International Journal of Current Science Research
www.drbgrpublications.in

Volume: 3; Issue: 2; February-2017; pp 1138-1144. ISSN: 2454-5422

Annual Growth study of Fresh water fishes in Kullursandhai dam with relation to Zooplankton density

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Abstract

Fish culture practice is a dominant activity in Kullursandhai reservoir, the only fish resource for the town people. To promote the fishing practice in fresh water system regular monitoring and systematic approach is necessary. Length and Weight of the four fish species in Kullursandhai reservoir is correlated with the Zooplankton population species diversity. Chi-square test is performed to analyse the scenario of Length and weight of the four fish species. Except the fish species C*irrhinus mrigala*, all the three fish species *Catla catla, Labeo rohita* and *Oreochromis mossambicus* for the fish length, Chi-square calculated value is lesser than the critical value therefore uniform distribution over a month is accepted. But for the weight of the fish, Chi-square calculated value is greater than the critical value therefore Uniform distribution over a month is rejected. Length and Weight of fish *Cirrhinus mrigala* showed uniform distribution over the month. This may be due to the constant Zooplankton species Diversity Index value of 2.0 to 2.5. Causative factor for non gaining of weight by the fish species from the month of January to May, 2013 may be due to the declining trend of the Zooplankton species population.

Keywords: Growth, Fresh water fish, Zooplankton

Introduction

Limnology is an interdisciplinary science, that deals with the study of structural aspects and problems associated with the freshwater environment such as ponds, dams, lakes and rivers

(Adoni *et al*., 1985). Reservoirs have been constructed for irrigation, generating hydraulic power, drinking purpose, recreation and predominantly for fish production (Sreenivasan,1993; Sivanappan,2001). Living organisms on the earth are completely dependent on the abiotic factor that is water. Owing to the human population explosion, industrialization, and technology up gradation will shoot up the demand for water (Venugopalan and Pandian, 1989). Inflow of sewage water, industrial and agricultural development in the surroundings of the reservoir areas consistently alters the reservoir ecosystem in many aspects, which is affecting the health of the organism, livelihood of organism and human life (Venkatesan, 2007). Contribution of Zooplankton is enormous in any aquatic ecosystem, themselves involving a determining role in the food chain as a second tropic level or primary consumers (Quasim, 1977). Population density of zooplanktons depends heavily on the physico-chemical factors of the water which in turn influence the life of flora and fauna of the dam (Kadam *et al*., 2007; Prabu *et al*., 2008). Fishing practice in Kullursandhai reservoir was done throughout the year. Fish catch is available from the month of January to December. Therefore an attempt was made during the year 2013 to relate the population density of Zooplankton with the growth of the fresh water fishes *Oreochromis mossambicus, Catla catla, Cirhinus mrigala and Labeo rohita* in Kullursandhai reservoir.

Materials and Methods

Planktons were collected once in every month for a study period of one year from January, 2013 to May, 2013 by following the Silk net method from the surface water sample by using a bolting silk net(No:30) having a mesh size of 35 µm fitted to aluminium frame. These planktons were fixed with 5% formalin for microscopic examination. Varieties of zooplanktons were separated and photographed in the laboratory with the help of Phase contrast microscope and Olympus DX 53 under 20x magnification. The quantitative analysis of the processed planktons were done by the Sedgewick-Rafter counting cell. Identification of plankton was done following Tonapi (1981). Species Diversity index was done for the population density of the zooplanktons by Shanon -Wiener diversity index (Brandon and Shamp, 2011).

50 fishes of four species were collected randomly from the fish catch from the different parts of the Kullursandhai dam. Length and Weight of the fishes were measured and recorded from the month of January, 2013 to May,2013 for one year study period. Chi –square test

was conducted for one year to check the distribution level of the four fish species and compared with the zooplankton population density.

Results

Table 1: shows a calculated χ^2 – value of 1.744 for 11 degree of freedom and a critical χ^2 – value of 19.675 at 5% level of significance. Since the calculated χ^2 – value is less than the critical χ^2 – value, the null hypothesis that is length of *C.catla* fishes are uniformly distributed over the month is accepted. Thus, the length of *C.catla* fishes have a uniform distribution over a month. For the weight of the fish calculated χ^2 – value of 251.49 for 11 degree of freedom and a critical χ^2 – value of 19.675 at 5% level of significance. Since the calculated χ^2 – value is greater than the critical χ^2 – value, the null hypothesis that is weight of *C.catla* fishes are uniformly distributed over the month is rejected. Thus, it indicates that weight of *C.catla* fishes do not have a uniform distribution over a month.

Chi Square test for the length of *Labeo rohita* fish shows a calculated χ^2 – value of 0.741 for 11 degree of freedom and a critical χ^2 – value of 19.675 at 5% level of significance. Since the calculated χ^2 – value is less than the critical χ^2 – value, the null hypothesis that is length of *L.rohita* fishes were uniformly distributed over the month is accepted. Thus, it indicates that length of *L.rohita* fishes have a uniform distribution over a month.

Chi Square test for the weight of *Labeo rohita* fish shows a calculated χ^2 – value of 221.35 for 11 degree of freedom and a critical χ^2 – value of 19.675 at 5% level of significance. Since the calculated χ^2 – value is greater than the critical χ^2 - value, the null hypothesis that is the weight of *L.rohita* fishes uniform distribution over the month is rejected. Thus, it indicates that weight of *L.rohita* fishes do not have a uniform distribution over a month.

Chi Square test for the length of *Cirrhinus mrigala* fish shows a calculated χ^2 – value of 1.710 for 11 degree of freedom and a critical χ^2 – value of 19.675 at 5% level of significance. Since the calculated χ^2 – value is less than the critical χ^2 – value, the null hypothesis that is length of *C.mrigala* fishes were uniformly distributed over the month is accepted. Thus, it indicates that length of *C.mrigala* fishes have a uniform distribution over a month.

Chi Square test for the Weight of *Cirrhinus mrigala* fish shows a calculated χ^2 – value of 10.447 for 11 degree of freedom and a critical χ^2 – value of 19.675 at 5% level of significance. Since the calculated χ^2 – value is less than the critical χ^2 – value, the null hypothesis, that is weight of *C.mrigala* fishes were uniformly distributed over the month is

accepted. Thus, it indicates that weight of *C.mrigala* fishes have a uniform distribution over a month.

Chi Square test for the Length of *Oreochromis mossambicus* fish shows a calculated χ^2 – value of 0.720 for 11 degree of freedom and a critical χ^2 – value of 19.675 at 5% level of significance. Since the calculated χ^2 – value is less than the critical χ^2 – value, the null hypothesis that is length of *O.mossambicus* fishes were uniformly distributed over the month is accepted. Thus, it indicates that length of *O.mossambicus* fishes have a uniform distribution over a month.

Chi Square test for the Weight of *Oreochromis mossambicus* fish shows a calculated χ^2 - value of 560.95 for 11 degree of freedom and a critical χ^2 - value of 19.675 at 5% level of significance. Since the calculated χ^2 - value is greater than the critical χ^2 – value, the null hypothesis that is weight of *O.mossambicus* fishes were uniformly distributed over the month is rejected. Thus, it indicates that weight of *O.mossambicus* fishes do not have a uniform distribution over a month.

Table 1: Chi Square test values for the length and weight of the fish species in Kullursandhai dam

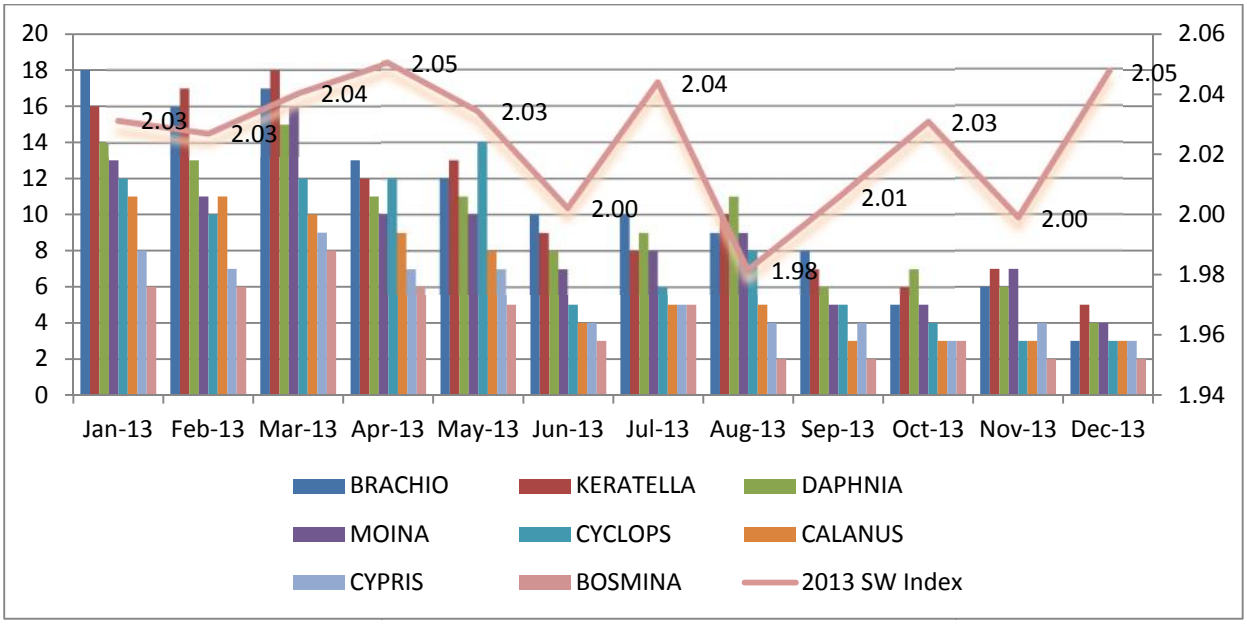
	LENGTH OF THE FISH			**WEIGHT OF THE FISH**		
	Degree of Freedom	Critical value x^2	Calculated value x^2	Degree of Freedom	Critical value x^2	Calculated value x^2
Catlacatla	11	19.67	1.74	11	19.67	251.4
Labeorohita	11	19.67	0.74	11	19.67	221.3
Cirrhinusmrigala	11	19.67	1.71	11	19.67	10.44
Oreochromis mossambicus	11	19.67	0.72	11	19.67	560.9

5% level of significance

In **Fig 1** Diversity index of the zooplanktons reveals that from the beginning month of the year 2013 fluctuates in and around 2.00 value. The population density declines from highest value of 18 to lowest value of 3 from January to May. Highest population of

Zooplanktaon was Brachionus of 18% and the lowest zooplankton species being Bosmina 2% was noted from the present study. Zooplankton population gradually decrease month after month throughout the year 2013.

Fig 1 : Performance occurrence of Zooplanktons in Kullursandhai Reservoir



Discussion

The structure and dynamics of Zooplankton changes in the freshwater habitats were determined mostly by trophic relationships and interspecies interactions while fish predation pressure support the greater species diversity and its reinstatement (Anna Gozdziejeweska and StephenTucholski, 2011). Growth of the fish is measured in the form of length and its weight. In Kullursandhai dam the fish growth is favoured to the increasing population of Zooplankton species. However the zooplankton species declines from the month of January to May, 2013 was noticed may be due to the increasing temperature. Higher temperature negatively influence the dynamics of zooplankton in fresh water habitats (Sarkar and Sen, 1995). Length of all the fish species *Catla catla, Labeo rohita, Cirrhinus mrigala and Oreochromis mossambiccus* was uniformly distribute over a month since zooplankton playing the role of intermediate between the phytoplankton and fish species (Balsaheb, 2010). But the weight of the all the fish species except *Cirrhinus mrigala* were not uniformly distributed throughout the year may be due to the high predatorship towards the zooplankton by *C.mrigala* fish (Chakrabarthy *et al*., 2008). Low percentage of Bosmina was recorded in the present investigation may be the causative factor for the non uniform distribution in the weight of *Catla catla, Labeo rohita,*and *Oreochromis mossambiccus.* Similar observation

was made by Sugunan (1995). Therefore in the present study the length of all the four species increased month after month but it is inversely proportional to the weight of the fish species due to the declining trend in the zooplankton population density.

Conclusion

- Zooplankton population density is declining from the month of January to May.
- Zooplankton is directly influencing the weight of the fish but not related to the Length of the fish.
- Fish species *Cirrhinus mrigala* thrives well in Kullursandhai reservoir as this is only species which improved both by length as well as weight.
- Length of all the four fish species were uniformly distributed over a month but the weight is not uniformly distributed.
- To put up the weight of fish in Kullursandhai reservoir, the population of Zooplankton and its diversity plays a pivotal role.

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