External parasite infection of common carp (*Cyprinus carpio*) and big head (*Hypophthalmichthys nobilis*) in fish farms of Mashhad, northeast of Iran

Ahmad Nematollahi · Amin Ahmadi ·
Hemn Mohammadpour · Mansour Ebrahimi

Received: 4 March 2012 / Accepted: 5 July 2012 / Published online: 24 July 2012
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Abstract Totally 75 common carp and 100 big head fishes were caught by using net from fish farms in Mashhad, northeast of Iran. In laboratory skin, eye and fin of fishes were inspected by stereomicroscope and in second phase direct smears are prepared from probable lesions. Gills were dissected and its filaments were placed in petri dishes and fixed by Glycerin. In total 50 parasites (consist 19 protozoa and 31 metazoa) were recorded from fishes. The parasites represented in Protozoa (*Ichthyophthirius multifiliis* and *Trichodina* sp.) and Monogenea (*Dactylogyrus* spp.) and Copepoda (*Lerne cyprinacea*). During this study, infection with *Dactylogyrus* spp. was recorded on fish in all months. Mean intensity of *Dactylogyrus* spp. varied significantly among the seasons ($P < 0.05$). The maximum mean intensity was recorded in winter. Also infection with *Lerne cyprinacea* in spring was significantly higher than other seasons ($P < 0.05$). The results of this study together with the previously recorded prevalence of parasitic infection in fishes support that infection to external parasites (both protozoa and metazoa) is widespread cause for losses in fish farms of Iran.

Keywords External parasite · *Cyprinus carpio* · *Hypophthalmichthys nobilis*

Introduction

Carp of the family Cyprinidae, are the largest family of freshwater fishes in the world, have long been introduced beyond their native ranges, a practice that continues today (Nelson 1994). Although carps have been introduced for several centuries, the widespread introduction of the genus *Hypophthalmichthys*, the big head carps, is a relatively recent phenomenon. The genus of common carp (*Cyprinus carpio*) and big head (*Hypophthalmichthys nobilis*) in this family are inbred in very countries in world. By rearing fish in good environmental condition, optimum fish health can be achieved (Winton 1996). Beside unfavorable environmental conditions that are threat the fishes; pathogenic factors are very important in fish health and conclusive economics losses. Parasites are among the important factors responsible for weight loss, disruption of reproduction or impotency, blindness, abnormal behavior, epithelial lesions, deformities of gills and other symptoms that ultimately lead to economic loss in the fish industry. Although external parasites are not able to produce generalized symptoms, but they are cause localized damages and they may cause secondary fungal, bacterial and viral infections or act as carriers of bacteria, virus and other pathogens (Azari Takami 1997).

The external parasites of common carp and big head were investigated in Iran (For example, Pazooki et al. 2007; Jalili Jafari 1998; Raissy et al. 2010). To date, the following parasites have been recorded from common carp and big head in Iran: *Dactylogyrus* spp., *Trichodina* sp., *Ichthyophthirius multifiliis*, *Letnea cyprinacea*, and *Tylo-delpys clavata*. This external parasites commonly infest gills and skin and responsible for weight loss, disruption of reproduction or impotency, blindness, abnormal behavior, epithelial lesions, deformities of gills and other symptoms (Aksoy and Dorcu 2006). The aim of this study was to

A. Nematollahi (✉) · H. Mohammadpour
University of Tabriz, Tabriz, East-Azarbaijan, Islamic Republic of Iran
e-mail: anemat@tabrizu.ac.ir

A. Ahmadi · M. Ebrahimi
University of Mashhad, Mashhad, Islamic Republic of Iran

determine the external parasites fauna and mean intensity and seasonal changes of parasite species of common carp and big head in Mashhad, northeast of Iran.

Materials and methods

This study was carried out between September 2010 and May 2011. A total 75 common carp and 100 big heads fishes were caught by using net from fish farms in Mashhad, northeast of Iran. The specimens were placed in plastic tanks with ice and transferred to the laboratory. The work on specimens was achieved immediately. In the laboratory skin, eye and fin of fishes were inspected by stereomicroscope and in second phase direct smears were prepared from probable lesions. Gills were dissected and its filaments were placed in petri dishes and fixed by Glycerin. Preparation, fixing, staining and mounting of parasites were made by general methods used in parasitology (Lonc and Zotoryzky 1995). The parasites were identified according to keys by (Gusev 1983) and (Pojmanska and Chabros 1993). Statistical comparisons were carried out by using SPSS 16 statistical software. One way ANOVA was performed to compare prevalence related to seasons.

Results

In total 49 of 175 (28 %) fishes were infected by at least one parasites and 50 parasites (consist 19 protozoa and 31 metazoa) were recorded from fishes. The parasites represented in Protozoa (*Ichthyophthirius multifiliis* and *Trichodina* sp.) and Monogen (*Dactylogyrus* spp.) and Copepoda (*Lernaea cyprinacea*). Parasitic fauna of fishes are shown in Table 1.

During this study, infection with *Dactylogyrus* spp. was recorded on fish in all months. Mean intensity of *Dactylogyrus* spp. was varied significantly among the seasons ($P < 0.05$). The maximum mean intensity recorded in

winter. Also infection with *Lernaea cyprinacea* in spring was significantly higher than other seasons ($P < 0.05$).

Discussion

In this study 50 parasites (19 protozoa and 31 metazoa) species were recorded from the fishes. The results of study showed that the most common parasite was *Dactylogyrus* spp. in both common carp (*Cyprinus carpio*) and big head (*Hypophthalmichthys nobilis*) which was 13 and 6.6 %, respectively. This parasite is a monogenea which is cause infection of gill and skin. Infection with the parasite is cause degeneration and hemorrhage in gill and skin. This parasite had been reported from different fish species previously from Iran and other points of world and has been known as a parasite of various freshwater fish, found most commonly in common carp (*Cyprinus carpio*) and big head (*Hypophthalmichthys nobilis*). A lot of studies have been published on the seasonal changes of monogenean infection in fish (For example Shulman 1989; Özer 1999; Ozer 2002). The data from the Lake Beysehir seem to support the link with water temperature. In this study the highest infection of *Dactylogyrus minutus* was recorded in winter. The seasonal variations of Dactylogyrids are influenced by temperature, oxygen concentrations of water, size of fish host and fish maturity (Zitnan 1978; Pojmanska and Chabros 1993).

Other common parasite in this study was *Lernaea cyprinacea*. *Lernaea* is a metazoan parasite from copepoda which infected skin and gill of fish in adult and copepodid stage. In this study adult form of the parasite was recorded in big head but in common carp was recorded both adult and copepodid stage. *Lernaeasis* is common and most infection in silver carp and big head carp farms. Occurrence of high infestation by *Lernaea* in silver carp and big head carp farms is interpreted by *Molnar* hypothesis. According to this opinion, the number of voracious cyclops, a predator of *Lernaea*, decreased due to the

Table 1 Parasitic fauna in 75 common carp and 100 big head fishes

Host	Parasites	Infected organ(s)	Percent of infected fishes	Total percent
<i>Cyprinus carpio</i>	<i>Trichodina</i> sp.	Skin	6	35
	<i>Ichthyophthirius multifiliis</i>	Skin and gill	7	
	<i>Dactylogyrus</i> spp.	Skin	13	
	<i>Lernaea cyprinacea</i> (adult)	Skin	7	
	<i>Lernaea cyprinacea</i> (copepodid form)	Gill	2	
<i>Hypophthalmichthys nobilis</i>	<i>Trichodina</i> sp.	Skin and gill	4	19.9
	<i>Ichthyophthirius multifiliis</i>	Skin	4	
	<i>Dactylogyrus</i> spp.	Gill	6.6	
	<i>Lernaea cyprinacea</i> (adult)	Skin	5.3	

introduction of silver carp and particularly big head carp, which help the survival of *Lernaea* in ecosystem. The resulting large numbers of the copepodid stages produced from *Lernaea* successfully hide themselves in the gills of fish hosts. The occurrence of such a situation resulted in a prevalence of lernaeasis infection among fish species during the summer of the aforesaid year and continued for several years (Selda et al. 2008). But in disagreement of this hypothesis in this survey infection with *Lernaea cyprinicea* in spring was significantly higher than other seasons ($P < 0.05$). According the results of present study prevalence of protozoa is 10.85 %. In this study 19 protozoa, consist *Trichodina* sp. and *Ichthyophthirius multifiliis* were recorded. The protozoa are the most harmful parasites and cause death of fish in both natural waters and fish farm. Protozoa infections cause oedema, hyperplasia, hypertrophy and hemorrhage in host tissues. It seems that infestation with *Trichodina* sp. and *Ichthyophthirius multifiliis* is common in fishes in Iran. Since infestation with the protozoa was recorded in most studies about parasitic infection of fishes.

In conclusion results of this study with the previously recorded prevalence of parasitic infection in fishes of Iran support that infection to external parasites (both protozoa and metazoa) is widespread cause for losses in fish farms in Iran.

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