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LERNAEA DIVERSITY AND INFECTION IN INDIAN AND CHINESE CARPS UNDER SEMI-INTENSIVE CULTURE CONDITIONS IN LAHORE, PUNJAB

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ABSTRACT

Indian and Chinese carps, *Labeo rohita*, *Catla catla*; *Ctenopharyngodon idella; Hypophthalmichthys molitrix* and *Aristichthys nobilis* were obtained from Punjab University Fish Research farms Lahore. These fishes were examined for parasitic infection, lernaeasis. *Lernaea cyprinacea* (L.) was the most prevalent parasite infecting these five fish species (comprising 88.48-100% population). In addition to *L. cyprinacea*; *Lernaea polymorpha* (Yu, 1938); *Lernaea oryzophila* (Monod, 1932) were found on *L. rohita* and *C. idella.* *Lernaea ctenopharyngodonis* was found on *C. idella* only. Prevalence of *Lernaea* was 68.9% and 63.6% in *L. rohita* and *C. catla* respectively and 78.1% in *C. idella*; 66.7% in *A. nobilis* and 9.1% in *H. molitrix*. Mean intensity was 17.3; 9.2; 6.91; 1.0 and 3.0 in these fishes respectively. The prevalence was highest in February which dropped towards April. The abdomen and the base of pectoral, pelvic and anal fin of these fishes seem the most common site of attachment of *Lernaea* than any other area of the body of the fish. As 52.05 to 57.80% parasites were attached here. *Lernaea* diversity and infection in carps reared in earthen ponds under semi-intensive culture conditions are discussed.

Keywords: *Lernaea cyprinacea,* infection, diversity; culturable carps.

INTRODUCTION

Polyculture of carp is commonly believed to result in higher production due to exploitation of multiple trophic niches by these fishes. Major and Chinese carps are reared under semi-intensive culture conditions in earthen ponds in the province of Punjab Pakistan. Use of organic manure, inorganic fertilizers and addition of supplementary feed in fish ponds is a common practice to grow fish (Iqbal *et al.,* 2001a). Parasitic infection of freshwater fish is heavily influenced by factors such as; water temperature, host fish species and infective stages of the parasites present in the pond. Uncontrolled and unregulated transport of fish eggs, larvae and poor pond management play a very important role in spread of disease (Post, 1987). The copepod, family lernaeidae have many representative species that are parasites. The majority of lernaeid parasites have undergone extensive morphological adaptations (Piasecki *et al*., 2004). The most important lernaeid parasite in cyprinids is *L. cyprinacea*. This parasite lacks host specificity to an extent that it can infect all freshwater fish. *Lernaea cyprinacea* is more prevalent in still and slow flowing water than in fast flowing streams (Hoffman, 1976). As a result of attachment, *Lernaea* can have serious pathogenic effects on the skin and fins of the fish. Young fish are most at risk of death. *Lernaea* can penetrate the visceral cavity, including heart and resulting peritonitis and death (Kabata, 1985).

Lernaea cyprinacea is widely distributed in Africa, Asia, North America and Europe and recently been reported in native fishes from Brazil (DeMagalhaes, 2006) and Western Australia (Hassan *et al*., 2008). This study was aimed to find infection and diversity of *Lernaea* spp. in Indian and Chinese carps in semi-intensive polyculture conditions in earthen ponds.

MATERIALS AND METHODS

The diseased fish samples were collected from a fish pond (57 x 54 x 1.4 m) at Punjab University Fish Research Farm, Lahore from February to April 2005. In total 113 fishes were collected in four samples (Feb. 1 sample; March 1 sample; April 2 samples). (The fish ponds at the site are supplied with ground water through tube-well and fish is fed on supplementary feed and fresh fodder. The ponds are fertilized with organic manure and inorganic fertilizers). Fish samples were brought live to Fish Disease and Health Management Laboratory in pond water for examination. The fishes were weighed and measured. Body of fish was divide into four sections as under; S1-mouth area; S-2 area above lateral line including dorsal fin; S-3 area below lateral line (abdomen, pectoral fine, pelvic fin, anal fin); S-4 caudal fin. These four sections were examined thoroughly for *Lernaea* attachment. The *Lernaea* were visible to naked eye and with the help of magnifying glass and appeared as thread like structure attached on different areas of the body of fish. The parasites were removed from the fish with the help of the forceps and kept in a drop of water on a clean glass slide and observed under a microscope. Each *Lernaea* specimen from every infected fish was

collected and preserved in 70% alcohol in glass bottles. The preserved specimens were identified according to Bauer *et al*., (1973) and Kabata (1985). The water temperature, dissolved oxygen (DO) and pH were measured on the site with DO meter YSI (Model 57) and digital pH meter on sampling day.

RESULTS

The water temperature, dissolved oxygen and pH of infected pond ranged from 13ºC to 19°C; 6.2mg/L to 4.9mg/L and 7.2 to 7.90 respectively during study period. These parameters were suitable and within the normal range required for carp rearing and culture as described by Boyd and Tucker (1998).

The infected fishes had adult female *Lernaea* spp attached to their bodies. Minute lesions (<1mm) were present on the infected fishes at the point of attachment of *Lernaea*. The infected fishes were listless with dull and dark colour (Fig.1). The *Lernaea* spp were penetrating the skin, and their egg sacs were seen on surface of the fish. In spite of heavy infection (a *L. rohita* with 235 *Lernaea* and *a C. catla* with 52 *Lernaea*) no dead fish was observed.

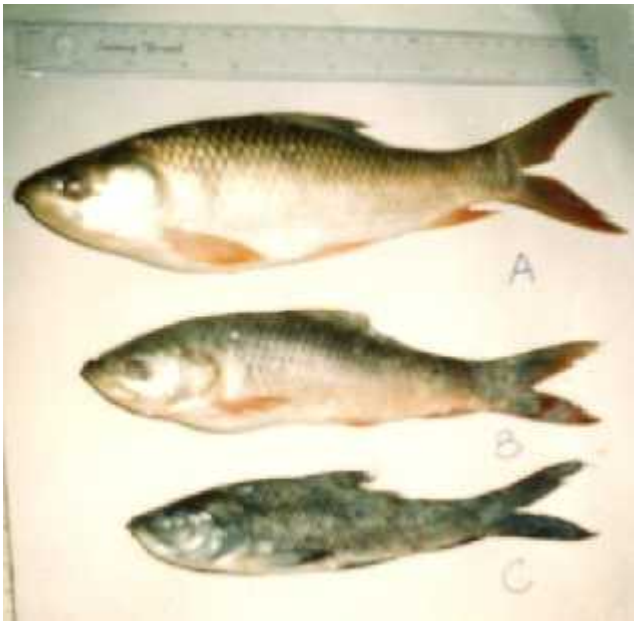

Fig.1. A healthy and mildly infected *L. rohita* (A, B), heavily infected *C. catla* (C). (B & C after removal of *Lernaea*).

***Lernaea* species diversity:** From 31 infected *L. rohita,* three species of *Lernaea* were recorded, which were *L. cyprinacea*, *L. polymorpha* and *L. oryzophila*. A total of 536 *Lernaea* specimens were recovered from these fishes, including 529 (98.69%) *L. cyprinacea* (from 29 fishes); 4 (0.74%) *L. polymorpha* and a 3(0.55%) *L. oryzophila* from one fish each.

In *C. idella,* 25 fishes harboured four species of *Lernaea*; *L. cyprinacea; L. polyImorpha*; *L. oryzophila* and *L. ctenopharyngodonis.* According to results a total of 173 *Lernaea* specimens were observed in *C. idella,* of which *L. cyprinacea* were 153 (88.43%); followed by *L.polymorpha* (14, 8.09%); *L ctenopharyngodonis* (4, 2.31%) and *L. oryzophila* (3, 1.73%) specimens respectively. Mixed infection was observed with different combination. Double infestation was in two combination viz. 4 fish were infested with *L. cyprinacea* + *L. polymorpha*; one fish was infested with *L. cyprinacea* + *L. oryzophila* and *Lernaea ctenopharyngodonis* was recorded from two individual fish.

In *C. catla*, a total of 129 *Lernaea* specimens were recovered from14 fishes in 1st, 2nd and 4th samples all of which were identified as *L. cyprinacea*. In one *H. molitrix,* 3 *L. cyprinacea* were recorded. Two *L. cyprincaea* were observed in two *A. nobilis*.

Prevalence and Mean intensity of infection of *Lernaea* in five fish species: In total 113 fishes of five species were examined. The prevalence and mean intensity of *Lernaea* in *L. rohita* was 68.9% and 17.29 respectively. The prevalence was 100% in February which decreased gradually towards April. The mean intensity showed unusual trend due to one fish, which carried exceptionally very high number (235) of parasite in sample 2. In *catla catla* prevalence of *L. cyprinacea* was 63.63% and mean intensity was 9.21. The prevalence remained 100% in February and March but dropped to 66.66% in April (Table 1). The mean intensity varied from 1 to 21.

High prevalence (78.12%) was observed in *C .idella*. Prevalence showed same trend in *C. idella* as observed in *L. rohita*, being 100% in February which dropped gradually in April. The mean intensity was 6.92, which showed almost the same trend as observed in prevalence, highest in February and decreasing gradually towards April.

Eleven *H. molitrix* (mean total length 27.9 ±1.5cm; mean weight 251.5 ± 6.8g) were examined in three samples, of which one *H. molitrix* was infected (9.09%) with 3 *L. cyprinacea* only. Three *A. nobilis* (mean length 28.6±2.5cm; mean weight 340.3.5g) were studied in sample 2, of which two fish were infected (66.6%) with one *L. cyprinacea* each. The data for *H. molitrix* and *A. nobilis* is not shown in Table 1.

Site of attachment of *Lernaea* species: The adult female *Lernaea* were attached on various sections of the body of the fish (Table 2). Abdomen/ventral side (S-3) of the fish is the most common and favorite site of attachment of *Lernaea* than rest of the body. As 52.02% to 57.80% parasites were attached here. The area above lateral line (S-2) is the second most popular site of attachment with 23.12% to 27.13% *Lernaea* attached here.

Table 1. *Lernaea* species infection in three fish species

Fish	Sample	Fish Exam.	Fish Infect.	Preval-ence (%)	Mean length(cm)	Mean Weight (g)	parasite range	Mean Intensity
L.rohita	Feb.	6	6	100	26.9 ± 3.2	243±14	7-45	19.3
	Mar.	7	4	57.14	28.5± 3.09	273±8.5	2-235	63.7
	Apr.1	15	8	53.3	29.6± 4.51	337±13	1-17	5.0
	Apr.2	17	13	76.47	31.3± 5.43	427±28	1-86	9.6
	Total	**45**	**31**	**68.9**				**17.29**
C.catla	Feb.	3	3	100	24.2 ±7.61	223 ± 23	2-52	21
	Mar.	5	5	100	19.2 ±5.93	135 ±14	1	1
	Apr.1	5	0	-	16.8 ±3.86	73 ± 5	0	-
	Apr.2	9	6	66.66	15.6±8.97	92 ± 4	1-19	10.16
	Total	**22**	**14**	**63.63**				**9.21**
C.idella	Feb.	5	5	100	23.8±7.15	235± 20	2-22	10.4
	Mar.	8	7	87.5	33.07±3.5	503± 18	4-11	5.0
	Apr.1	8	5	62.57	30.2±7.4	418± 27	1-13	6.0
	Apr.2	11	8	72.72	23.8±7.15	695± 44	1-23	7.0
	Total	**32**	**25**	**78.12**				**6.92**

Table 2. Attachment of *Lernaea* on fish

Fish	S-1	S-2	S-3	S-4
L.rohita	13.99	24.06	52.05	9.9
C.catla	7.75	27.13	53.49	11.63
C.idella	6.94	23.12	57.80	12.14

values are in %

DISCUSSION

Three species of *Lernaea; L. cyprinacea, L. polymorpha* and *L. oryzophila* were recorded from *L. rohita. Leranea cyprinacea* was the most prevalent species (98.69%) observed in *L. rohita.* In contrast to this Hussain (1998) reported five species of *Lernaea; L. polymorpha L.arcuata, L.lophiara. L. cyprinacea, L.oryzophila.* The difference in diversity of *Lernaea* species reported by Hussain (1998) and present study may be attributed to variable environment of the sampling site.

Four species of *Lernaea* were observed from *C. idella* i.e. *L. cyprinacea, L. polymorpha, L. oryzophila* and *L. ctenopharynogodonis.* This indicates that *C. idella* has higher *Lernaea* diversity than other four carp species studied. Tasawar *et al.,* (1999) also reported four species of *Lernaea* from *C. idella*; *L.cyprinacea, L. polymorpha, L. lophiara* and *L. ctenopharynogodonis. Lernaea cyprinacea* dominated in term of number than other *Lernaea* spp. both in *L. rohita* and *C. idella*. In *C. catla, H. molitrix and A. nobilis* all the specimens observed were *L. cyprinacea.*

The prevalence of *L. cyprinacea* in *L rohita, C. catla* and *C. idella* was high. The high prevalence in these fishes may be associated to their preferred trophic behavior in the pond. The reason for high prevalence in *C. idella,* may be that, this fish spend time in that area of pond with vegetation for feeding. At such places, probably the free living infective stages of *Lernaea* congregate and this increases the chances of infection. In polyculture condition, *C. idella* has higher incidence of lernaeasis than *A. nobilis* and *H. molitrix* (Bauer, *et al*., (1973). Our results are comparable to Tasawar *et al*., (1999, 2001). Iqbal *et al*., (2001c), Shafiq *et al*., (2001) and Tasawar *et al*., (2007) reported high prevalence of *L. cyprinacea* in *C. Catla.* Iqbal *et al.,* (2001b) suggested that *C. catla* is the most susceptible host of *Lernaea cyprinacea*. These five carps seem suitable host for *Lernaea* species when reared in ponds. Goodwin (1999) stated that *A. nobilis* provide an excellent host for adult *Lernaea. Lernaea cyprinacea* is the most prevalent species in culturable carps as observed in this study and reported earlier (Tasawar *et al*., 1999, 2001, 2007; Iqbal *et al*., 2001 b; Shafiq *et al*., 2001).

Mean intensity in *C. idella* was lower than *L. rohita* and *C. catla*. Shafiq *et al*., (2001) reported low mean intensity of *L. cyprinacea* in *C. idella*. The difference in mean intensity in the present study and Shafiq *et al*., (2001) may be due to different sources of the fish examined, size of the infected fish and infective stages of parasites available in the pond.

The 100% prevalence in the month of February in *L. rohita; C. catla* and *C. idella* indicates that *Lernaea* infection in these fishes was established by late winter when water temperature was 13-15º C, as observed in this study. Tasawar *et al*., (1999) also reported that parasitic infection of *Lernaea* was highest in winter when water temperature was between 13-23 ºC and low during the summer months. Iqbal *et al*., (2001c) reported high

prevalence of *Lernaea* sp. in carps from December to April.

Abdomen and ventral side of the body of the fish (S-3) seems the most common site of attachment of *Lernaea* spp. It is convincing that *Lernaea* have definite affinity for abdomen and at the base of fins. These sites offer more protection in water and tissues at the base may be more easily penetrated by the parasite. This support the hypothesis proposed by Medeiros and Maltchik (1999) that *L. cyprinacea* prefers that location which offers greater protection against water current. However, this particular way of attachment of *Lernaea* is very pathogenic by its nature (Khalifah and Post, 1976; Kabata, 1985; Sharif and Roberts, 1989).

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