



EFFECTS OF NEMATODE PARASITE ON THE FEEDING INTENSITY OF HOST FISH *XENENTODON CANCILA*

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Abstract: Diseases form the most serious limiting factors in aquaculture, because of the adverse effect it produces on the normal health condition and metabolic activities of the fish resulting in great economic loss. An indigenous fish population, *Xenentodon cancila* of Chittar dam, Kanyakumari District, Tamilnadu was found infested with the nematode parasite *Philometra pellucida* of the order Dracunculoidea. A total of 679 fishes were collected from the reservoir and studied. The parasites were found distributed in the musculature, body cavity, alimentary canal, gonad, liver, airbladder and kidney. The infestation of the parasite on the host fish was very high with a mean percentage prevalence of 81% and mean intensity 5.8. Effect of *Philometra pellucida* on the weight of *Xenentodon cancila* showed significant difference. *Xenentodon cancila* is a carnivorous cannibalistic surface feeder. Feeding intensity is a factor to understand the health status of the host fish. Feeding intensity of both infested and uninfested fishes were studied in relation to month, sex of the fish, size of the fish and levels of infestation. To relate feeding intensity to infestation, the condition of the stomach was grouped into three categories namely, trace (T - stomachs with empty and trace food materials), half full (H - quarter and half filled stomachs) and full (F - 3/4 full and gorged stomachs). Corresponding feeding indices of infested and uninfested fishes were calculated using the formula $F \times 100 / N$. Out of 129 stomachs of uninfested fish examined, 19.38 per cent was with trace stomach, 47.29 per cent with half full stomach and 33.33 per cent with full stomach were encountered. In infested fish, out of the 550 stomachs examined, 48.18 per cent was with trace stomach, 31.82 per cent with half full stomach and 20.00 per cent with full stomach. It is not influenced by the factors like sex and length of host. But when the levels of infestation increased the percentage occurrence of trace stomach increased and percentage occurrence of half full and full stomach decreased. Comparatively, the feeding intensity of male fish was more than female with insignificant differences. However, feeding intensity in relation to length of fish and month did not show any significance.

Key words: *Xenentodon cancila*, *Philometra pellucida*, Dracunculoid nematode, Infestation, Feeding intensity

INTRODUCTION

Nematodes are considered as the most important helminthes parasites of fishes. There are numerous documented diseases caused by nematodes in freshwater aquaculture (Conboy *et al.*, 2002). Nematodes such as *Philometra* cause pathology mostly in natural fish populations. Most authors (Moravec, 1994; Dick and Choudhury, 1995) agree that fish nematodes damage the hosts by depriving the fish of digested food; by feeding on host tissues, sera or blood; and by direct mechanical damage through fixing to host tissues and developing or migrating in them. Growth rate, food consumption and swimming activity are reduced in infected fish. These worms bore their anterior ends deep into mucosa up to the muscularis layer. Kall *et al.* (2004), who

examined *P. obturans* infection of pike (*Esox lucius*), reported that the pikes infected by this large worm inhabiting gill arteries were less active, showed lethargy and died. *Xenentodon cancila* is classified as Least Concern (LC) on the IUCN Red List (April 2011). The approach of this paper is to highlight the effects of nematode parasite on the feeding intensity, as it reveals the health status of the host.

Most nematode species infect the intestinal tract (Morevec and Wang, 2002). The major damage caused by these worms is associated with their consumption of intestinal contents, thereby depriving the host of nutrients. Large numbers of parasites leads to complete destruction of the intestinal mucosa and death of the fish. Fluid filled spaces were distributed on the inner

surface of the body. Feeding intensity of both infected and uninfected fishes were studied in relation to month, sex of the fish, size of the fish and levels of infestation.

MATERIALS AND METHODS

To evaluate the influence of *Philometra pellucida* on *Xenentodon cancila*, the fishes were classified into different length groups. To relate feeding intensity to infestation, the condition of the stomach was grouped into three categories namely, trace (T - stomachs with empty and trace food materials), half full (H - quarter and half filled stomachs) and full (F - 3/4 full and gorged stomachs). Corresponding feeding indices of infested and uninfected fishes were calculated using the formula $F \times 100 / N$.

RESULTS AND DISCUSSION

Diseases of all kinds are now known to occur on an increasingly larger scale on aquaculture systems. Fish mortality is not the only criterion to evaluate the effect of fish disease. The morbidity which leads to weight losses and poor growth in surviving fish contributes substantial losses to the farmers. Most of the available literature on nematode parasites deals with the identification of the parasite and their nomenclature. But infestation causes serious problems to host animals either directly or indirectly affecting the physiological functions of the host.

Xenentodon cancila a freshwater fish is everly infested with the nematode parasite *Philometra pellucida*. Of the 679 fishes collected from the reservoir during 2004, 550 (81 %) were found to be infested with the nematode parasite. It is a carnivorous predatory fish feeding on phyto planktons, crustaceans, aquatic insects and fishes. Effects of *Philometra pellucida* on feeding intensity of *X. cancila* was studied and the results indicated that out of 129 stomachs of uninfected fish examined, 19.38 per cent was with trace stomach, 47.29 per cent with half full stomach and 33.33 per cent with full stomach were encountered. In infested fish, out of the 550 stomachs examined, 48.18 per cent was with trace stomach, 31.82 per cent with half full stomach and 20.00 per cent with full stomach (Table 1 and Fig. 1).

Table.1 Effects of *Philometra pellucida* on feeding intensity of *X. cancila*

Infestation	Full(F)	Half(H)	Trace(T)	Total
Uninfected	43(33.33)	61(47.29)	25(19.38)	129(100)
Infested	110(20.00)	175(31.82)	265(48.18)	550(100)
Total	153(22.53)	236(34.76)	290(42.71)	679(100)

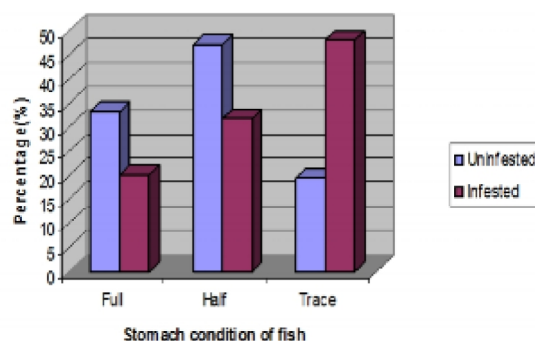


Fig. 1. Stomach condition in relation to infestation of *Philometra pellucida*

The feeding intensity of infested fishes examined over a period of 12 months revealed that all three categories of stomachs were encountered in each month. Feeding intensity in relation to different months showed a fluctuating pattern (Table 2 and Fig. 2).

Table 2. Feeding intensity in relation to different months

Month	No. of fishes infested	Stomach condition		
		Full(F)	Half(H)	Trace(T)
Jan	34	5(14.71)	14(47.18)	15(44.12)
Feb	38	6(15.79)	10(26.32)	22(57.89)
Mar	29	9(31.03)	11(37.93)	9(31.03)
Apr	59	12(20.34)	15(25.42)	32(54.24)
May	32	2(6.25)	10(31.25)	20(62.50)
June	34	8(23.53)	11(32.35)	15(44.12)
July	88	24(27.27)	24(27.27)	40(45.45)
Aug	56	17(30.36)	16(28.57)	23(41.07)
Sept	40	7(17.50)	17(42.50)	16(40.00)
Oct	59	8(13.56)	22(37.29)	29(49.15)
Nov	53	10(18.52)	20(37.04)	23(43.40)
Dec	28	2(7.14)	5(17.86)	21(75.0)
Total	550	110(20.0)	175(31.82)	265(48.18)

In a healthy fish the percentage occurrence of half stomach and full stomach were more in male (F - 34.09 %; H - 48.86 %) than in female (F - 31.71 %; H - 43.90 %). But in infested fish trace stomach was found to be maximum and

it was more in female (48.22 %) than in male (48.16 %). There was no marked difference between males and females in different stomach conditions in infested fish (Table 3).

Feeding indices of *X.cancila* due to infestation of *Philometra pellucida* in relation to length group showed that in all the length groups full and half stomach were more in uninfected fishes and trace stomach was more in infested fishes. Only one uninfected fish was observed at higher length group (32 - 35 cm) whereas 42 fishes are infested with parasite in which 59.52 per cent with half stomach, 28.57 per cent with trace stomach and 11.90 per cent with full

stomach (Table 4 and Fig. 2 & 3). Chi - square test on infested and uninfected fish shows significant relationship between stomach condition and length in infested fishes.

In the present study, feeding intensity is not influenced by the factors like sex and length of host. But when the levels of infestation increased the percentage occurrence of trace stomach increased and percentage occurrence of half full and full stomach decreased. This indicates that the infested fishes were not inclined to take sufficient food once infestation reached a particular level (Table 5, Fig. 4 to 7).

Table 3. Feeding indices of *X. cancila* due to infestation in relation to sex of host

Sex	Stomach condition				Stomach condition				Grand Total
	F	H	T	Total	F	H	T	Total	
Male	30 (34.09)	43 (48.86)	15 (17.05)	88 (100)	71 (20.11)	112 (31.73)	170 (48.16)	353 (100)	441
Female	13 (31.71)	18 (43.90)	10 (24.39)	41 (100)	39 (19.80)	63 (31.98)	95 (48.22)	197 (100)	238
Total	43 (33.33)	61 (47.29)	25 (19.38)	129 (100)	110 (20.00)	175 (31.82)	265 (31.82)	550 (100)	679

Table 4. Feeding indices in relation to length of the host

Length (cm)	Stomach condition of uninfected fish				Stomach condition of infested fish			
	F	H	T	Total	F	H	T	Total
17-20	9(34.62)	11(42.31)	6(23.08)	26	4(16.67)	8(33.33)	12(50.00)	24
20-23	9(45.00)	8(40.00)	3(15.00)	20	12(15.19)	20(25.32)	47(59.49)	79
26-29	10(30.30)	15(45.45)	8(24.24)	33	30(22.73)	32(19.30)	70(53.03)	132
29-32	5(29.41)	9(52.94)	3(17.65)	17	21(21.43)	38(38.77)	39(39.80)	98
32-35	-	1(100)	-	1	5(11.90)	25(59.52)	12(28.57)	42
Total	43(33.33)	61(47.29)	25(19.38)	129	110(20.00)	175(31.82)	265(48.18)	550

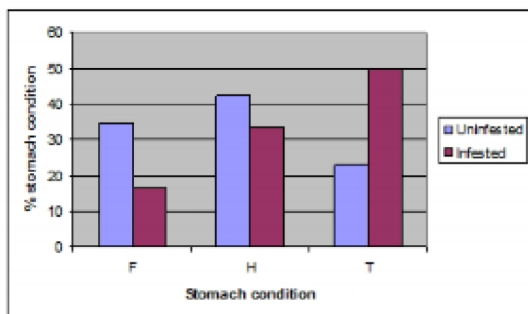


Fig. 2. Feeding indices at 17 - 20 cm length

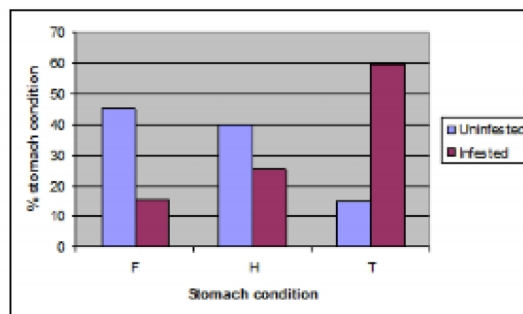


Fig. 3. Feeding indices at 20 - 23 cm length

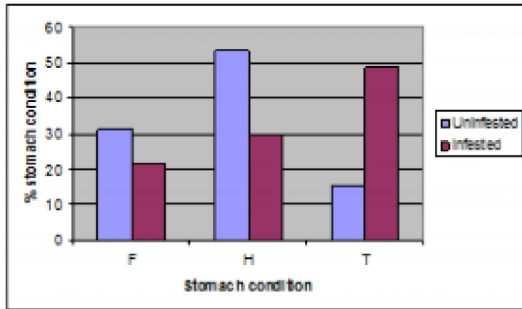


Fig. 4. Feeding indices at 23 - 24 cm length

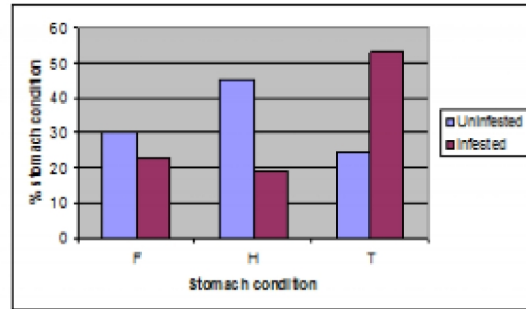


Fig. 5. Feeding indices at 26 - 29 cm length

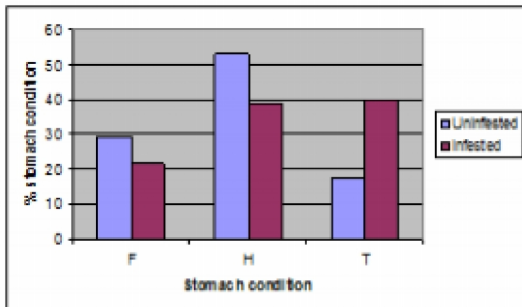


Fig. 6. Feeding indices at 29 - 32 cm length

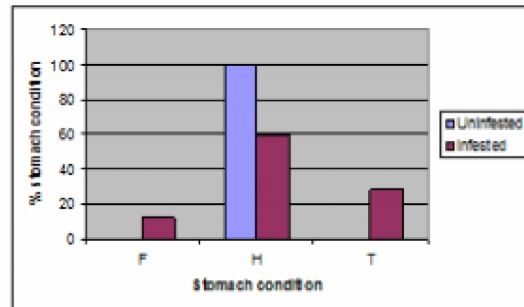


Fig. 7. Feeding indices at 32 - 35 cm length

Table 6. Feeding indices in relation to levels of infestation and sex of host

Parasites	Stomach condition								Grand total
	Male				Female				
	F	H	T	Total	F	H	T	Total	
1-10	61 (19.24)	101 (31.86)	155 (48.90)	317	34 (23.13)	45 (30.61)	68 (46.26)	147	464
11-20	10 (30.30)	11 (33.33)	12 (36.36)	33	4 (17.39)	4 (17.39)	15 (65.22)	23	56
21-30	-	-	3 (100)	3	1 (7.69)	5 (38.46)	7 (53.85)	13	16
>30	-	-	-	-	-	9 (64.29)	5 (35.71)	14	14
Total	71 (20.11)	112 (31.73)	170 (48.16)	353	44 (19.80)	73 (31.98)	80 (48.22)	197	550

Table 5. Feeding indices of *X. cancila* in relation to levels of infestation

Parasites	Stomach condition		
	H	T	Total
1-10	146(31.47)	223(48.06)	464(100)
11-20	15(26.79)	27(48.21)	56(100)
21-30	4(25.00)	10(62.50)	16(100)
>30	3(21.43)	10(71.43)	14(100)
Total	168 (30.54)	270(49.09)	550(100)

In female, percentage occurrence of trace stomach increased as the level of infestation increased. Out of the total infested fishes, 55.45 per cent male fishes are infected with 1 -10 parasites and only 6.00 per cent males infected with 11 - 20 parasites.

Comparatively, the feeding intensity of male fish was more than female with insignificant differences. When they consume more, there is greater chance to be infested by copepods, the intermediate hosts of nematode parasite. It was

noticed that infection with 1-20 parasite was more in males than in females. Altogether, 61.45 per cent of the male fishes are infested with 1 - 20 parasites, whereas in females trace stomachs increased, half and full stomach decreased when the level of infestation increases. This proves the fact that higher level infections were found only in females and once infected, they cannot feed further. In support of these facts, Tierney (1991) found less full stomach in three spined stickle backs *Gasterosteus aculeatus* parasitized with the cestode *Schistocephalus solidus*. When the levels of infestation increased, the percentage occurrence of trace stomach increased and percentage occurrence of half and full stomach decreased indicating the severity of infestation.

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