishes in Darbandikhan Lake, it appeared that there are 45 species of different parasite groups which denote the richness of the parasitic population.

2. Among these parasites seven species have been recorded for the first time in Iraq, namely: (*Myxobolus amurensis*, *Dactylogyrus dyki*, *D. persis*, *D. mascomai*, *D. suchengtaii*, *Gayrodactylus molnari* and *Paradiplozoon leucisci*). Also, four species (*Dactylogyrus barbiodies*, *D. formosus*, *D. lenkorani* and *Gyrodactylus sprostonae*) have been recorded for the first time in Kurdistan region.

3. Some fish species were recorded as new hosts in Iraq for some parasite species.

4. Some fishes in Darbandikhan Lake showed a high degree of sensitivity towards the infection with the specific species of the parasites, for example, the prevalence of *Hypophthalmichthys molitrix*, *Carasobarbus luteus* and *Chondrostoma regium* reached 100%, 90.90% and 85.71% concerning the infection with *Dactylogyrus suchengtaii, D. carassobarbi* and *D. elegantis* respectively.

5. The fish *C. trutta* was more infected with parasites (nine species), followed *S. lepidus* (eight species) and *C. luteus and M. mastacembelus* (six species), while, *G. ruffa* and *H. molitrix* were less infected (one species).

6. Most parasites showed host specificity for one or two fish species, except *Ichthyophthirius multifiliis* which parasitized on seven species of fishes and *Lernae cyprinacea* which parasitized on four species of fishes.

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