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Studies on length-weight relationship of exotic fishes and their Gastrosomatic index from ranitalab, Rewa (M.P.)

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Abstract
The aim of this study was to establish the Length-weight relationship and Gastro-somatic index of *Exotic fishes* in Ranitalab from Nov. 2012 to Oct. 2013. The data of length and weight of required fishes were collected on monthly basis, using standard method given in literatures. After the collection of length-weight data of, *Ctenopharyngodon idella*, *Cyprinus carpio* (Lin.), *Hypophthalmichthys molitrix* (val.) *Tilapia mossambica* (Pet) following observations were derived. Gastrosomatic index is concerned the minimum value 1.96 for *Cyprinus carpio* and maximum value 5.60, while in case of Grass carp it was minimum 5.08 and maximum 14.60 with silver carp Gastrosomatic index was calculated minimum 4.14 and maximum 14.93, in Tilapia minimum value was 5.59 and maximum was 17.43.

Keywords: length-weight relationship, *cyprinus carpio*, ranitalab and GSI

Introduction
The study of length-weight relationship in fishes is of considerable importance in the fishery work. It has two objectives (i) to determine the type of mathematical relationship between the two variables. So that if one variable is known the other could be computed and (ii) to known the well-being of fish and also type of growth i.e. whether isometric or allometric.
The relationship has been referring by Haimovici and Velasco (2000) [6] and Costa and Araajo (2003) [3] as a very important key which has widely used in the fish biology with several purposes. This useful tool provides important information concerning with the structure and function of fish populations (Anderson and Neumann, 1996) [1].
The feeding biology of fish is certainly an important aspect of the fish biology. The study of feeding biology or food and feeding habits of fish help to select such fish species for culture, to know how fish live in its environment and fish growth in its habitat. For the proper fisheries managements, it is crucial to identify good or bad environments and to indicate the future courses of action with the help of feeding biology of fish. Feeding habits of fish is also help to know the inter-specific relationship and the productivity of the water bodies. The knowledge of feeding biology helps to produce optimum yield by utilizing all the available potential food of the water bodies properly without any competition. By studying the food and feeding habits, one can understand what program should be follow for the development of the water bodies to produce more fishes.
Fishes feed on a wide range of food material and obtain their nourishment from plants as well as animals. According to Ashraf (2010), depending upon the number of food items consumed by fish, they may be called stenophagic (feeding on a few different types of foods) or euryphagic (feeding on avariety of foods). Food and Feeding habits of carps have been a field of interest to fisheries researchers since very long. Sunder *et al*., (1990) [13] studied the food and feeding habits of the *Cyprinus carpio* var. specularis from dal lake (Kashmir) in relation to gastrosomatic index, condition factor and length weight of fish and reported that the monthly fluctuation in feeding activity and gastrosomatic index (GaSI) is in agreement with each other.

2. Material and Methods
In order to study the food and feeding habits of common carp, sample were collected from the commercial catcher during fishing year Nov. 2012 to Oct. 2013 at Ranitalab Rewa.
The coefficient of correlation 'r' can be calculated using the following.

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

All the fish specimens were weighed separately and then gutted for the collection of gut contents and preserved in 5% formalin. The collected guts were weighed and their content emptied in the watch glass. To find out the feeding rhythm of *Cyprinus carpio, Ctenopharyngodon idella, Hypophthalmichthys molitrix and Tillapia mossambica* Gastro-somatic index (GSI) was calculated using the fallowing formula (Desai, 1970) [5].

$$\text{GaSI (\%)} = \frac{\text{Weight of gut (g)}}{\text{Total weigh of fish (g)}} \text{ x } 100$$

3. Result and discussion-
The length-weight relationship of different fishes has been studied by several ichthyologists in several places. But so far no work has been attempted on this aspect in the water bodies around Rewa district. Hence, three water bodies of different

ecological nature of this region were selected for above study. For the purpose of length-weight relationship, regular monthly observation was made from November 2012 to October 2013. During the study period, with the help of fishing parties and local fishermen. The data of length and weight of required fishes were collected on monthly basis, using standard method given in literatures. After the collection of length-weight data of, *Ctenopharyngodon idella*, *Cyprinus carpio* (Lin.), *Hypophthalmichthys molitrix* (val.) *Tilapia mossambica* (Pet) following observations were derived.

***Cyprinus carpio*:** In the Govindgarh lake which is under control of fisheries department was previously known as a good centre for *common carp* production, Ranitalab pond 601 *common carp* of size varying from 34.00 cm. to 62.00 cm. having the weight from 662.00g. To 3582.00g. Was studied during the investigation (Table 1). After the calculation of length-weight relationship the value of 'a' = -1.405, b = 2.715 and r= 0.96 establish their growth parameters (Table 1, Fig. 1).

***Ctenopharyngodon idella*:** In the study of Ranitalab pond, 84 grass carp of different sized length from 67.02g. to 79.08 and weight from 3863.00g to 7118.00g were observed. Figure 50 represents the values of a = -3.810, b = 4.018 and r = 0.85 during the investigation (Table 1 & Fig. 2).

***Hypophthalmichthys molitrix*:** In the Ranitalab pond total 84 *H. molitrix* was studied during the study period. The minimum length 26.06 cm. and maximum 52.00 cm. and weight ranged from 234.00 g. to 1642.00g. Were measured respectively. The results of length-weight relationships showed a = -1.686, b 2.828 and r = 0.99 (Table 1 & Fig. 3).

***Tilapia mossambica*:** In the case of Ranitalab pond 381 fishes were studied for length and weight relationship. which ranged from 13.80 to 19.14 cm. in length and 38.82 to 106.14 by weight. When the mean values of length and weight were transformed into log value the least linear regression provided the value of a = -1.960, b = 3.131 and r = 0.96 (Table 1 & Fig. 4).

Table 1: Descriptive statistics estimated parameters of length–weight relationship at Ranitalab pond from November 2012 to Oct 2013.

Species	Number examined	Length range (cm.)		Weight range (g.)		Parameters of length weight relationship		
		Min	Max.	Min.	Max.	'a' value	'b' value	'r' value
Cyprinus carpio	601	34	62	662	3582	-1.405	2.715	0.96
Ctenopharyngodon idella	84	67.02	79.08	3863	7118	-3.810	4.018	0.85
Hypophthalmichthys molitrix	84	26.06	52.00	234	1642	-1.686	2.828	0.99
Tilapia mossambica	381	13.80	19.14	38.82	106.14	-1.960	3.131	0.96

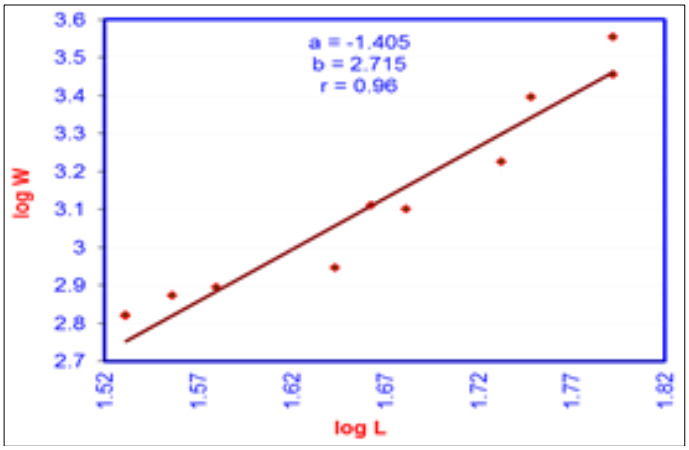

Fig 1: Logarithmic length-weight relationships of *Cyprinus carpio* at Ranitalab

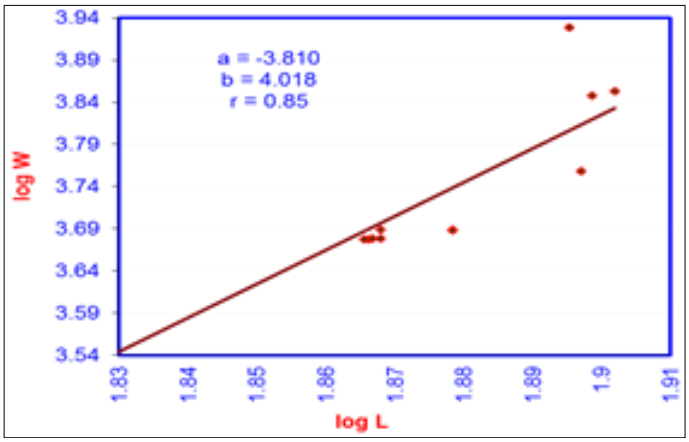

Fig 2: Logarithmic length-weight relationships of Ctenopharyngodon idella at Ranitalab

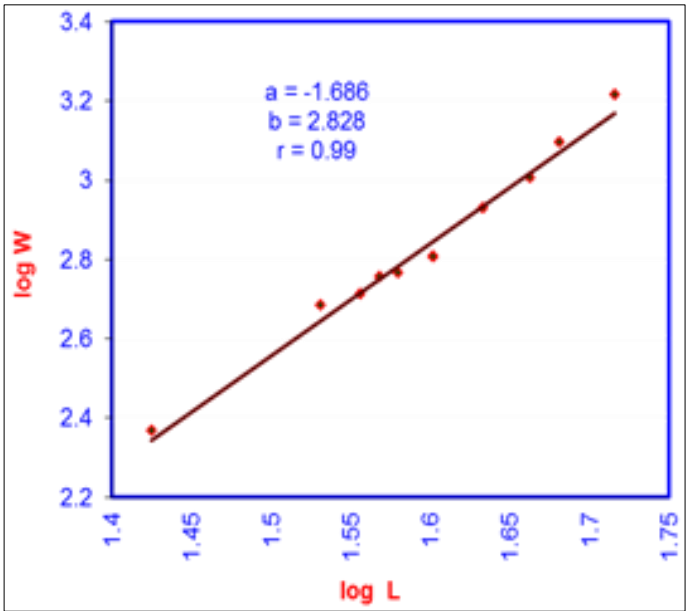

Fig 3: Logarithmic length-weight relationships of Hypophthalmichthys molitrix at Ranitalab.

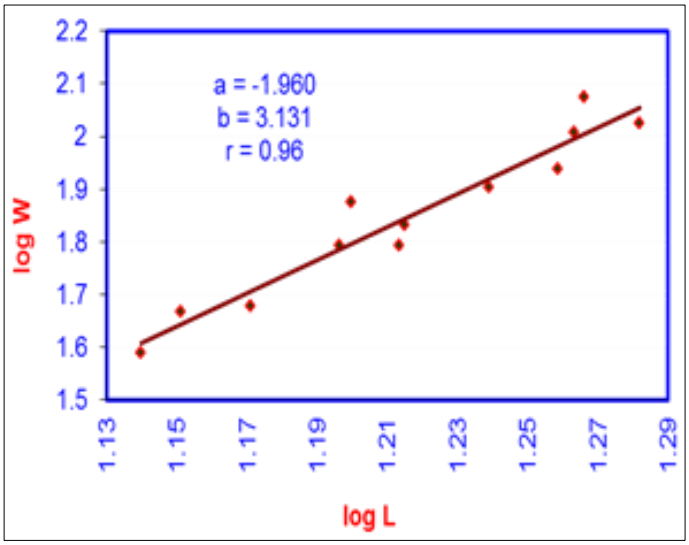

Fig 4: Logarithmic length-weight relationships of Tilapia mossambica at Ranitalab.

Gastro somatic Index (GaSI)

For the analysis of quantitative feeding of common carp, grass carp, silver carp, tilapia, gastro somatic index was calculated. During the study period monthly collected specimens were brought to the laboratory and length weight of each fish was recorded after that, the stomach was dissected out and weighed with and without contents. The gastro somatic indices were comparatively minimum in the month of July and maximum in month of May for *Cyprinus carpio*, and for grass carp it was minimum in rainy season and maximum in summer, when Gastrosomatic index were calculate in silver carp it was minimum in rainy and maximum in summer for tilapia GSI was fluctuate with different months. (Table 2)

Table 2: Mean values of Gastrosomatic Index of Ranitalab from Nov. 2012 to Oct. 2013

Months	*Cyprinus carpio*	*Grass carp*	*Silver carp*	*Tilapia*
Nov	4.54	5.08	4.81	11.18
Dec	3.79	5.24	5.17	10.24
Jan	3.79	5.77	6.21	10.10
Feb	2.83	14.60	7.87	8.29
Mar	2.22	10.91	8.08	17.43
April	5.35	8.17	7.89	16.88
May	5.60	10.91	13.23	10.97
June	5.51	11.96	14.93	14.26
July	1.96	9.80	10.16	5.59

Aug	2.44	10.12	4.14	8.85
Sep	3.30	7.60	5.51	16.29
Oct	3.74	7.12	10.25	8.66
Max.	5.60	14.60	14.93	17.43
Min.	1.96	5.08	4.14	5.59
Seasonal variations				
Winter	3.74	7.67	6.02	9.95
Summer	4.67	10.49	11.03	14.89
Rainy	2.86	8.66	7.52	9.85

Gastrosomatic index is concerned the minimum value 1.96 for *Cyprinus carpio* and maximum value 5.60, while in case of Grass carp it was minimum 5.08 and maximum 14.60 with silver carp Gastrosomatic index was calculated minimum 4.14 and maximum 14.93, in Tilapia minimum value was 5.59 and maximum was 17.43 (Table 2).

Every organism on earth requires energy for growth, reproduction and other metabolic activities. These life sustainable processes take place utilizing food energy. Hence, food is considered as the most essential component for the growth of all living organisms. Fishes like any other organisms depends on the energy received from its food to perform its biological processes. Food consumption is the major factor controlling fish production. Information on the natural food of fish is important in understanding its nutritional requirements, its interaction with other organisms and its potential use for aquaculture (Royce, 1987) [11].

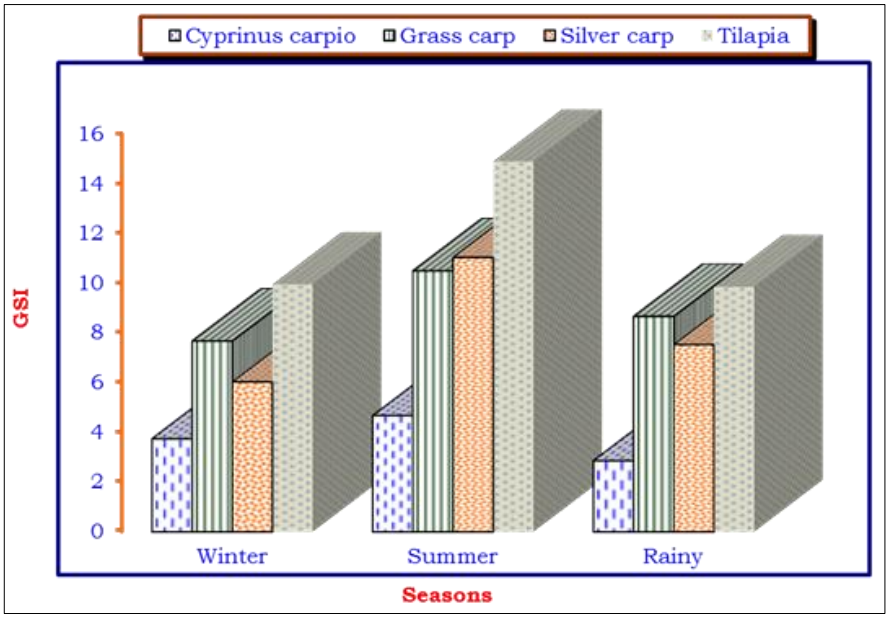

Fig 5: Seasonal variations of Gastrosomatic Index of Ranitalab from Nov. of 2012 to Oct. 2013

Quantitative assessment of food items and feeding habits in fishes is an important aspect of fisheries management and the study of food and feeding habits of fishes can shed light on the behaviour, habitat use and energy intake of various fish species and inter / intra specific interactions that occur in aquatic ecosystems (Walters, *et al.*, 1997) [14].

Once the food preference of a species is ascertained, an evaluation of its trophic relationship such as overlapping of food spectrum with other coexisting species, competition from other species, selectivity or flexibility in feeding on the food items etc, can be made. Different feeding habits and food preferences would be the likely outcomes of potential use of artificial diets and their compositional adjustment aimed at achieving improved results (Sabapathy and Teo, 1993 and Deguara *et al*., 2003) [12, 4].

The food and feeding habits of fish also vary with time, space as well as stages of growth (Lewin, 1955) [10] and this would, in turn, pinpoint the importance of detailed study of this aspect. Same species occupying in different habitats may feed on different types of food (Hyndes *et al.*, 1997) [8] or even in the same habitat, the diet may vary at different times.

The diets of most fish species vary with age and growth. The variation of fish diet with extrinsic (biotope, region) or intrinsic (species, size, behaviour) factors provide information on basic functioning of fish assemblages too, which are important for developing Ecosystem Based Fisheries Management models (Hanson and Chouinard, 2002 and Kublicki *et al.*, 2005) [7, 9].

Feeding habit is an important factor to be considered while introducing species to a new ecosystem so as to leave the native fauna with least disturbance in their natural habitat.

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