Pakistan J. Zool., vol. 46(6), pp. 1679-1683, 2014.

Parasitic Infection in an Imported Fish Fantail, a Variety of Goldfish, *Carassius auratus* L. in Pakistan

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Abstract.- The parasitic infection in an imported ornamental fish fantail, a variety of goldfish *Carassius auratus* purchased from pet shop in Lahore was studied. In total eight species of parasites belonging to protozoans, monogenean and digenean trematodes and crustacean were identified. *Trichodina* Ehrenberg 1831 infection on skin and fins was 20%, (mean intensity 9.5); *Ichthyophthirius multifiliis* Fouquest 1876 infection on gills was 43.3% and on fins 30% (mean intensity 20.72 and 29.25, respectively). There was no difference in the infection of fins and gills by *I. multifiliis* (χ^2 = 1.14, df = 11, p=0.05). *Tetrahymena* sp. infection was 10% (mean intensity 98). Gills showed 100% infection with *Dactylogyrus* Diesing 1850 (mean intensity 29.3), *Gyrodactylus* Von Nordmann 1832, infection on skin of fish was 70% (mean intensity 11.1). Metacercariae of an unidentified digenean were also found encysted on gills (infection 66.60%, mean intensity 20.4). *Argulus foliaceus* Muller, 1785 infection was 26.60% and mean intensity 6.0. A cyclopoid stage of *Lernaea* sp. was also observed on skin. *Dactylogyrus* infection was the highest which caused severe damage to gill filaments and secondary lamellae. This study points our attention to a serious issue of import of infected fish.

Key words: Imported fantail, parasitic infection, *Dactylogyrus* sp. *Gyrodactylus* sp.

INTRODUCTION

Pet fish keeping is a hobby worldwide, mainly in developed countries (Olivier, 2003). The major part of aquarium fish industry is from freshwater fish sector (Helfman, 2007). Upto 2 million people worldwide are believed to keep marine aquaria (Wabnitz, 2003). FAO (2007) reported that world export of ornamental fish was almost US $ 283 million in 2006. South East Asian countries supply over 50% of the world's ornamental fish (Olivier, 2003). Many rural communities in South America, Africa and Asia earn their livelihood from this industry. Goldfish is the most popular and commonly kept aquarium fish in the world (Komiyama, *et al.,* 2009). Ahilan *et al.* (2009) listed eleven varieties of goldfish including fantail. Twenty species of ornamental fishes are imported live into Pakistan from South East Asian countries (Ahmad, 1996). According to Andrews (2006) pet fish trade is of great benefit to many countries, yet it may have adverse effects as a result of spread of different pathogens through the introduction of nonnative species. The ectoparasites are generally known to comprise the largest group of pathogens in warm water fish (Snieszko and Axelrod, 1971).

Many studies reported the transmission of parasites and other pathogens through ornamental fishes worldwide. Some of these studies are from Germany, Australia, Korea, Norway, Sri Lanka, Brazil, Turkey, Pakistan (Moravec *et al.*,1999; Evans and Lester, 2001; Kim *et al.*, 2002; Levsen *et al.,* 2003; Thilakaratne *et al*, 2003; Pizza *et al.*, 2006; Tavares-Dias *et al.*, 2010; Iqbal *et al.*, 2012a,b, 2013a,b; Iqbal and Sajjad, 2013; Iqbal and Mumtaz, 2013; Iqbal and Hussain, 2013; Haroon *et al.*, 2014; Iqbal and Haroon, 2014; Iqbal and Rehman, 2014; Koyuncu, 2009; Kayis *et al.*, 2013). In freshwater fishes, two monogenean parasites attack gills and skin and are narrowly host specific. There are 970 species of genus *Dactylogyrus* which infect gills of fishes (Gibson *et al.*, 1996). Two species namely *D. extensus* and *D. vastator* are common gill parasites of cyprinids, while *Gyrodactyus salaris* and *G. turnbulli* infect skin and fins of fishes. The common protozoan parasites of freshwater fishes are *Ichthyophthirius multifiliis, Chilodenella* sp, *Trichodina* sp. *Ichthyobodo necator* and *Tetrahymena* sp. Most of the ectoparasitc protozoan produce serious diseases and may cause mortality when their infection is very

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0030-9923/2014/0006-1679 $ 8.00/0

high. Among crustacean, two parasites of freshwater fishes are *Argulus foliaceus* and *Lernaea cyprinacea* which are cosmopolitan in distribution and infect almost all fishes (Bond, 2004; Noga, 2007; Rasouli *et al.*, 2012). The aim of present study was to investigate and identify parasitic fauna of a freshwater ornamental fish fantail, imported to Pakistan.

MATERIALS AND METHODS

The experimental fish fantail was purchased from pet shop in Lahore from July to October 2013. The fishes were brought live in sterilized polyethylene bag and kept in glass aquarium in aerated water in the Lab. The fish were weighed, measured and examined for the presence of any parasites or lesions on the body of fish. The mucus from skin, gills, fins and operculum was scrapped with glass slide and then spread carefully with cover slip separately for examination of protozoan and monogenean gill and skin flukes, under compound microscope at x10 and x40 magnification. The fish gills were cut and examined under microscope for monogenean gill fluke. The specimens were preserved in 10% buffered formalin and 70% ethanol for storage before further studies. The crustacean parasites were collected from fins cleaned in saline and preserved in 70% alcohol. The fresh mount preparation technique was applied to observe the motile parasites (Post, 1987; Southgate, 1994). Parasites were identified according to Kabata (1985) and Lome and Dykova (1992). Chi-square test was applied to check difference in infection level on gills and fins. Photographs of slides of parasites were taken with digital microscope camera Digiprolabomed, USA.

RESULTS

Thirty fantail fish were examined for parasitic infection. The total length and body weight ranged from 7.5-12.5cm and 7.2-31.1g. Clinically, 10 fish were moribund which showed sluggish movement. Two fish had patches on the skin. Tips of fins were eroded and white spots were very clearly seen on them. The infected fishes were having 2 to 6 species of parasites attached to their fins, fin rays, gills, skin and head. The infection was 100% and mean intensity of infection was 91.2 in the whole fish sample. The parasites recorded were monogeneans such as *Dactylogyrus* sp. and *Gyrodactylus* sp. protozoans such as *Trichodina* sp., *Tetrahymenea* sp., *I. multifiliis*; an unidentified digenean metacercaria on gills; crustacean such as *A. foliaceus* and a cyclopoid stage of *Lernaea* sp. A total of 2737 parasites were recovered. The species wise prevalence, mean intensity and site of infection in given in Table I.

Dactylogyrus infection on gills was 100% and it caused damage to gill epithelium and erosion of gill filaments. *Gyrodactylus* sp. had high infection (70%) but low mean intensity (11.1%). *Tetrahymenea* showed low infection (10%) but very high mean intensity (98). *Trichodina* infection was 20% and mean intensity 9.5. High mean intensity of infection (20.72) of *I. multifiliis* on gills is serious pathological condition for the fish. This has resulted in deformation of respiratory surface. Fin infection by *I. multifillis* was 30% and mean intensity 29.25. No significant difference was observed in infection of gills and fins by *I.multifillis* ($\chi^2 = 1.14$, df = 11, p=0.05). Infection of encysted metacercaria of digenean on gill filament was high (66.60 %, mean intensity 20.4). The gill filaments became swollen. Whereas, *Argulus foliaceus* showed 26.60% infection and mean intensity was 6.0. Only one *Lernaea* was found on skin of fish.

DISCUSSION

The most common parasite on gills with highest infection was *Dactylogyrus* sp. It caused destruction of gill epithelium and disruption of tissues of gill filaments. The structure of capillaries are damaged and blood supply become poor, this affects respiratory function. This parasite had been reported worldwide but is most common in carps (Nematollahi *et al.*, 2013). *Gryodactylus* sp. showed lower infection than *Dactylogyrus* sp. and seems less pathogenic than *Dactylogyrus*. However, the damage it causes to skin, scales and epithelium at the point of attachment on host is prominent because it form foci for entrance of secondary pathogens. Monogenean are host specific, have direct life cycle

Table I.- Parasites recovered from Fantail, *Carassius auratus.*

Parasite	Infected fish	Prevalence (%)	Site of infection	Total parasites	Range of parasites	Mean intensity
Dactylogyrus sp.	30	100	Gills	879	5 - 72	29.3
Gyrodactylus sp.	21	70	Skins/fins	233	1 - 30	11.1
Trichodina sp.	6	20	Skins/fins	57	2 - 25	9.5
I. multifiliis	22	43	Gills	456	1 - 160	20.72
I. multifiliis	12	30	Fins	351	1 - 275	29.25
Tetrahymena sp.	3	10	Skins/fins/gills	294	65 - 120	98.0
Digenean metacercariae ?	20	66.6	Gills	408	2 - 56	20.4
A. foliaceus	8	26.6	Fins	48	1 - 17	6.0
Lernaea sp.	1	3.3	Skin	1	1.0	1.0
				2737		91,2

and their transmission is enhanced in poorly managed fish ponds (Thilakaratne *et al.*, 2003; Woo, 2006). The results of the present study are comparable to Thilakaratne *et al.* (2003), Chand *et al.* (2011) and Kayis *et al*. (2013), who reported clear hemorrhagic areas on the skin of *C. auratus* infested with *Gyrodactylus* sp. and destruction of gill of fish infested with *Dactylogyrus* sp. High infection of encysted metacercariae of digenean on gills filaments as observed here may also prove to be fatal to fish too.

Infection of *I. multifiliis* on skin and fins results in irritation, detachment of epidermis and mucus production, whereas gill infection cause gill damage and respiratory stress (Tavares-Dias *et al.*, 2010). In heavy infection 100% mortality can occur. Infection by *I. mulltifiliis* cause white spot disease in fishes. This parasite is low host specific and widely distributed in freshwater fishes (Thilakaratne, *et al.*, 2003; Tavares-Dias *et al.*, 2010; Chanda *et al*, 2011; Iqbal *et al.*, 2013b).

Trichodina sp. occur in large numbers on fish under stressed conditions in ponds due to poor water quality and overcrowding, these parasites can proliferate massively and become serious ectoparasites (Lom and Dykova, 1992). *Trichodina* sp. has also been reported by Iqbal and Hussain (2013) in shubunkin *C. auratus*. High mean intensity of infection of *Tetrahymena* sp. was recorded from skin of the fish. *Tetrahymena* sp. infection has also been reported from six ornamental fishes *viz., Poecilia reticulate, C. auratus, Poecilia sphenops, Puntius* sp. *Pterophyllum scalare, C. carpio* from Sri Lanka (Thilakaratine *et al.*, 2003) and from *Carnegiella strigata* in Brazil (Tavares-Dias *et al.*, 2010) and in guppy, *P. reticulata* (Leibowitz and Zilberg, 2009). *Tetrahymena* infection is also known as guppy disease.

Low infection of *A. foliaceus* was observed in fantail. However, it is potentially a serious pathogen of commercial fish (Iqbal *et al.*, 2013a). High infection up to 800-1000 parasites per fish may cause mortality in *C. carpio* and other carps (Pekmezic *et al*., 2009). One *Lernaea* sp. was found on fish. This is the infective stage of parasite. *Lernaea* infection is serious problem in culturable and ornamental fishes (Iqbal *et al*., 2012a; Iqbal and Haroon (2014). This study has highlighted the issue of introduction of parasites with ornamental fishes imported into Pakistan. This unchecked import of diseased fish must be strictly regulated and controlled so as to safeguard our biodiversity and ecosystem.

AKNOWLEDGEMENTS

We are grateful to University of the Punjab, Lahore for providing funds for this study.

The Conflict of interest declaration

There is no conflict of interest or otherwise.

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(Received 15 May 2014, revised 7 August 2014)