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Ecological study of exotic fishes in Ranitalab, Rewa (M.P.)

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Abstract
Present paper deals ecological study of exotic fishes in Ranitalab Rewa district, Madhya Pradesh, during the period Nov. 2012 to Oct. 2013. *Common carp, Silver carp, Grass carp and Tilapia* were the most dominant species among all exotic fishes. Attempts were made to estimate the diversity of exotic fishes and their role in the ecology of the water bodies as a means of successful aquaculture practices. The topography of the Ranitalab is undulating type with hilly terrain around the pond. Plantation is over the earthen bund and slope of the bund with grass at the inner side of bund which is most important aspect for crossing the limnetic ecosystem. The scientific fishing was made trap and nets with the help of fisherman after the weight and length measurement fishes allowed back to the water body. Tilapia is showed positive correlation as compare to others fishes. It shows positive correlation with air, water temperature, conductivity, TDS, pH, Total alkalkinity, Chloride, Sodium, Potassium, Nitrate and Sulphate.

Keywords: physico-chemical, water, ponderal index and ranitalab

1. Introduction
Water is the most necessary component for the living being, Life on the earth is never possible without water. Water is one of the most vital elements of the human environments. It is being used for many purposes e.g., industrial water supply, irrigation, drinking, propagation of fish and other aquatic systems and generation of hydro-power plants.
According to an estimate about 70% of all the available water in our country is polluted due to the discharge of effluents from the industries, domestic waste, land and agricultural drainage (Shrivastava and Kanungo, 2013) [1]. Chemicals are a major source of water contamination that introduced during water movement through geological materials (Kataria *et al.*, 2011) [2].
Fertilizers and pesticides are major contributors to water pollution. Weathering of rocks, leaching of soils and mining processing, etc., these are contaminate natural water (Manjare *et al.*, 2010) [3].
In the ecosystem water is considered to be the most important component for the life but day by day the quality of water become degraded. There are several factors which are responsible for deterioration of water bodies such as increased human population, industrialization, use of excess fertilizers in the agriculture and other man-made activities etc. There are several diseases have been identified among the human beings, which are caused by using contaminated water.
Water born disease infections occur during fish culture Therefore it is necessary that the quality of water should be checked at regular time of interval because the financial losses due to water born diseases have negative impact on the nation. Nowadays this is the major problem of developing countries throughout the world.
The study of physico-chemical characteristics of water is an important aspect of limnological study. It is difficult to understand the biological activities and productivity of water body without adequate knowledge of water chemistry. According to Hutchinson (1957) [4] water effects life through its physico-chemical properties. These properties of water are important determinants of particular ecosystem.
The basic principle of composite fish culture system is the stocking of various fast-growing, compatible species of fish with complementary feeding habits to utilize efficiently the natural food present at different ecological niches in the pond for maximising fish production.
Age composition of the catch often has been used different fisheries of the world to predict the future available stocks, so knowledge of length weight of fishes has various biological use. Age, length, and weight are closely related to each other. The estimation of length is a key to estimation of weight and age etc.
The length of fish has been converted to weight of fish. Extensive semi intensive and intensive culture of many indigenous and exotic carps of various food habits are being done by using fertilizers and supplementary foods. By employing these methods, maximum fish production can be obtained in limited time from the water bodies.
In case of Vindhyan region generally the fish species like catla (*Catla catla*), rohu (*Labio rohita*), mrigal (*Cirrhinus mrigala*), common carp (*Cyprinus carpio*), silver carp (*Hypoptholmichthys molitrix*) Tilapia and Grass carp (*Ctenopharyngodon idella*) etc. are cultured under polyculture.
The cultivation of fishes is very profitable area and has ecological importance too, and these variations from the basic law are measured by a unit, the condition factor (also known as Ponderal index, k-factor or coefficient of condition) and serves as a useful index of the nutritional biological cycle of the species (Jhingran, 1972) [5]. Thus condition factor also is a

medium to know the relationship between length and weight of a particular fish.

2. Materials and Methods

A beautiful landscape and most important visitors affected area of Rewa. This pond make a popularity after reconstruction and most interested government involvement for its beauty and safety. Ranitalab was constructed in 18th century AD by the late maharaja of Rewa state. Its catmint area is about 0.68 sq miles.

The total area of Ranitalab is 34.57 acre. The average distance from the bund to centre of the pond is 137 meters, while average distance from bank to the centre of the pond in 130 metres. It has average depth of water in pond is 3.53 metres and the average volume of the pond water is 3518337 cu ft.

The main source of water is rain water and the inflow point is one. Main water body situated backside of Ranitalab devi ma temple so there a lot of human activity involve to pond and its water sources water used for bathing and washing but now a days it has remarkable for fish culture its fish fauna has so much verity and fish catchment is prohibited in this area.

The fish Reservoir has been selected on random basis for the study which are under exotic fish practices. Monthly sampling was done from Nov. 2012 to Oct. 2013 in all the reservoir for finding out the various abiotic (temperature, transparency, pH, dissolve oxygen, free CO_2, total alkalinity, Biological oxygen demand (BOD) and biotic parameters. The physico-chemical analyses of the water samples were done according to APHA (1998) [6].

The study exotic fishes like common carp (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*), *Tilapia mossambica* and Grass carp (*Ctenopharyngodon idella*) etc. were selected for the study of length weight relationship formula proposed by Huxley (1924) [7] and Le Cren (1951) [8] was used. The primary objective of this study to evaluate the ecology and determine the water quality and secondary aim of the study is the identification of length weight of these species of fishes.

The coefficient of correlation 'r' can be calculated using the following.

$$r = \frac{\sum xy - n\bar{x}\bar{y}}{\sqrt{[(\sum x^2 - n\bar{x}^2)(\sum y^2 - n\bar{y}^2)]}}\, r$$

Individual variations from general length-weight relationship have been studied under the general name condition factor (Le Cren 1951) [8]. Such change in "condition" have usually been analyzed by name of condition factor as k- factor as ponderal index. Which has been calculated by using different formula by various workers. Hile (1936) [9] proposed the fallowing formula to determine the condition factor as k- factor:

$$K = \frac{W x 10^5}{L^3}$$

Where,

K = condition factor
W = weight of the fish
L = Length of the fish (in mm)

3. Results and Discussion

Ranitalab pond is represents the lentic ecosystem. In the study period during the collection of data, the sexes were not differentiated due to practical field problems. During the monthly collection of data, mean value of length and weight were taken for the calculation of condition factor. On the basis of collected data following monthly and seasonal fluctuation were observed.

Table 1: Mean values of Ponderal Index (K) of Exotic fishes at Ranitalab from Nov. 2012 to Oct. 2013

Months	*Cyprinus carpio*	*Ctenopharyngodon idella*	*Hypophthalmichthys molitrix*	*Tilapia mossambica*
Nov	1.324	1.198	1.129	1.452
Dec	1.169	1.029	1.228	1.477
Jan	1.157	1.129	1.103	1.462
Feb	1.417	1.279	1.064	1.653
Mar	1.502	1.169	1.004	1.537
April	1.679	1.127	1.067	1.885
May	1.598	1.416	1.003	1.596
June	1.684	1.400	1.004	1.88
July	1.068	1.012	1.130	1.513
Aug	1.035	1.194	1.167	1.542
Sep	1.430	1.203	1.043	1.642
Oct	1.198	1.185	1.240	1.418
Max.	1.684	1.416	1.240	1.885
Min.	1.035	1.012	1.004	1.418
Seasonal variations				
Winter	1.27	1.16	1.13	1.51
Summer	1.62	1.28	1.02	1.72
Rainy	1.18	1.15	1.15	1.53

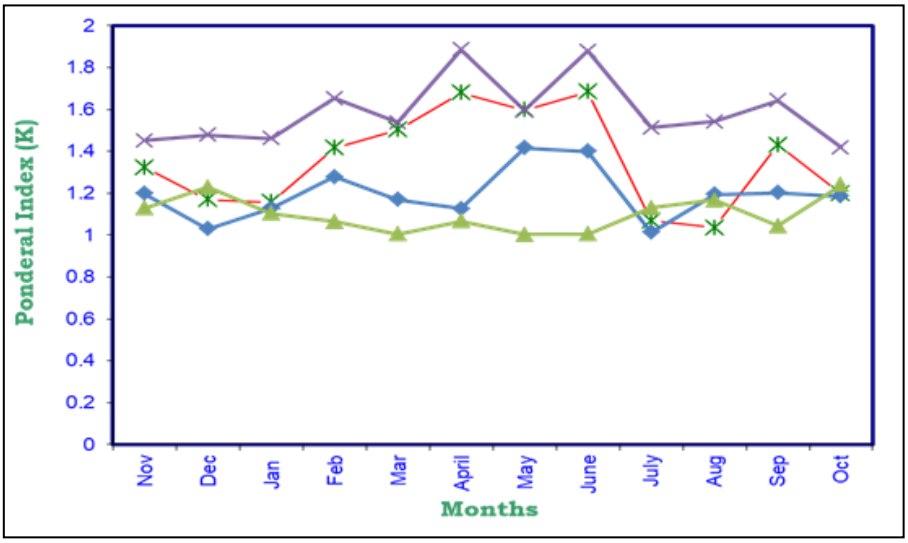

Fig 1: Ponderal Index (K) of Exotic fishes at Ranitalab from Nov. 2012 to Oct

Table 2: Co-efficient of correlation (r) between Physico-chemical features of water and Ponderal index at Ranitalab.

	Common carp	***Grass carp***	***Silver carp***	***Tilapia***
Air Temp.	0.23	0.37	-0.11	0.41
Water Temp.	0.18	0.35	0.00	0.32
Secchi Trans	-0.31	-0.22	0.46	-0.52
Conductivity	0.74	0.48	-0.62	0.58
TDS	0.76	0.52	-0.63	0.62
pH	0.50	0.48	-0.05	0.28
CO_2	-0.37	-0.32	0.00	-0.38
Total Alk.	0.40	0.25	-0.23	0.22
Dissolved O_2	-0.21	-0.44	0.23	-0.42
Chloride	0.85	0.52	-0.73	0.62
Total Hard.	0.56	0.25	-0.46	0.48
Ca Hard.	0.39	0.28	-0.69	0.53
Sodium	0.42	0.32	-0.18	0.63
Potassium	0.62	0.33	-0.65	0.33
Nitrates	0.47	-0.27	-0.18	0.59
Phosphate	-0.50	-0.43	0.27	-0.07
Sulphate	0.48	0.21	-0.37	0.37
Relative Silica	-0.47	-0.15	0.50	-0.33

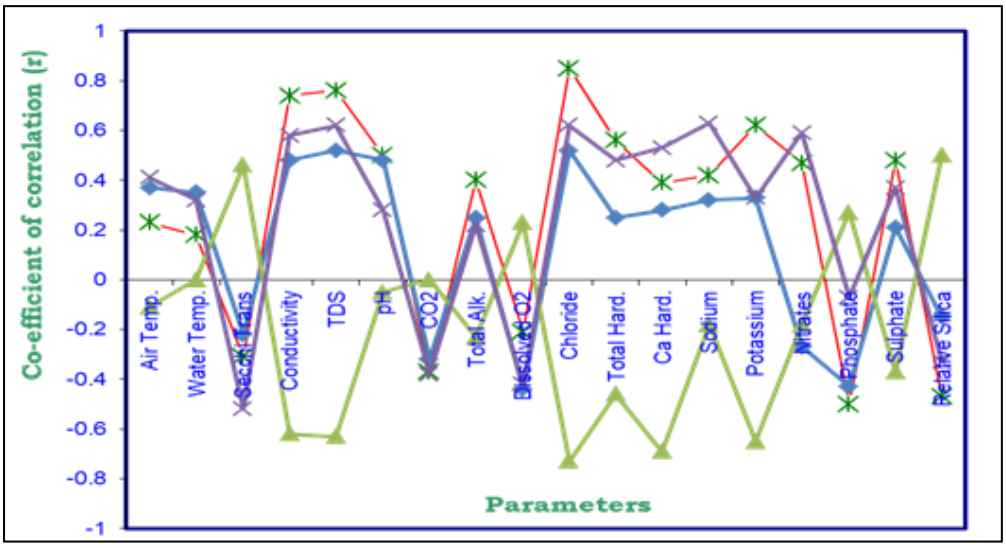

Fig 2: Co-efficient of correlation (r) between Physico-chemical features of water and Ponderal index at Ranitalab

In the present study marked seasonal variations were observed in the case of *common carp, silver carp, grass carp and tilapia* all the water bodies. Generally maximum value of Ponderal index were found during summer season. The high value during summer season may be attributed due to active metabolic activities, sufficient availability of food, maturity time of gonads and preparatory period of pre-spawning. Jhingran (1972) [5], Nautiyal (1985) [10], Mitra (2001) [11], Mortuza (2006) [12] etc. were also reported more or less similar seasonal fluctuation in their studies. Seasonal variations in the case of *Channa punctatus* and *Ompok pabda* did not show remarkable difference during the study period.

According to Hart (1946) [13] the inflection in the 'K' value indicated the size at first and second maturity and spawning of the fish. Le cren (1951) [8] said that, the condition factor is affected by length as well several other factor like physico-chemical factor of water, environment, food supply, degree of parasitism and sexual cycle. The relation of Ponderal index (K) with physicochemical features of water are evident from the value of coefficient of correlation (r) given in table 2. In Ranitalab it observed that not a single species show positive correlation with all physicochemical parameters. Tilapia is showed positive correlation as compare to others fishes. It shows positive correlation with air, water temperature, conductivity, TDS, pH, Total alkalkinity, Chloride, Sodium, Potassium, Nitrate and Sulphate.

Due to more and more pollution and herbivour nature of these exotic carp shows some time negative correlation as minute percentage with oxygen, which is a noteworthy observation for supporting to monoculture of these fishes in specific water bodies.

4. Acknowledgement

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