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Short Communication

Ornamental fish goldfish, *Carassius auratus* and related parasites in three districts of West Bengal, India

Abstract

The lucrative business of ornamental fish culture in West Bengal (Mainly in three districts-Howrah, North and South 24 Parganas) are facing loses due to the invasion of different ecto- and endo-parasites. The present study shows that the ornamental fish (Goldfish – *Carassius auratus*) are mainly affected with ecto-parasites like *Ichthyophthirius* sp., *Dactylogyrus* sp., *Gyrodactylus* sp., *Argulus* sp. and endo-parasites like *Procamallanus* sp. and *Cucullanus* sp. The intensity of infection is high in case of *Ichthyophthirius* sp. and the intensity of the infection is high in summer months when the temperature is high or moderately high. In cooler months the intensity of the infection is lower as because the parasites are unable to breed or scarcity of food particles.

Key words:
Carassius auratus, fish parasites, goldfish, intensity of infection, ornamental fish

Introduction

There is a tremendous scope for the aquarium fishes of West Bengal, India. Three districts of West Bengal, viz. Howrah, North 24 Parganas and South 24 Parganas play pioneer role in aquarium fish production in the country. By culturing imported exotic fishes locally, or the colorful resources of indigenous fishes, India not only earns the foreign exchange, but also enters into the world market of ornamental fishes. The ornamental fish trade plays an important role for socioeconomic upliftment of the backward class and females in our country with little investment of money. Catching, keeping, breeding of ornamental fishes for the aquaria is a good economic activity which has not so far properly realized, hence not properly organized in India. The business has been found to be a very profitable economic activity and deserves the scientific study and development. The business can either be the main or subsidiary economic activity to earn money for the culturists. The varieties of indigenous fishes are increasing the demand of Indian ornamental fishes in foreign countries. However, the business is not without risk. The culturist cannot supply the fishes as per demands because of problems due to the diseases. A huge loss of stocked fish often occurs.

The aim of the present study provides relevant information of various pathogens that invade the ornamental fish in various fish farms of three districts of West Bengal, India. When the fish suffer from a disease they are sometimes treated rapidly and the real causative agent cannot be observed. In West Bengal, due to the lack of information about the ornamental fish parasitic diseases and their proper treatment, the culturists suffer lots of loses every year and fully commercialization of the trade is not yet done.

Materials and Methods

During the period of March 2009 to March 2010, around 50 farms of three districts (Howrah, North 24 Parganas and South 24 Parganas) were surveyed and culturists interviewed to get information about the fish pathogens

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and diseases. During this period, about 159 species of goldfish, *Carassius auratus* were collected and examined to find out the pathogens. To study the pathogens, the fish were killed; the body mucus and pieces of organs were taken in the slide with a drop of 0.65% saline solution for microscopic observation. The external surface of the fish was examined thoroughly using dissecting microscope. The fins, nostrils, operculum and buccal cavity were examined for external parasites (Monogeneans, crustaceans). Gills were examined completely under a dissecting microscope. The smears of the gills were examined under the microscope. Pieces of gills were treated with 4% formalin, shaken and the sediment examined under a microscope. Small fish were placed in containers of 4% formalin, shaken and the sediment examined for parasites. The sample of fish species was opened up dorsoventrally and the internal organs examined for the endo-parasites. The entire digestive system was taken in a petri dish with physiological saline solution (0.65%). The gut was divided into sections and each section examined for parasites. The gonads, liver, heart, gall bladder and pericardial cavity were examined for parasites. The number of parasites per fish and site of infection were noted. Drawings of the parasites were made and identification done using appropriate keys reported by Yagamuti, Frimeth, Hoffman and Arthur and Abu Tweb.[1-4]

Table 1: Total intensity of the infection of different parasites (during the period of March 2009 to 2010) and location of the infection

Parasites	Infection %	Location
Ichthyophthirius sp.	45	Skin and gill
Gyrodactylus sp.	20	Skin and fins
Dactylogyrus sp.	17	Gill
Argulus sp.	11	Gill and skin
Procamallanus sp.	61	Intestine
Cucullanus sp.	39	Intestine

The intensity of infection with different parasites in different months of the study period was observed. The intensity of the parasites infected to the fish mostly was also observed during the study period. Simultaneously, the temperature was recorded in different months and average temperature of the months was recorded.

Results

Of the 159 fish specimens examined, 123 (77.36%) were found to be infected with different parasites. The survey showed that the fish were mainly affected with ecto-parasites like *Ichthyophthirius* sp. (65%), *Gyrodactylus* sp. (40%), *Dactylogyrus* sp. (37%), *Argulus* sp. (11%) and endo-parasites like Nematode - *Procamallanus* sp. (61%), *Cucullanus* sp. (39%) [Table 1]. All internal parasites were found from the intestine of the host. The summery of the fish examined and their infection details are given in the Table 1.

The interview of the farmers also concluded that they faced the white spot problems in skin (*Ichthyophthirius* sp.) mostly in all season, and the value of the fishes decreased if the white spots in the skin appeared. Another problem they faced was the inadequate growth rate of fishes due to the intestinal parasites. The occurrences of the pathogens were high in summer and autumn months and low in winter months. Monthly prevalence of *Ichthyophthirius* sp. varied from 10 to 71.1%. Overall, the infection was low in the months of November, December, January and February i.e., 12, 10, 11 and 13%, respectively. Nevertheless, the intensity was suddenly increased in March (59.3%), and high in August (71.1%). *Gyrodactylus* sp. showed higher intensity in the month of October (76%), and lower in the months of December and January (4 and 7%). *Dactylogyrus* sp. showed its high intensity in the month of October (72%) same as *Gyrodactylus* sp. and low in the months of January

Table 2: Intensity of infection of different parasites in different months (during the period of March 2009 to March 2010) and average temperature in the respective months

Months	Temperature (°C)	*Ichthyophthirius* %	*Gyrodactylus* %	*Dactylogyrus* %	*Argulus* %	*Procamallanus* %	*Cucullanus* %
March	32	62.1	54.0	19.0	34.3	57.9	51.3
April	34	60.3	57.4	32.0	41.7	60.1	59.4
May	34	61.0	54.2	51.2	50.2	69.2	59.0
June	30	64.4	60.3	50.3	56.0	73.0	69.0
July	30	70.6	60.0	60.3	49.0	68.0	69.0
August	29	71.1	72.0	65.0	48.7	72.0	74.0
September	29	69.0	71.2	70.1	45.2	61.9	64.4
October	28	56.3	76.0	72.0	48.8	58.3	62.0
November	23	12.0	71.2	69.5	20.0	59.0	51.3
December	19	10.0	04.0	00.0	04.0	48.2	42.0
January	19	11.0	07.0	02.0	04.5	34.0	30.1
February	25	13.0	12.0	07.0	08.3	21.0	26.2
March	33	59.3	29.3	20.0	21.1	41.4	47.0

and February (0 and 2%). *Argulus* sp. showed high intensity in the months of June and July (56 and 49%) and low in the month of December (4%). The intensity of the Nematode – *Procamallanus* sp. was high in the months of June, July and August (73, 68 and 72%, respectively) and low in January and February (34 and 21%, respectively). Nematode – *Cucullanus* sp. showed its highest intensity in the month of August (74.0%) and lowest in the months of January and February (30.1 and 26.2%, respectively) [Table 2].

Discussion

This preliminary investigation of the parasitofauna of ornamental fish in three districts showed 77.36% infection rate. This is rather very low as compared to other similar work of Das and Nandi,[5] where they found 143 species of Protozoa have been dealt with from 65 species of fish hosts and 14 species of Cestoda and 22 species of Nematoda are recorded from 15 and 17 species of fishes, respectively. The survey showed that the intensity of *Ichthyophthirius* sp. is high in all season except in winter season. Schäperclaus[6] reported that the *Ichthyophthirius* is the most important pathogenic parasites of the fish. Mortality rate of infected fish by *Ichthyophthiriasis* could reach almost 100%. *Ichthyophthiriasis* outbreaks occur during the summer months when temperatures are at the peak reported by Ogut.[7] *Gyrodactylus* sp. infection is high mainly in the autumn with moderate temperature and low in the winter season. The similar work of Davioda *et al*.[8] showed the intensity of *Dactylogyrus* was high in moderate high-temperature months than cooler months. King *et al*.[9] observed that the intensity of *Gyrodactylus* sp. was high in warm aquarium waters in warmer months. The report also concluded that at the higher temperature, the parasite was capable of reproducing on host. Anderson[10] reported the moderate temperature is suitable for the growth of *Gyrodactylus* sp. Gill fluke (*Dactylogyrus* sp.) infection is commonly seen in all farms with infection rates varying from 60% to 90% of fish. The highest mortality due to gill fluke is manifested during the first week after stocking. The incidence of visible infections or disease in spawn and early fry at the hatcheries is low, except for gas bubble disease, which is probably due to high ammonia level and eutrophic conditions reported by Lakra and Singh.[11] As it is seen, the intensity of the species was highest in summers and autumns. It decreased between late autumn and winter reported by Ozturk.[12] The maximum intensity of the *Dactylogyrus* sp. was recorded high with highest temperature by Tekin-Özan.[13] *Argulus* sp. showed its intensity high in higher temperature and gradually the intensity of infection decreases with the fall of temperature in cooler months. The study has been supported by Walker.[14] where the study showed that the intensity of infection with *Argulus* sp. is dependent on temperature. Higher temperature cause higher intensity of infection than cooler temperature. The study had also shown that development time of the egg stages is heavily dependent upon the temperature of surrounding water with development being more rapid at higher temperatures. *Argulus foliaceus* eggs for example hatch after just 8 days at 26˚C reported or after several months for eggs deposited at temperature below 10˚C reported by Lester and Roubal, Mikheev *et al*.[15,16] Edema *et al*.[17], Okaka[18] and Khalil[19] reported that Nematode parasites were found to infect most fish species. The parasites reported in this study (*Procamallanus* sp., *Cucullanus barbi* and *Spinitectus* sp.). Okaka and Omoigberale[20] recorded nematodes as the most common parasite, infecting 18.6% of the fish population. According to Ginetsinskaya[21] and Lacerda[22] the number of hosts did not permit seasonal analyses, a higher number of endo-parasites were observed in May and June. The annual cycles and reproductive periods of fish parasites are frequently related to the hydrological variation of the habitat of the host, as well as to the fluctuations in the abundance of plankton and benthic organisms and fish that feed on them.

It was concluded that the present study has shown the intensity of the infection of different parasites are low in cooler months, and intensity increases with the temperature in summer and autumn months, which is in contrast to the trend observed here. Interviews from the different culturist also showed that the problems of different parasitic diseases are low in intensity in cooler months. The warmer months provide better environment for the breeding of fish parasites, and foods for them.

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