World Journal of Fish and Marine Sciences 4 (3): 249-253, 2012
ISSN 2078-4589

DOI: 10.5829/idosi.wjfms.2012.04.03.61326

Biodiversity of Parasites of Fishes in Gheshlagh (Vahdat) Reservoir, Kurdistan Province, Iran

[1]A. Bozorgnia, [2]M.R. Youssefi, [3]M. Barzegar, [4]S.M. Hosseinifard and [5]S. Ebrahimpour

[1]Department of Fishery, Qaemshahr-Branch, Islamic Azad University, Qaemshahr, Iran
[2]Department of Veterinary Parasitology, Babol-Branch, Islamic Azad University, Babol, Iran
[3]Consultancy Service PVT in Fisheries, Tehran, Iran
[4]Department of Fishery, Babol-Branch, Islamic Azad University, Babol, Iran
[5]Islamic Azad University, Garmsar-Branch, Iran

Abstract: In this study the ecto- and endoparasites of 150 specimens of native and introduced fishes in Gheshlagh (Vahdat) Reservoir, situated in Kurdistan Province, were investigated. In 12 species of examined fishes, totally 30 kinds of protozoan and metazoan parasites were found. These included *Ichthyophthirius multifiliis*, *Trichodina pediculus*, *Trichodina perforata*, *Myxobolus* spp. (2 species), *Dactylogyrus* spp. (12 species), *Dogielius molnari*, *Gyrodactylus sprostonae*, *Paradiplozoon* sp. (Diporpa stage), *Diplostomum spathaceum* (metacercaria), *Ligula intestinalis* (pelerocercaria), *Bothriocephalus gowkongensis*, *Khawia armenica*, *Acanthocephalorhynchoides cholodkowskyi*, *Contracaecum* sp. (larval stage), *Ergasilus* sp., *Lernaea cyprinacea*, *Lernaea* sp. (copepodid stage) and *Tracheliastes polycolpus*. The observed parasite species belong to 8 classes. The study of the biodiversity of 30 parasite species revealed the following data: Holotrircha: 3 species in 5 fish species; Myxozoa: 2 species in 3 fish species; Monogenea: 15 species in 10 fish species; Digenea: 1 species in 2 fish species; Cestoda: 3 species in 5 fish species; Acanthocaphala: 1 species in 2 fish species; Nematoda: 1 species in 1 fish species and Crustacea: 4 species in 6 fish species. The sparse fauna of some parasite groups such as the Digenea is due to sparse Mullusca which are intermediate hosts for Digenea. According to the results of the present investigation *Capoeta damascina* showed highest contamination rate, infected by 7 metazoan from 4 classes of parasites in here, whereas *Gambusia holbrooki*, *Pseudorasbora parva* and *H. molitrix* were infected by only 1 parasite species each. In the present article two new host species for *Ligula intestinalis* are reported for the first time.

Key words: Fish Parasites % Gheshlagh Reservoir % Kurdistan % Iran

INTRIDUCTION

Gheshlagh Dam is built on the Gheshlagh River in the Kurdistan Province situated in west of Iran. The dam is a sandy-stony type with the maximum height of 80 meters and total length of 300 meters. It was survived and designed during 1973-1979 and was inaugurated in 1983. The dam, as a multipurpose development project, was constructed with the aim of providing tap water, generating electric power with installed capacity of 7 mW, providing annual irrigation to benefit 4000 ha fertile lands, providing flood protection and development of fisheries activities. The reservoir has a maximum surface area of 934 ha and effective capacity of 199 million cubic meters [1]. Sanandaj city has a dry-cold climate. The annual average temperature of the water ranges from 5.2°C (January) to 25°C (August). The introduction of exotic fish species to Gheshlagh Reservoir with the aim of improving fisheries' commercial activities was started by the Fisheries Company in 1985 and now the fish species composition includes 7 introduced transplanted Chinese carps, common carp, randomly introduced *Pseudorasbora parva* and *Gambusia holbrooki*. The later was introduced widely to combat malaria by consuming the aquatic larvae and pupae of the carrier mosquito [2]. The native fish species including 6 species all belong to Cyprinidae.

Corresponding Author: Soheil Ebrahimpour, Islamic Azad University, Babol-Branch, Iran.
Tel: +989111149309, Fax: +981112415030.

The aim of the present study was to clarify the fauna of ecto- and endoparasites and species composition in Gheshlagh Reservoir. As Gheshlagh Reservoir is a new constructed dam, little attention was paid to parasites of fishes and records were limited mostly to macroparasites [3]. The first article was published by Jalali and Barzegar who reported some parasites on the gills of a few fish species inhabited in Gheshlagh Reservoir [3]. Later on, Barzegar and Jalali reported some Cestoda and Acanthocephalan worms in fishes of Gheshlagh Reservoir [4]. The present study pays considerable attention to biodiversity of parasites of fishes in reservoir and discusses the fish parasites system in the Gheshlagh Reservoir ecosystem.

MATERIALS AND METHODS

Fish samples were acquired, using gillnet, bag net and hook by local fishermen from Gheshlagh Reservoir and transported alive to the laboratory during winter of 2004 and spring, summer and autumn of 2005. Both commercial and non commercial sized fishes were collected. Only fresh or already killed fish samples were subjected for parasitological investigation. Approximately 150 fish specimens belonging to 2 families, 11 genera and 12 species including 6 native species; *Chalcalburnus mossulensis*, *Capoeta damascina*, *Capoeta trutta*, *Leuciscus cephalus*, *Barbus lacerta* and *Garra rufa* and 6 exotic species; *Cyprinus carpio*, *Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, *Aristichthys nobilis*, *Pseudorasbora parva* and *Gambusia holbrooki* were examined.

The identification of host fishes was carried out by Iranian ichthyologists, in accordance with Berg [5], Coad [6] and Abdoli [1] and then whole specimens were fixed in 4% formalin and transferred to the Zoological Institute of the Slovakian Academy of Sciences for confirmation. Methods used for collecting, fixing, staining and mounting the parasites specimens were carried out according to Fernando [7], Gussev [8], Malmberg [9], Lom and Dykova [10] and Roberts [11]. The identification of parasites was carried out in accordance with the keys given by Gussev [8], Lom and Dykova [10], Schulman [12] and Jalali [13].

RESULTS

Totally 30 protozoan and metazoan parasites, most of them known species, were found in/on dissected fishes of Gheshlagh Reservoir. These parasites, collected from 12 fish species, included; 15 monogenea, 3 holotricha, 2 myxozoa, 1 digen (metacercaria), 4 crustacea, 3 cestoda, 1 acanthocephale and 1 nematode. Among them, 24 species proved to be known species. But 1 myxozoan, 2 monogenea (*Dactylogyrus* sp. and *Paradiplozoon* sp.), 1 nematode (*Contracaecum* sp.) and 2 crustacea (*Ergasilus* sp. and *Lernaea* sp.), totally 6 species, were identified only to generic level and require further studies for detailed identification (Table 1).

DISCUSSION

More than 150 fish specimens belonging to 12 fish species were examined for metazoan and protozoan parasites. The parasites have been recorded in those fish species as follows: One species of Acanthocephala in 2 fish species, 3 species of Cestoda in 5 fish species, 4 species of Crustacea in 6 fish species, 1 species of Digenea in 2 host species, 15 species of Monogenea in 10 fish species, 1 species of Nematoda in 1 host species, 2 species of Myxozoa in 3 fish species and 3 ecto-protozoan in 5 fish hosts [14]. The community of ectoparasites was composed of 24 species (80 %) while community of endoparasites included 6 species (20%).

During the present investigation 11 (36.7%) parasite species were found in 6 introduced fish species whereas 19 (63.3%) parasite species were found in native fish species, out of which, 5 were monospecific monogenea which are very harmful and responsible for high mortality among fingerlings particularity when water temperature varied between 18 to 22°C (the end of spring to mid summer in the Gheshlagh Reservoir) [14].

Furthermore two pseudophillian Cestoda, *Bothriocephalus gowkongensis and Ligula intestinalis*, Caryophyllaidae and *Khawia armenica* which originate from Holoarctic region have been recently introduced to reservoir along with Chinese carp. One of these parasites, *Ligula intestinalis*, can be harboured by native a fish which causes heavy mortality in infected Ch. *mossulensis* population in summer of every year (Fig. 1).

Among the fishes found to be infected by varying parasites (parasites system) in Gheshlagh Reservoir, *Capoeta damascina* infected by 7 parasites species established the highest level of parasitism of fish parasites system and *Hypophthalmichthys molitrix*, *Pseudorasbora parva* and *Gambusia holbrooki* infected with only one species each had no variation in their parasites systems. Furthermore two latter fish species are reported as new host for *Ligula intestinalis* (pelerocercoid) in Iran for the first time [15].

Table 1: List of parasite species found in/on fish samples from Gheshlagh Reservoir

	Parasite species	Host (s)	Infected organ (s)
Holotricha	*Ichthyophthirius multifiliis* Fouquet 1876	*Cyprinus carpio*	Gill
	Trichodina pediculus Mueller, 1786	*Chalcalburnus mossulensis*	Gill
	Trichodina perforata Lom *et al*, 1976	*Ctenopharyngodon idella*	Gill
		Aristichthys nobilis	Gill
		Leuciscus cephalus	Gill
Myxosoa	*Myxobolus saidovi* Gasimagomedov and Danijarov, 1975	*Capoeta trutta*	Gill
	Myxobolus sp.$_2$	*Leuciscus cephalus*	Gill
		Capoeta damascina	Gill
Monogenea	*Dactylogyrus acinacus* Gussev *at al*., 1993	*Garra rufa*	Gill
	D. alatus Linstow, 1878	*Chalcalburnus mossulensis*	Gill
	D. aristichthys Long et Yu, 1955	*Aristichthys nobilis*	Gill
	D. extensus Mueller et Van cleave, 1932	*Cyprinus carpio*	Gill
	D. hypophthalmichthys Achmerov, 1952	*Hypophthalmichthys molitrix*	Gill
	D. kersini Gussev *et al*., 1993	*Capoeta trutta*	Gill
	D. lamellatus Achmerov, 1956	*Ctenopharyngodon idella*	Gill
	D. lenkorani Mikhailov 1967	*Capoeta damascina*	Gill
		Capoeta trutta	Gill
	D. linstowi Bychowsky, 1936	*Capoeta damascina*	Gill
		Barbus lacerta	Gill
	D. pulcher Bychowsky, 1966	*Capoeta damascina*	Gill
	D. recotorabus Gussev *et al*., 1993	*Garra rufa*	Gill
	Dactylogyrus sp.	*Leuciscus cephalus*	Gill
	Dogielius molnari Jalali 1992	*Capoeta damascina*	Gill
	Gyrodactylus sprostonae Ling, 1992	*Cyprinus carpio*	Gill
	Paradiplozoon sp. (Diporpa stage)	*Capoeta damascina*	Gill
Digenea	*Diplostomum spathaceum* Rudolphi, 1819 (metacercaria)	*Cyprinus carpio*	Lens of eyes
		Barbus lacerta	Lens of eyes
Cestoda	*Ligula intestinalis* (L.,1758) (pleorocercoid)	*Chalcalburnus mossulensis*	Body cavity
		Pseudorasbora parva	Body cavity
		Gambusia holbrooki	Body cavity
	Bothriocephalus gowkongensis Yeh, 1955	*Cyprinus carpio*	Intestine
		Ctenopharyngodon idella	Intestine
	Khawia armenica Kholodkovsky, 1915	*Capoeta damascina*	Intestine
Acanthocephala	*Acanthocephalorhynchoides cholodkowskyi* Kosylew, 1928	*Capoeta trutta*	Intestine
		Capoeta damascina	Intestine
Nematoda	*Contracaecum* sp. (larva stage)	*Barbus lacerta*	Body cavity
Crustaceans	*Ergasilus* sp. Nordmann, 1832	*Capoeta damascina*	Gill Skin
		Chalcalburnus mossulensis	Skin
		Leuciscus cephalus	Gill
	Lernaea cyprinacea Linaeus,1758	*Cyprinus carpio*	Skin
	Lernaea sp. (copepodid stage)	*Barbus lacerta*	Gill
	Tracheliastes polycolpus Nordmann,1832	*Capoeta trutta*	Fin

Monospecific species of parasites

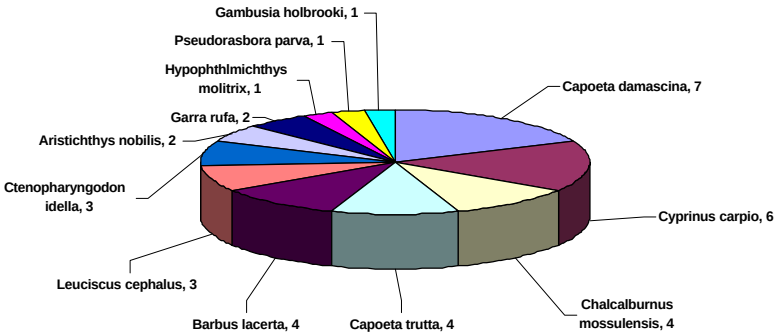

Fig. 1: Number of parasites species harbored by each fish species

Among the examined fishes almost all fish species were parasitized by at least one parasite species. In addition, 30 parasites species were also recorded: 3 Holotricha(10%), 15 Monogenea(50%), 1 Nematode, 1 Acanthocephale and 1 Digenean(3.4%), 3 Cestoda(10 %), 4 Crustacea(13.3%) and 2 Myxozoa(6.5%). Total number of parasites species found per examined fish species was 2.5 which are estimated to be high (due to incomplete sampling). Therefore it is a safe prediction that those numbers represent only as a part of the total number of parasites which are harbored by those fish species.

About the sparse number of helminthes parasite species with indirect life cycle in Gheshlagh Reservoir, we postulated that the sparse fauna of Digenea and Nematoda is a consequence of the scarcity of Mullusca and their intermediate hosts in stony and sandy beds of reservoirs [16].

On the basis of the above fact, it is strongly suggested that uncontrolled entry of fish into the reservoir must be manned. Otherwise new parasites could be transmitted to reservoir and may endanger the fishes due to changing the ecosystem and fish fauna and transmitting the disease to the native fishes. Therefore future developments of fishery industry of the reservoir are strongly recommended. In general, it can be stated that introduction of exotic species to a new habitat can lead to controversial results while there is no doubt on positive influence of some introduced fishes in aquaculture [17].

There is however some examples of unsuccessful fish introduction in new areas. In these cases, parasites introduced by new fishes attack endemic fishes more severely than those already in place. Some sorrowful instances can prove these statements [18]. Woo described that Caspian sturgeon introduced the monogenean *Nitzschia sturionis* after being transferred to the Aral Sea which caused heavy mortalities in the endemic sturgeon and almost exterminated the whole population [18]. Although introducing non-native fish species to new habitat such as lakes will encourage fishery activities but the influence of the exotic fishes on the environment should be studied before and the possibility of parasite transmission should be considered.

REFERENCES

1. Abdoli, A., 1999. The inland water fishes of Iran (In Persian). Nature Museum and World Wild of Iran, pp: 377.
2. Gussev, A.V., 1983. The methods of collection and processing of fish parasitic monogenean materials (In Russian), Nauka, Leningrad, USSR, pp: 48.
3. Jalali, B. and M. Barzegar, 2004. Parasites of the gills of fishes in Gheshlagh Reservoir (In Persian). J. Veterinary Sci., of Iran, 3: 41-50.
4. Barzegar, M. and B Jalali, 2005. Helminthes, Acanthocephalan and Crustacean parasites of fishes in Gheshlagh Reservoir (In Persian). J. Veterinary Sciences of Iran, 3: 229-234.
5. Berg, L.S., 1964-5. Freshwater fishes of USSR and adjacent countries,(In Russian). Nauka, Moscow, USSR, 3: 926-1382.
6. Coad, B.W., 1992. Freshwater fishes of Iran. A checklist and bibliography. Ichthyology Section. Canadian Museum of Nature. Ottawa, Ontario, Canada, pp: 66.
7. Fernando, C.H., J.I. Furtado, A.V. Gussev, G. Hanek and S. Kakonge, 1972. Methods for the study of freshwater fish parasites, University of Waterloo. Biology series, Canada, 12: 76.
8. Gussev, A.V., 1985. Monogenea. In: O.N. Bauer, (Ed). Key to parasites of freshwater fishes of USSR. Nauka Leningrad, USSR, 2: 424.
9. Malmberg, G., 1970. Excretory system and the marginal hooks as a basic for the systematic of *Gyrodactylus* (Termatoda: monogenea). ARK. Zool. Ser., 2: 39-42.
10. Lom, J. and I. Dykova, 1992. Protozoan parasites of fishes. Elsevier Science Publisher. Amsterdam. Netherlands, pp: 315.
11. Roberts, R.J., 2001. Fish pathology. Harcourt Publisher Limited. London, UK, pp: 472.
12. Schulman, S.S., 1984. Parasitic protozoan (in Russian) In: O.N. Bauer, (Ed). Key to parasites of freshwater fish of the U.S.S.R, Vol. 1. Nauka, Leningrad.
13. Jalali, B., 1998. Parasites and parasitic diseases of fresh water fishes of Iran (In Persian). Fisheries Company of Iran, pp: 564.
14. Jalali, B. and M. Barzegar, 2006. Fish parasites in Zarivar Lake. J. Agric. Sci. Technol., 8: 47-59.
15. Shamsi, Sh, B. Jalali and M. Aghazadeh, 2009. Infection with *Dactylogyrus* spp. among introduced Cyprinid fishes and their geographical distribution in Iran. International J. Veterinary Research, Shiraz University, 10(1): 26: 70-74.

16. Jalali, B. and K. Molnar, 1990a. Occurrence of monogeneans of freshwater fishes of Iran I: Dactylogyridae from fish of natural waters and description of *Dogielius mokhayeri* n. sp. Parasite. Hung., 23: 27-32.
17. Jalali, B. and K. Molnar, 1990b. Occurrence of monogeneans of freshwater fishes of Iran II.: *Dactylogyrus* spp. on cultured Iranian fishes. Acta Vet. Hung., 38: 339-342.
18. Woo, P.T.K., 2006. Fish diseases and disorders. Protozoan and Metazoan infections. CAB International. U.K., 1: 808.