



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2016; 2(5): 168-170  
www.allresearchjournal.com  
Received: 05-03-2016  
Accepted: 06-04-2016

**Shyam S Kunjwal**  
Department of Zoology, D.S.B  
Campus, Kumaun University,  
Nainital, Uttarakhand, India.

**Anju Thapliyal**  
Department of Zoology, Pauri  
Campus HNB Garhwal  
University.

## **Length-weight relationships (LWR) and condition factors of *Schizothorax richardsonii* (Gray, 1832) influenced by artificial and natural feeding**

**Shyam S Kunjwal, Anju Thapliyal**

### **Abstract**

The present study reports the fish length and fish weight. Length- weight relationship (LWR) is a most diagnostic indication of growth parameter of the fish. Length-weight relationship plays a vital role in fishery. Asela is a phytophagous fish and has developed a special mouth adapted to scraping attached algae from the surface of stones. Therefore the present investigation attempted to compare the length and weight relationship and condition factor of *Schizothorax richardsonii*, reared with artificial feeding and natural periphyton based feeding. On the basis of this parameter, growth parameter, growth performance of the fish was evaluated for both type of feeding practice & the result obtained through this study will be highly helpful with the objective of evaluating the growth performance of snow fish periphytic natural feeding and to work out its cost benefit.

**Keywords:** *Schizothorax richardsonii*, artificial and natural feeding, Length- weight relationship, Pearl millet

### **1. Introduction**

The major fishery in the uplands mainly consists of very popular Snow trout (*Schizothorax richardsonii*) and Mahseer. Snow trout is endemic to the Himalayas and, true to its name, it is found in streams and lakes which receive snow melt water from the hills. Most of the snow trout species are of Central Asian origin. Snow trout is a phytophagous fish and has a special mouth adapted to scraping attached algae from the surfaces of stones. In natural environment, it feeds on attached algae including *Spirogyra*, *Ulothrix*, *Oedogonium*, as well as on the benthic insect larvae. The growth of this fish is not very encouraging, so that its culture in captivity has not attracted the attention of the aquaculturists. As this is an important fish for hill biodiversity and is a preferable fish of the people, it is desirable to develop a culture technique of this fish. In present experiment, growth of this fish was evaluated with complete artificial diet and with natural periphyton based diet in the pond environment. The periphyton community is an important component of aquatic eco-system (Wetzel, 1983). In recent years, extensive researches are going on the traditional periphyton based aquaculture practices as fisheries enhancement technique throughout the world.

Length- weight relationship is an important diagnostic indication of growth parameters of fish. The knowledge of length-weight relationship has a vital role in the fishery. The ratio of the length to the weight is known to be a useful index to indicate the condition of fish (Rawat, 1991 and Deorari, 1993). Assessment of fish condition based on weight at given length is thought to be reliable indicators of the energetic condition or energy reserves in fish (Lambert and Dutil, 1997). Poor condition is usually associated with poor feeding and/or environmental conditions. Fish in poor condition may suffer increased natural mortality (Lambert and Dutil, 2000). The mathematical relationship between length and weight of fishes is a practical index suitable for understanding their survival, growth, maturity, reproduction and general wellbeing of the fish (Le Cren, 1951). The present study attempted to compare the length and weight relationship and condition factor of *Schizothorax richardsonii*, reared with artificial feeding and natural periphyton based feeding. On the basis of these parameters, growth performance of the fish was evaluated for both types of feeding practices.

**Correspondence**  
**Arul Sheeba Rani M**  
Department of Zoology, D.S.B  
Campus, Kumaun University,  
Nainital, Uttarakhand, India.

**2. Materials and Methods**

Experiment was carried out in the raceways at Department of Zoology, D.S.B Campus, Kumaon University, Nainital (Long. 29° 23 'N, lat. 79° 30 'E, altitude 1938 msl) during the period of September' 2008 to August' 2009. One group of the fish was fed with pelleted artificial diet, prepared with mixture of rice bran (40%), mustard oil cake 25%, and soyabean oil cake 25% and fish meal 10% having the 25% crude protein on dry basis. Supplementary feeding was done twice a day @ of 5% body weight. Second group of the fish was reared with natural periphyton based diet grow on substrate of bamboo poles and plastic sheet (3 m<sup>2</sup> surface area of substrate for 120 nos. of fish). The initial, final and at monthly interval, length and weight of each fish were recorded. Total fish length was measured from the tip of the snout to the tip of the lower lobe of the caudal fin. Equations for the estimations were according to LeCren (1951) and Borary and Soliman (1987). Length weight relationship was analyzed by the formula  $W = aL^b$  (Pauly, 1984) and logarithmically transformed into  $\log W = \log a + b \log L$ , where  $W$  is the total weight of the fish,  $L$  is the total length of the fish, 'a' is the proportionality constant and 'b' is the regression coefficient. The condition factor (K) was calculated as per formula:

$$K = \frac{W}{L^3} \times 100$$

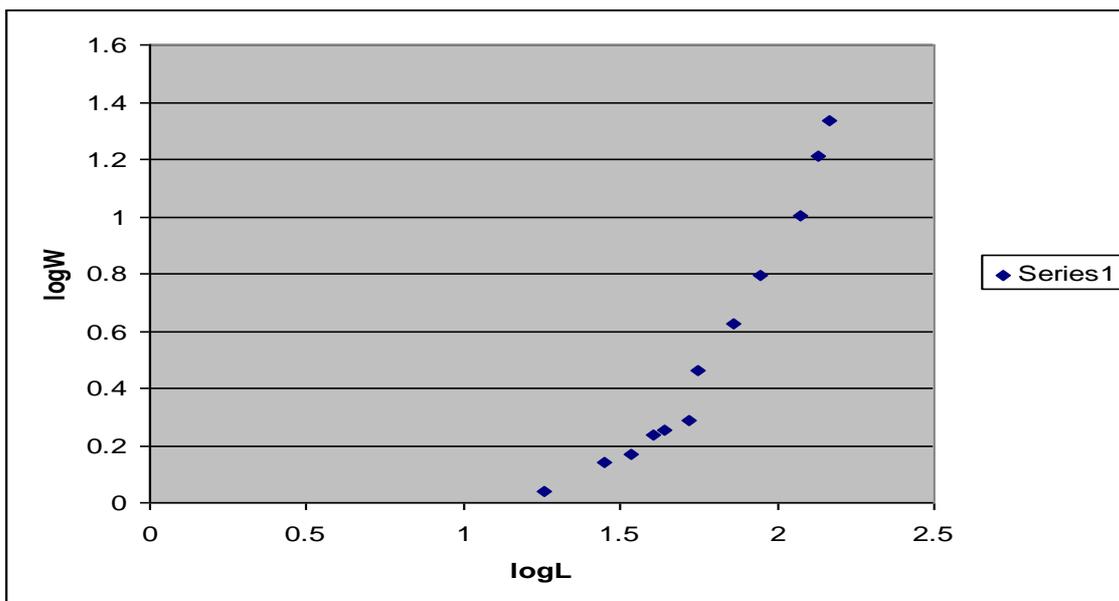
**3. Results and discussion**

The values of 'a' and the exponent 'b' are calculated following LeCren (1951). To see whether species followed

Cube law the values of the exponent 'b' was tested against '3' applying 't' test. The value of regression coefficient 'b' as 1.8300 and 2.7385 in the fish of raceway R1 and R2 respectively, are in agreement with the studies of Quadiri and Mir (1980), Chauhan and Malhotra (1981); Malhotra and Chauhan (1984). Thakur and Das (1974) reported the value of an exponent significantly greater than 3 or less than 3 denoted that it did not maintain the isometric pattern of growth. In the present study, these values are less than 3 in the fish of R1 (fed with artificial diet), indicates that fish are lighter for its length. Value of b in the fish of R3 (fed with periphyton based diet) is more close to 3, indicates isometric pattern of growth. The coefficient of correlation were found to be 0.9394 and 0.9609, indicates the ideal morphometry of grown fish and superior results with natural periphyton based diet (table 1). The observed length and weight are shown in scattered diagram (Fig. 1 & 2). Log values of observed length and weight were plotted and regression line fitted to the data, which showed a straight line relationship. Several scientists have calculated ponderal index or condition factor of different fishes viz. 0.73 to 0.95 in *Tor putitora* (Pathani and Das, 1980), 1.03 -1.31 in *Salmo trutta fario* (Kumar *et al.*, 1979). Kumar *et al.*, (1979) concluded that the value of condition factor as about 1 is considered to be of its average weight. The values of K in present study were recorded as 0.931 and 0.991 in Raceway R1 and R2, respectively showed that the fishes fed with natural diet are more robust than that of artificial diet fed fishes. The data revealed that periphyton based feeding practice is better for growth and production rather than the artificial feeding to snow trout in the pond environment.

**Table 1:** Length-Weight relationship and condition factor 'K' of snow trout with different feed under captive condition

Raceways	Exponential equation	Logarithmic equation	Correlation coefficient 'r'	Value of 'K'
R1	$W = 2.330 L^{1.830}$	$\log W = -0.3679 + 1.830 \log L$	0.9394	0.931
R2	$W = 4.3727 L^{2.7385}$	$\log W = -0.6407 + 2.7385 \log L$	0.9609	0.991



**Fig 1:** Logarithmic graph of L-W relationship in R1

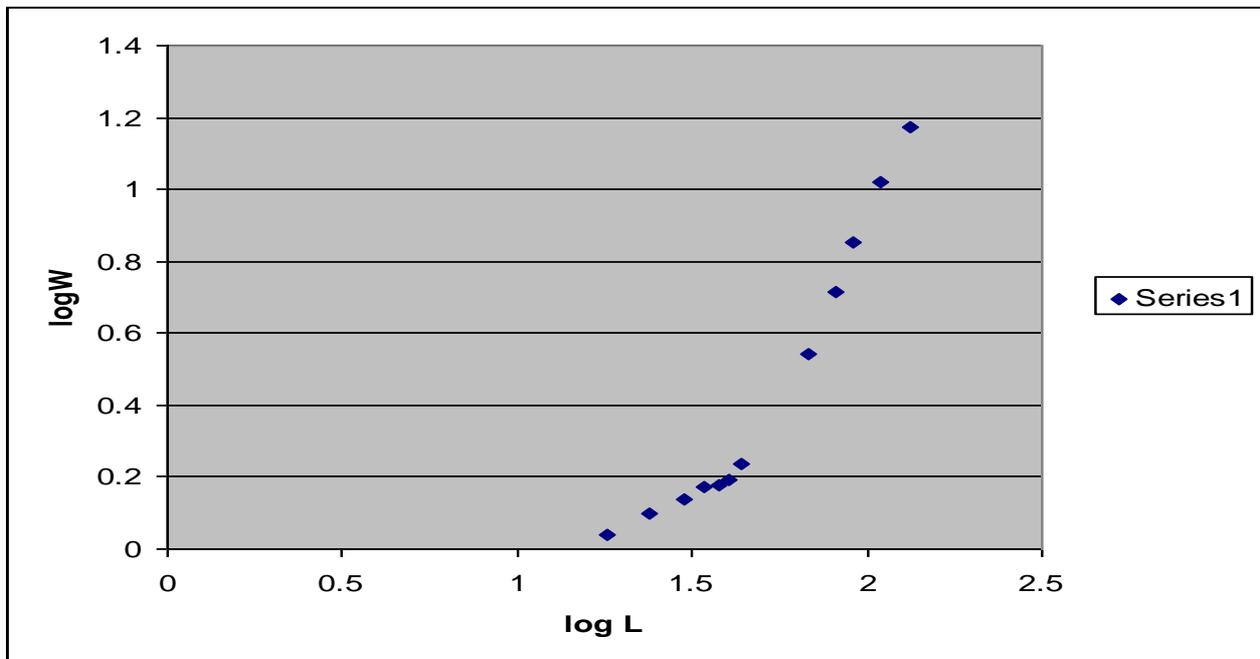


Fig 2: Logarithmic graph of L-W relationship in R2

#### 4. Acknowledgements

The authors express sincere gratitude to Head of the Department, Department of Zoology, D.S.B campus, Kumaon University, Nainital and to Director, DCFR, Bhimtal for providing facilities and able guidance to carry out the study.

#### 5. References

- Borary FA, Soliman FN. Length-weight relationship relative condition and food and feeding habit of the goat fish *Upeneus sulphureus*, (Cuvier) in Safaga Bay of the Red Sea. J. Inland Fish. Soc. India. 1987; 19:47-52.
- Chauhan RS, Malhotra SK. Bionomics of hill stream cyprinids II. *Barillus bola* (Ham.), Biology. 1981; 3(2):34-36.
- Deorari BP. Productive potential of a manmade reservoir of Tarai of Uttar Pradesh with Particular reference to fish fauna. Ph. D. Thesis submitted to Rohilkhand University, Bareilly. 1993, 291.
- Kumar K, Sehgal KL, Sundar S. Length-weight relationship and ponderal index of brown trout, *Salmo trutta fario* (Lin.) catches in the streams of Kashmir. J. Fisheries Soc. India. 1979; 1:56-61.
- Lambert Y, Dutil JD, Can simple condition indices be used to monitor and quantify seasonal changes in the energy reserves of Atlantic cod (*Gadus morhua*). Can. J. Fish. Aquat. Sci. 1997; 54(1):104-112.
- Lambert Y, Dutil JD. Energetic consequences of reproduction in Atlantic cod (*Gadus morhua*) in relation to spawning level of somatic energy reserves. Can. J. Fish. Aquat. Sci. 2000; 57:815-825.
- Le Cren ED. The Length-weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca fluviatilis*). J. Anim. Ecol. 1951; 20:201-219.
- Malhotra SK, Chauhan RS. Bionomics of hill stream cyprinids. VI. Length-weight relationship of *Labeo dero* (Ham) from India. Proc. of the Indian Academy of Sciences (Animal Science). 1984; 93(5):411-417.
- Pathani SS, Das SM. A note on length-weight relationship and seasonal condition factor of Mahasheer, *Tor tor* and *T. putitora* (Ham.). J. Inland Fish Soc. India. 1980; 12(1):140-143.
- Pauly D. Fish population dynamics in tropical waters: a manual for use with programmable calculator. ICLARM studies and Reviews, Manila, Philippines, 1984; 8:325.
- Qadri MY, Mir S. Length-weight relationship of *O. plagiostromus* (Mc Clell). Geobios. 1980; 71(4):158 - 159.
- Rawat HS, Studies on the limnology and fisheries of Tumaria reservoir (Nainital). Ph.D. Thesis, Kumaon University, India. 1991, 1-188.
- Thakur NK, Das MK, Length-weight relationship of *H. fossiles* (Bloch). J. Inland Fish. Soc. India. 1974; 6:95-96.
- Wetzel RG. Attached algal-substrata interactions, fact or myth and when and how? In: Wetzel, R.G., (Eds.). Periphyton of freshwater ecosystems. The Hague, Dr. W. Junk Publishers. 1983, 208-215.