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LENGTH-WEIGHT RELATIONSHIPS AND GUT ANALYSIS OF LABEO ROHITA FROM BOLAN WIRE, BALUCHISTAN PAKISTAN

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Abstract

The present study would be the first study carried out to analyze the gut contents of Labeo rohita from Bolan weir Dhadar main canal District kacchi in Baluchistan. Research was based on length-weight relationships and dietary habits of Labeo rohita. Samples were collected for examination of gut contents and Length-weight relationships during January 2020 to December 2020. Total 225 fish samples including 135 male and 90 female were analyzed. The combined sexes length ranged from 4.8cm-22cm and weight ranged from 20g to 462g. The regression coefficient for male and female and combined were characterized in logarithmic form as Log W= 0.0242+ 2.5490 Log L (Males), Log W=0.0204+2.5950 Log L (Females), Log W=0.0228+2.5650 Log L (Combined sexes). Determined values of regression coefficient (b) is 2.5490, 2.5950 and 3.00 for male, female and combined sexes. The basics feeding components of Rohu included Bacillariophyta (54.46%), Chlorophyta (21.79%), Euglenophyta (8.38%), Cynophyta (7.47%), Sand (0.04%) and Mud (0.02%). It is concluded that Labeo rohita is omnivorous in feedings and showed negative allometric growth.

KEYWORDS: Length-weight, Gut, Bolan, parameters, Labeo Rohita, Balochistan

1. INTRODUCTION

In fish species length-weight relationship plays a key role for acquiring optimum utility and governance in the population. For securing the taxonomy of fish species it is necessary to obtain holistic relationship among body weight and length (Doha and Dewan, 1967). In yield prognosis LWR permits divination of weight from length (Pauly, 1993). For comparative growth survey it is necessary to study the relationship among length and weight (Froese and Pauly 2011). In fisheries length-weight relationships (LWRs) data is one of the most employing data analyses (Mendes *et al*.,2004). This data provides momentous information about stock revaluation models (Moratoet *et al*.,2001, Borges et al 2003). Weight length

relationship is used for economical purposes as well as for population appraisal (Steeby *et al*., 1991 and Ali *et al*., 2000).

Feeding habits of Fish are vary for each fish regarding to their size, age, sexual practices, life biography stages, types of accessibility of food, season, time of the day, and the area in which they occur (Lagler *et al*., 2003). The knowledge of nourishment and feeding practice of species highlight their location in food chain. In aquatic ecosystem the feeding niche of *Labeo rohita* (Rhou) is incoherent. According to some litterateurs Rohu is a water column feeder (Dewan *et al*., 1991; Azam *et al*., 2004).

The other consider it as a surface feeder (Hora, 1944) and yet some consider it both as water column feeder as well as surface feeder (Das and Moitra, 1955).These conclusions are not on the basis of behavioral observations ,these are on the basis of gut content analysis because these data provide insufficient indication about fish digested factual biomass due to large size alteration of the natural food components .The weight determination of gut content are important indicants for the endeavor of various components of food, totality intake of food and provide more advocate measurement of fish diet (Hyslope 1980).The determination quantity of food ingested by fish is largely limited in different fish groups (Silverstein and Shimma, 1994, Bellardi et al 1995).

2. REVIEW OF LITERATURE

Abid and Ahmed., (2009) noticed the medicating frequency dominance on growth and survival of fingerlings of *Labeo rohita*. for fingerlings breeding used 280 L glass aquaria, observed the eating one, two and three times daily. The study suggested that under intensive culture daily three of feeding frequency is adequate for rearing culture of fingerlings of *Labeo rohita*. Rasool *et al*.., (2013) investigated the principal component analysis (PCA) for degree of distinction between Rohu populations from various geographical regions. By PCA indication exhibited a correlation among increase in number factors and alleviate in eigenvalues. Zafar *et al*.., (2003) reported that development in weight is approximately proportional to the cube of its length and conditional factor remains constant with increasing length or weight by working on various sized twenty five fish specimens of *Catla catla* from Korang River Islamabad. Atar and Secer, (2003) examined the width/length-weight relationship through sex along with condition factor. For this work selected blue carp population which were living in Beymelek Lagoon Lake. Noticed the parameters through statistical analysis and found the liner regression among width/length and weight were highly significant. No significant difference found among both male and female sexes, and

their condition factor was not significant. Nath *et al*.., (2017) reported a study to assess the relationship among total length and live body weight as well as the relationship among standard length, total length and head length. The work done on five indigenous fish species of Barak River, Assam India. Conducted the result as the relationship among total length, head length and standard length are liner for all cases.

3. MATERIAL AND METHODS

Fish collection

About 225 fish samples (Labeo rohita) were collected from Bolan weir from January 2020 to December 2020.

Length and weight measurement

The total length (cm) and weight (g) of fish samples were determined with the help of measuring tray and digital balance nearest to 0.1g.

Fish Preservation

For the preservation purpose fish specimens are placed into 10-15% formalin and 5mL of formalin were inserted in the guts of specimens with 10mL syringe which inhibited the enzymatic activates.

Length-weight Relationship

Calculation of length-weight relationship was conducted by utilization of an equation $W=aL^b$ accustomed by Achakzai *et al*., (2013).

Gut content Analysis

All fish samples were dissected properly and opened the guts for the removal of stomach and pored formalin in it. The analyzing of gut contents is accomplished by utilizing binocular microscope (Nikon Eclipse E200). For the examination of food, the rules are used which were given by (Wards and Whipple, 1959; Pennak 1989; Sangpradup and Boonsong, 2006).

Estimation of gut contents

For the estimation of gut contents two methods were used volumetric method which is given by (Pillay, 1952) and the other method was frequency occurrence method and this method is applied by following the rules of (Hynes; 1950)

Point volumetric method

$$=\frac{No\ of\ points\ allocated\ to\ compnent}{Total\ points\ allocated\ to\ sub-sample} \times 100$$

Determined occurrences frequency by applying formula; $P=\frac{a}{b} \times 100$

In the above formula a; represent total number of fish which were examined and food was in their guts, b; indicating number of that fish in their guts specific food item were observed while P; shows percentage of each food component.

Gastro-somatic index (GaSi)

The calculation of Gasi done by using formula of (Dadzie et al., 2000).

$$Gasi=100\frac{SW}{BW}$$

Here, SW indicating gut content and BW mentioning weight of bodies. Also applied the formula of (Biswas, 1993) for calculation.

$$Gasi\ (\%) = \frac{weight\ of\ gut\ (g)}{weight\ of\ fish\ (g)} \times 100$$

Gut fullness and its categories

It is determined by applying gravimetric method (Hynes 1950).

$$\text{Gravimetric method}=\frac{Total\ gut\ contents\ weight}{Total\ fish\ weight}\times 100$$

Grouped the guts into five categories like full (100%) 3 quarter (75%) ½ (50%) and empty (0%).

Index of preponderance

The keys of Natarajan and Jhingran, (1961) are applied to calculate the all-important food components. Got the index of preponderance by this formula

$$1=\frac{vi\ oi}{\sum vi\ oi} \times 100$$

Here, I; is index of preponderance, vi; indicate percentage and oi; is occurrence percentage while ∑; is summation.

4. RESULTS AND DISCUSSIONS

Length-weight relationships (LWRs)

It was observed that the total length ranged from 10-38cm and weight 20 to 462g. It is also concluded that the fish is negative allometric (Table 1 and Figures 1-3).

The regression coefficient of male, female and combined sexes are measured by using square method and applied the equation below.

Log W= 0.0242+ 2.5490 Log L (Males)

Log W=0.0204+2.5950 Log L (Females)

Log W=0.0228+2.5650 Log L (Combined sexes)

The weight- length relationship of *Labeo rohita* are examined in detail in Table 1, The constant a and b values were calculated as 0.0242, 2.5490 for male, 0.0204, 2.5950 for female and 0.0228, 2.5650 for combined population of *Labeo rohita* in the present study. Current study is supported by previous studies conducted by Pervin and Mortuza, (2008). The reported the b value 2.5 from similar fish. They also explained if the value b is equal to 3 the growth would be measured as isometric, the value below 3 negative allometric and above would be considered as positive allometric (Bagenal & Tesch, 1978; king, 1996). Achakzai et al., (2013) also described the values of b 3, which is higher than current study. Similar findings were also studied by Herath *et al*., (2014). However different findings are conducted by Naeem et al., (2010).

Gut analysis

About 225 fish samples (*Labeo rohita*) were dissected and opened to examine the gut contents. Great variations were found (Table 2 and Figure 4). The Bacillariophyta was the most abundant food recoded. The major bacillariophyta were Cyclotella, diatom and cymbella etc, that comprised of 28.42% by volume and 32.16% by occurrence. The next dominant gut contents were zooplankton. The Rotifers was 4.13% by occurrence and 5.23% by the volume. The most abundant aquatic plants by occurrence were 3.95% and by volume 4.55%. Miscellaneous were 1.75% by occurrence and 2.11% by volume. The Insect wings and legs were also recoded from the same fish specimens. These were 1.98% by volume and 1.61% by occurrence. The sand was by volume of 1.22% and by occurrence 0.59%. Mud was also located by the volume 1.20% and by occurrence 0.27%. This study is strongly supported by De moor, (1986) and concluded that phytoplankton was dominant food. Current research is also supported by Mishra, (2020) and concluded that the dominant food item is Bacillriophyta. Contrary findings were reported by Bowen, (1976) and concluded that the dominant food was detritus.

Gut Fullness and Gastrosomatic index (GaSI)

The variations were observed in gut fullness and (GaSI). Higher gut fullness was noticed in months of January, March, October and November. Lower values observed during months of May, July, September. GaSI showed higher values in the months of January, March and November (Table 3 and Figure 5).

Lower values observed during months of May (62), July (65), September (69). GaSI showed higher values in the months of January (2.8), March (2.9), November (2.8) respectively. Almost similar trends in GaSI and gut fulness were reported by Mishra (2020) in the same fish specimens from Meeranpure Lake Uttar Pardesh, India.

Index of preponderance

The index of preponderance showed great variations during the study period. The study was shown that major food of *Labeo rohita* from Bolan wire was *Bacillariophyta* (54.46), *Chlorophyta* (24.79), followed by *Euglenophycea* (8.38), *Cynophyta* (7.47), *Myxophyta* (2.75), Rotifers (1.29), Cladocerans (2.32), Aquatic plants (1.07), Miscellaneous (0.22), Insect wings and legs (0.19), Sand (0.04), Mud (0.02). Our findings are strongly supported by Mishra (2020) in the same fish specimens from Meera pure Lake Uttar Pradesh, India.

Stomach categories

During study period out of 225 stomachs 20 (8.89%) were empty, 30 (13.33%) were quarter, 80 (35.56%) were half, 70 (31.11%) were three quarter and 25 (11.11%) were full (Table 4). Similar findings were reported by Mishra (2020) in the same fish specimens from Meera pure Lake Uttar Pardesh, India.

Table1; descriptive statistical data showing relationship between length and weight of *labeo rohita* male (M) female (F) and combined sexes(c).

sex	N	Length range (cm)	Weight range (cm)	A	B	r^2
M	135	10-34	20-426	0.0242	2.5490	0.986
F	90	11-38	22-462	0.0204	2.5950	0.980
C	225	10-38	20-462	0.0228	2.5650	0.983

Table 2. Grading of various gut contents in *Labeo rohita* from Bolan Weir, Baluchistan.

Food items	% Composition of food items		ViOi	Index of preponderance $I=\frac{ViOi\times100}{\Sigma ViOi}$	Grade by Volume
	Volume(vi)	occurrence (Oi)			
Bacillariophyta	28.42	32.16	913.99	54.46	**I**
Chlorophyta	18.54	19.73	365.79	21.79	**II**
Euglenophyta	11.66	12.06	140.62	8.38	**III**
Cynophyta	10.16	12.34	125.37	7.47	**IV**
Myxophyta	7.43	6.22	46.21	2.75	**V**
Rotifers	5.23	4.13	21.60	1.29	**VI**
Cladocerans	7.50	5.19	38.93	2.32	**VII**
aquatic plants	4.55	3.95	17.97	1.07	**VIII**
miscellaneous	2.11	1.75	3.69	0.22	**IX**
Insect wings and legs	1.98	1.61	3.19	0.19	**X**
Sand	1.22	0.59	0.72	0.04	**XI**
Mud	1.20	0.27	0.32	0.02	**XII**

$\sum ViOi = 1678.41$

Table 3. Monthly gut fullness and Gastro somatic index *of Labeo rohita* from Bolan wire Balochistan Pakistan.

Months	Gut fullness	GaSI
January	90	2.8
February	87	2.7
March	92	2.9
April	70	1.4
May	62	1.3
June	70	1.2
July	65	1.8
August	70	1.9

September	69	1.7
October	90	2.6
November	92	2.8
December	88	2.7
Average	78.75	2.15

Table 4. gut fullness of *Labeo rohita*.

State	No of guts	Percentage
Empty 0%	20	8.89
Quarter 25%	30	13.33
Half 50%	80	35.56
Three Quarter 75%	70	31.11
Full 100%	25	11.11
Total	225	100

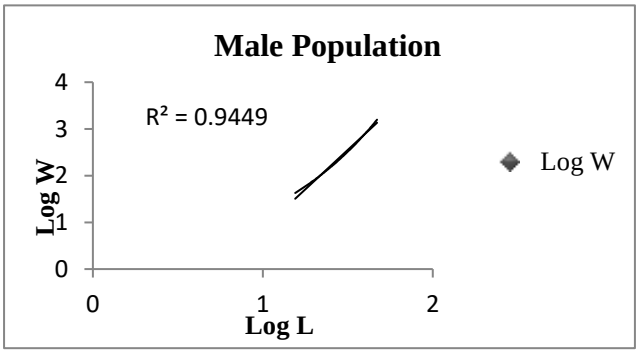

Figure 1. Co-efficient of logarithmic LWRs of male *Labeo rohita*

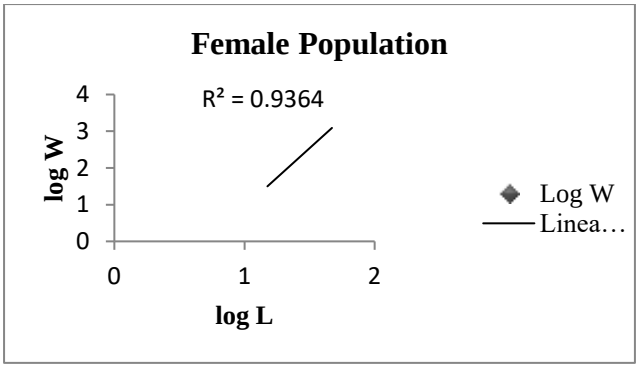

Figure 2. Co-efficient of logarithmic LWRs of female *Labeo rohita*

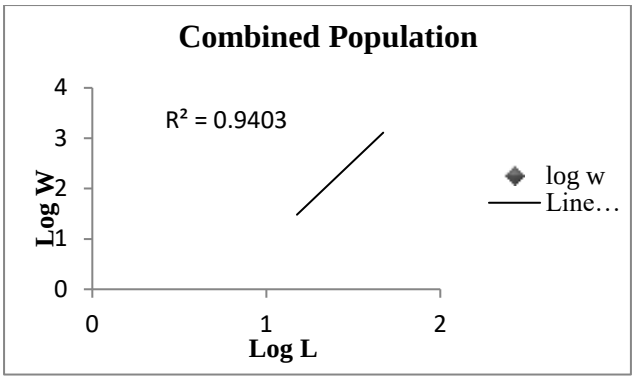

Figure 3. Co-efficient of logarithmic LWRs of Combined Population *Labeo rohita*

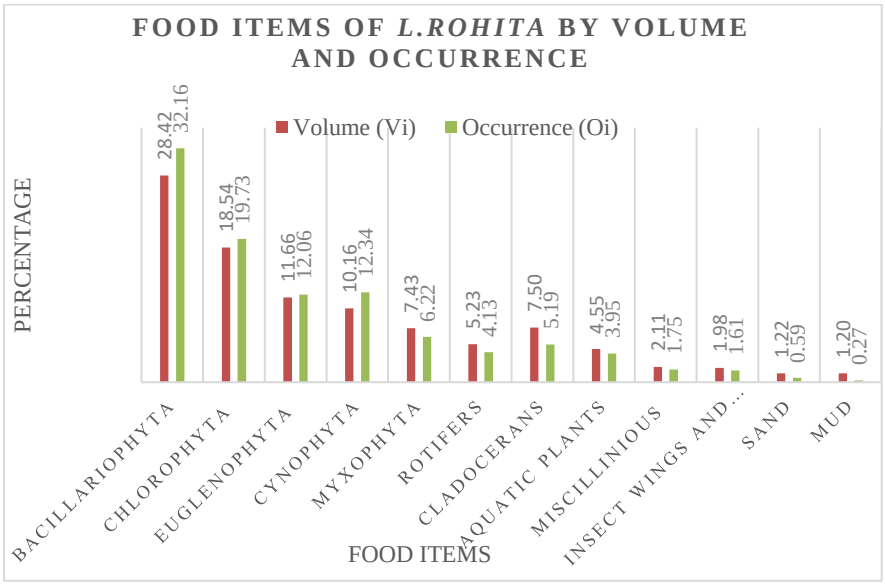

Figure 4. food items of Labeo rohita by volume and occurrence

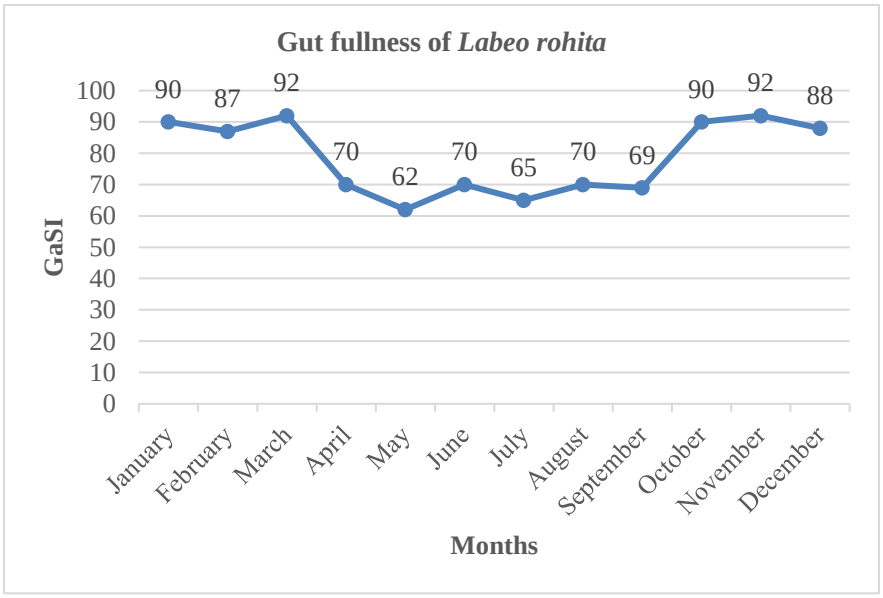

Figure. 5. Gut fullness of *Labeo rohita*

5. CONCLUSION

The weight and length relationship and gut analysis of *Labeo rohita* from Bolan wire would be the first study. It is concluded that *Labeo rohita* is omnivorous and showed negative allometric growth. The present study will help to work on other fishes estimate their weight and length relationships and feed and feeding habitat.

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