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AN ECOLOGICAL ASPECT ON DIGENETIC TREMATODE PARASITE OF FRESH WATER FISHES FROM UTTAR PRADESH (INDIA)

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ABSTRACT

Fresh water fishes are the common shelter for various species of digenetic trematode parasites in Lucknow (Uttar Pradesh), abundantly found in river Gomti, different ponds and canals of Lucknow. Fishes carry heavy infection of helminth parasites and serve as the host of different helminth parasites. Infection of these parasites may be result in poor growth, postpone sexual maturity and mortality of fishes, and cause human and animal diseases due to weak association of host and parasites. Digenean trematodes are important helminth parasites of Fresh water fishes. In this paper we have reported the seasonal fluctuation in the prevalence, intensity and relative density patterns of digenean infection in fresh water fishes from river Gomti Lucknow (India) during the Jan, 2011 to Dec, 2011.

KEYWORDS: Digenetic Trematodes, Intensity, Prevalence, Infection

INTRODUCTION

Majority of freshwater fishes carry heavy infection of digenean parasites which cause deterioration in the food value of fish and may even result in their mortality. Besides these, there are a number of helminth parasites, which are transmitted to human beings only through fishes due to weak association of host and parasites called zoonotic parasites. The study of helminth parasites, its frequency and distribution in fishes in Lucknow. These parasites use the fish for their shelter and food and destruct more or less each and every organ resulting in pathogenic effects (Lilley *et al.* 1992). Parasites interfere with the nutrition; metabolism and secretary function of alimentary canal, damage nervous system and even upset the normal reproduction of the hosts (Rahman *et al.* 1998a and 1998b). The distribution of helminths of the same host and their incidence and intensity of infestation varies from one place to another. The parasitic infection is greatly influenced by the season, which basically interferes with ecology and physiology of the fish. Mostly edible fresh water fishes are one of the most important carnivorous food fish, mainly feed upon crustaceans, insects, mollusks and plants. It is a common freshwater fish and has a great demand in market because of its relatively low cost and high availability. Crustaceans and mollusks are the host for various developing stages larvae of helminthes parasites. Fishes obtained from River Gomti at Luck now (26°51'30" North 80°56'14" East) were heavily infected with various helminthes parasites including larval and adult trematodes, Cestodes, Nematodes and Acanthocephalans. The seasonal changes in infection of digenetic trematodes in the Fresh water fishers were studied during the period from Jan 2011 to Dec, 2011. In this paper, we have reported the seasonal changes in prevalence, intensity and relative density, dominant % and Infestation index value patterns of digenean trematodes infection in edible fresh water fishers.

MATERIALS AND METHODS

Sampling of Fish and Parasites

Seasonal surveys were done at river Gomti (26°51'30" North 80°56'14" East) in Luck now (India) during Jan. 2011 to Dec 2011. Fresh water fishes were collected by fishermen at river side. These fishes were transported up to laboratory in alive condidtion. Fishes were sacrified by cutting through the spinal cord, and dissected to examine all internal organs and tissues. The alimentary canal of host was removed and cut open in normal saline water in petridish. It was lightly shaken and the content decanted several times. The intestine and its contents were examined thoroughly under a binocular microscope. The trematode parasites were sorted out, flattened and stored in 70% ethanol for 24 to 48 hours then counted separately. All parasites were stained in aceto-alum carmine, dehydrated in grades of ethanol and mounted in Canada balsam; then Camera Lucida diagrams, identified by Sytema Helminthol (Yamaguti, 1954) book.

Ecological Analysis

Data were studied in terms of prevalence, mean intensity, relative density dominant % and infestation index value. The above following papameters were formulated by Morgolis *et al.* (1982).

$$\text{Prevalence} = \frac{\text{Total No. of Hosts Infected}}{\text{Total No. of Hosts Examined}} \times 100$$

$$\text{Mean Intensity} = \frac{\text{Total No. of Infected Hosts examined}}{\text{Total No. of Hosts Examined}}$$

$$\text{Abundance} = \frac{\text{Total No. of parasites}}{\text{Total No. of Hosts Examined}}$$

Infestation Index = AxB/C^2 A= Number of Parasites, B= Number of infected hosts, C= Number of host examined.

$$\text{Dominant \%} = \frac{\text{Worm burden monthly}}{\text{Worm burden annually}} \times 100$$

Statistical Analysis

The prevalence, mean intensity, relative density dominant % and infestation index values of each trematodes were calculated according to Morgolis et al. (1982). Pearson linear coorelation coefficient (r) was computed to determined possible correlations between the prevalence and infection of fresh water fish trematodes.

RESULTS

Seasonal Analysis

Overall, we obtained data from 465 fresh water fish as hosts were collected from river Gomti for trematode parasites during Jan. 2011 to Dec. 2011. After thoroughly examination of gastro-intestinal tract of these hosts, there were 128 adult trematode parasites found. We have studied prevalence, mean Intensity, relative density, dominant (%) and infestation index values of trematode infection in fresh water fishes during Jan 2011 to Dec 2011. (Table 1-7 and Figure 1-12). The maximum prevalence present in the winter (38.23%) while minimum prevalence was reported in rainy season (25.92%). The maximum Mean intensity was reported in the winter season (1.59) while minimum was in summer season (0.26). The maximum relative density was reported in the summer (0.73) and minimum in rainy season (0.35). The maximum infestation index value was reported in the winter (0.33) while minimum in rainy season (0.20). The maximum

dominant (%) was reported in the winter (40.62) while minimum in summer (2.34). The maximum temperature (Tmax.) was reported in the summer (34.52) while minimum in winter season (26.52). The maximum temperature (Tmin.) was reported in the Rainy (25.32) while minimum in winter season (11.77).). The maximum humidity (%) was reported in the Rainy (79.65) while minimum in summer season (52.12).

Correlation with Fresh Water Fish Infection

To correct for sampling effort, we used the linear regression analysis of trematode parasites infection against prevalence, mean intensity, relative density, dominant % and infestation index value were analyzed. We obtained regression correlation coefficient (r) values for above; the strong positive correlation between infection and dominant (%) was 0.99, The positive correlation between infection and prevalence was 0.46, positive correlation between infection and mean intensity was 0.46, positive correlation between infection and relative density was 0.43.

Statistical Analysis

Although seasonal variation of infection was detected, we have calculated standard deviation and standard errors for data used in ecological terms. We found the standard deviation of fish infection was 4.96 while standard error was 1.49; standard deviation of prevalence was 5.28 while standard error was 17.53; standard deviation of mean intensity was 0.17 while standard error was 0.05; standard deviation of relative density was 0.57 while standard error was 0.17; standard deviation of dominant (%) was 3.87 while standard error was 1.16; standard deviation of infestation index value was 0.30 while standard error was 0.09.

Table 1: Monthly Variations in Prevalence %, Mean Intensity and Relative Density of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

Month/Year	Number of Host		Prevalence %	Number of Trematodes Obtained	Mean Intensity	Relative Density	Dominant %
	Examined	Infected					
Jan. (2011)	20	12	60	14	0.6	0.7	9.37
Feb. (2011)	51	05	9.80	10	0.09	0.19	3.90
Mar. (2011)	33	15	45.45	70	0.45	2.12	11.7
Apr. (2011)	18	05	27.78	06	0.27	0.33	3.90
May. (2011)	38	12	31.57	17	0.31	0.44	9.37
Jun. (2011)	20	10	50	25	0.50	1.25	7.81
July. (2011)	78	03	3.84	05	0.03	0.06	2.34
Aug. (2011)	33	10	30.30	05	0.30	0.15	7.81
Sept. (2011)	58	16	27.58	33	0.27	0.56	12.50
Oct. (2011)	28	08	28.57	16	0.28	0.57	6.25
Nov. (2011)	20	12	60	20	0.6	1	9.37
Dec. (2011)	68	20	29.41	33	0.29	0.48	15.62

Table 2: Seasonal Variations in Prevalence, Mean Intensity and Relative Density of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

Seasons	Number of Host		Prevalence %	Number of Trematodes Obtained	Mean Intensity	Relative Density	Dominant %
	Examined	Infected					
Winter	136	52	38.23	83	1.59	0.61	40.62
Summer	140	37	26.42	103	0.26	0.73	28.90
Rainy	189	49	25.92	68	1.36	0.35	30.46

Table 3: Monthly Variations in Temperature (Tmax. and Tmin.), and Humidity with Infection of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

Months	Temperature(˚c)		Humidity	Infection
	Tmax. (˚c)	Tmin. (˚c)		
Jan.(2011)	21.3	6.1	68.4	12
Feb.(2011)	26.9	10.1	64.9	05
March.(2011)	33.3	15.1	52.8	15
April.(2011)	37.8	19.3	39.5	05
May.(2011)	40.1	24.1	51.3	12
June.(2011)	36.6	25.8	67.3	10
July (2011)	33.9	25.5	83.6	03
August.(2011)	33.2	25.3	86.3	10
September.(2011)	33.7	24.7	81.4	16
October.(2011)	33	19	63.5	08
November.(2011)	29	13.7	69.7	12
December.(2011)	22.8	8.3	77.1	20

Table 4: Infestation Index Value of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

Months	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Infestation Index	0.42	0.01	0.96	0.09	0.14	0.62	0.002	0.04	0.15	0.16	0.6	0.14

Table 5: Seasonal Infestation Index Value of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

Season	Winter	Summer	Rainy
Infestation Index Value	0.33	0.30	0.20

Table 6: Regression Correlation Coefficient Value in the Year 2011

R Value in Between Infection and Prevalence	R Value in Between Infection and Mean Intensity	R Value in Between Infection and Relative Density	R Value in Between Infection and Dominant %
r=0.468	r=0.469	r=0.434	r=0.999

Table 7: Statistical Value in Various Ecological Parameters

Parameters	Infection	Prevalence	Mean Intensity	Relative Density	Dominant %	Inestation Index Value
SD	4.96	17	0.17	0.57	3.87	0.30
SE	1.49	5.28	0.05	0.17	1.16	0.09
Mean	10.66	33.69	0.33	0.65	8.32	0.27
Median	11	29.85	0.29	0.52	8.59	0.14
Variance	24.60	307.40	0.03	0.33	15.01	0.09

PREVALENCE

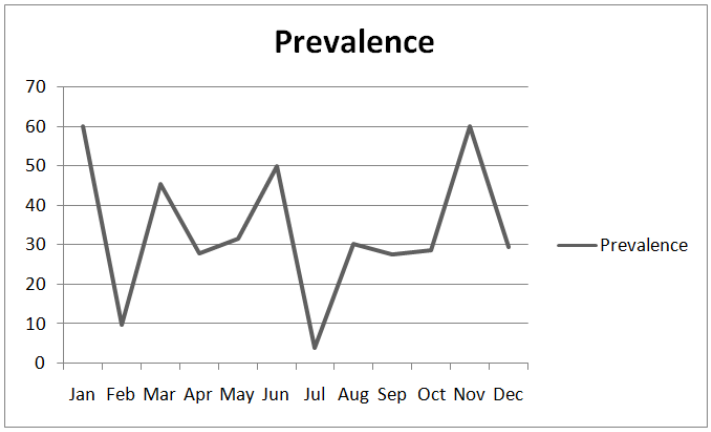


Figure 1: Monthly Variation in % Prevalence of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

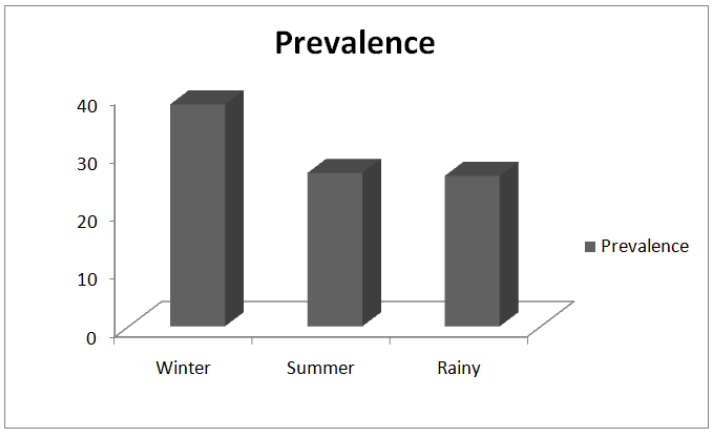


Figure 2: Seasonal Variation in % Prevalence of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

MEAN INTENSITY

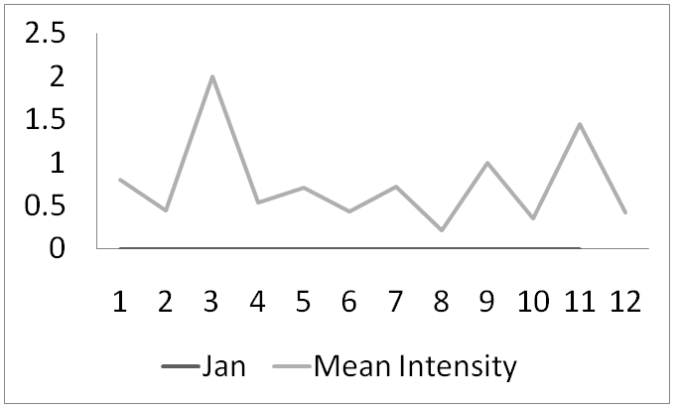


Figure 3: Monthly Variation in Mean Intensity of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

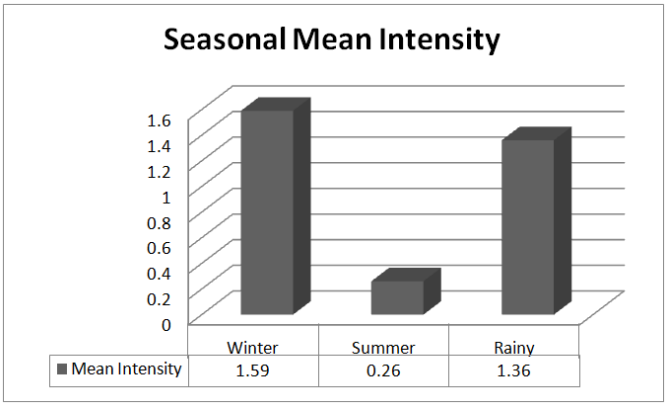


Figure 4: Seasonal Variation in Mean Intensity of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

RELATIVE DENSITY

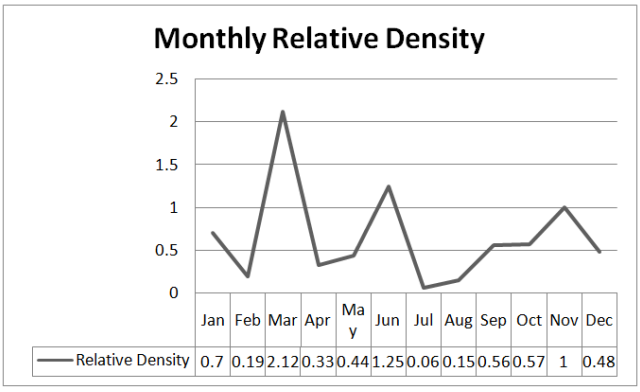


Figure 5: Monthly Variation in Relative Density of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

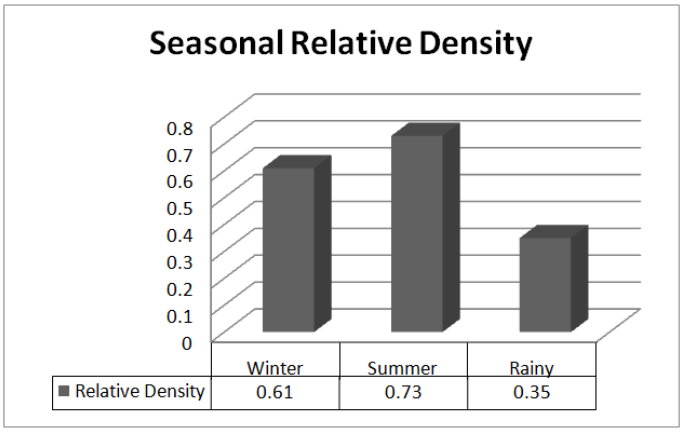
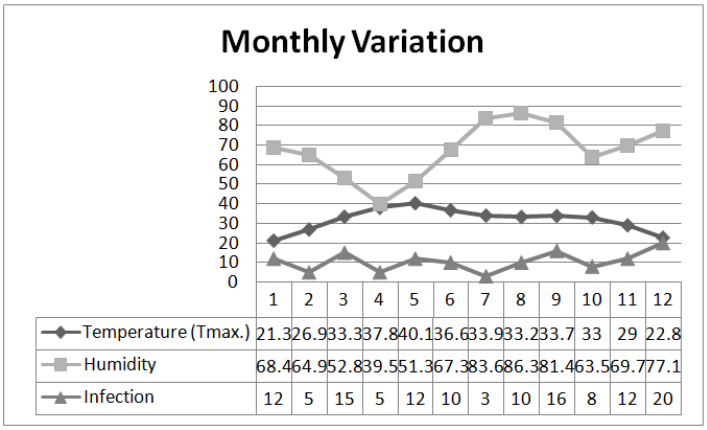


Figure 6: Seasonal Variation in Relative Density of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011



	1	2	3	4	5	6	7	8	9	10	11	12
Temperature (Tmax.)	21.3	26.9	33.3	37.8	40.1	36.6	33.9	33.2	33.7	33	29	22.8
Humidity	68.4	64.9	52.8	39.5	51.3	67.3	83.6	86.3	81.4	63.5	69.7	77.1
Infection	12	5	15	5	12	10	3	10	16	8	12	20

Figure 7: Monthly Variation in Temperature (Tmax), Humidity and Infection of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

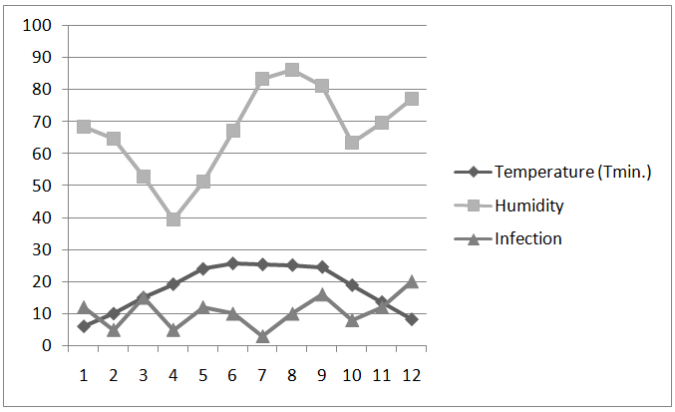
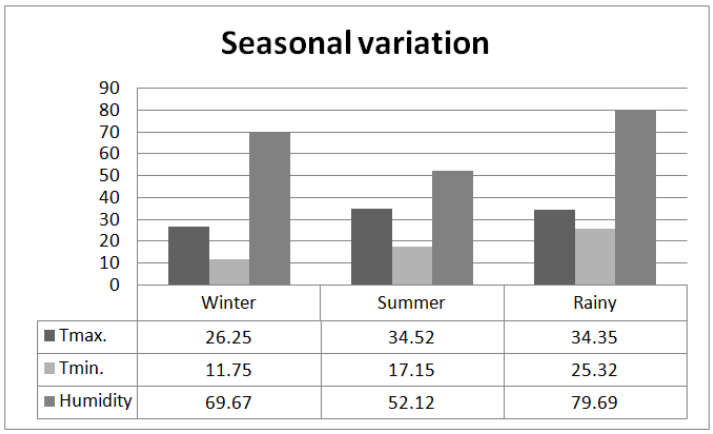


Figure 8: Monthly Variation in Temperature (Tmin.), Humidity and Infection of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011



	Winter	Summer	Rainy
Tmax.	26.25	34.52	34.35
Tmin.	11.75	17.15	25.32
Humidity	69.67	52.12	79.69

Figure 9: Seasonal Variation in Temperature, Humidity and Infection of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

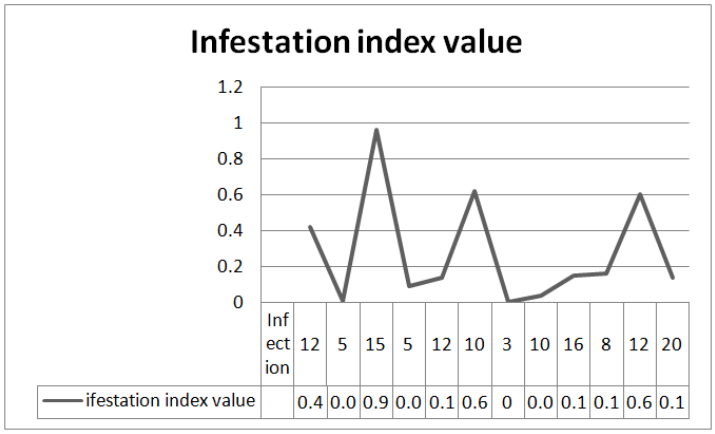


Figure 10: Monthly Variation in Infestation Index Value and Infection of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

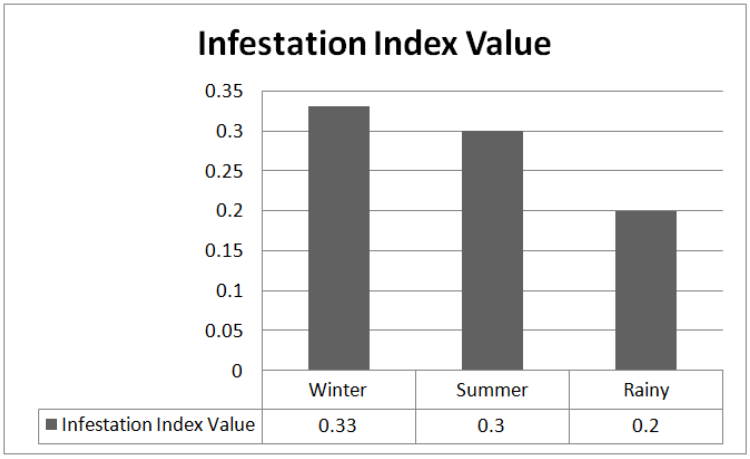


Figure 11: Seasonal Variation in Infestation Index Value and Infection of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

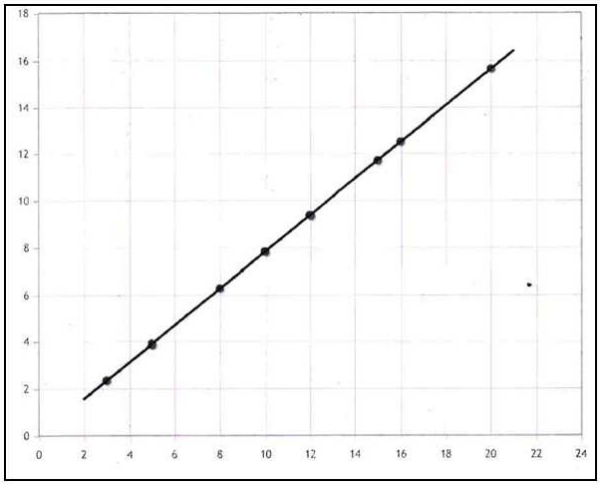


Figure 12: Regression between Infection and Dominant (%) of Trematode Parasites of Fresh Water Fishes from Jan, 2011 to Dec, 2011

DISCUSSIONS

On the seasonal point of view, the maximum prevalence present in the winter (38.23%) in the month of January

(60) while minimum prevalence was reported in rainy season (25.92%) in the month of July (3.84) The maximum Mean intensity was reported in the winter season (1.59) in the month of January (0.6) while minimum was in summer season (0.26) in the month of July (0.03). The maximum relative density was reported in the summer (0.73) in the month of March (2.12) and minimum in rainy season (0.35) in the July (0.06). The maximum dominant (%) was reported in winter (40.62) in the month of December (15.62) while minimum dominant (%) was in summer (28.90) in the month of July (2.34). The maximum infestation index value was reported in winter (0.33) in the month of March (96) while minimum was in rainy (0.20) in the month of (0.01). The present work indicates that the helminth trematode parasite is extensively distributed in gastro-intestinal tract of edible fresh water fish during winter season more than rainy. Being parasitic in nature, they damage the organ on which they subsist. Due to the occurrence of these parasites, the physiological activities of the victimized fishes are hindered and their developmental growth is retarded which cause economic loss to the fishery industry and piscine culture. Beside this, there is always the strong possibility of their infection to the human beings by consumption of these infected fishes. It is, therefore, this problem assumes importance and needs further research work on the study of trematode infection in different ecological situations which assist in protection of fish fauna.

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