Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2021; 9(5): 41-45

Received: 22-07-2021
Accepted: 24-08-2021

Hafiza Nimra Ghani Qureshi
Department of Zoology, Government Girls College No. 02, Dera Ismail Khan, Pakistan

Ruqia Bibi
Government Girls College No. 01, Dera Ismail Khan, Pakistan

Najam-un-Nisa
Department of Zoology, Government Girls College No. 02, Dera Ismail Khan, Pakistan

Sania Komal
Department of Zoology, Government Girls College No. 02, Dera Ismail Khan

Inam Ullah
(1) Department of Zoology, Government Girls College No. 02, Dera Ismail Khan, Pakistan
(2) College of Wildlife and Protected Area, Northeast Forestry University, Harbin 150040, P. R. China

Corresponding Author:
Inam Ullah
(1) Department of Zoology, Government Girls College No. 02, Dera Ismail Khan, Pakistan
(2) College of Wildlife and Protected Area, Northeast Forestry University, Harbin 150040, P. R. China

To observe the relationship between selected visceral organs & bodyweight of *Cirrhinus mrigala* at Indus river Dera Ismail Khan, Pakistan

Hafiza Nimra Ghani Qureshi, Ruqia Bibi, Najam-un-Nisa, Sania Komal and Inam Ullah

Abstract
Cirrhinus mrigala is a vital protein source. The present study was conducted to observe the relationship between selected visceral organs and the bodyweight of *Cirrhinus mrigala* (Hamilton 1822) from Indus River Dera Ismail Khan from March 2021 to May 2021. Samples of *Cirrhinus mrigala* were collected weekly. Fish was weighted in kg on digital balance, and length (in cm) was determined using the scale, and samples were preserved in 10% formalin solution. Selected visceral organs are removed and weighed on digital balance in grams. The relationship was obtained between body weight, body length, gonad weight, intestine weight, liver weight, swim bladder weight, and total visceral weight. A positive, highly significant correlation was observed among body weight, body length, intestine weight, swim bladder weight, and total visceral weight, but a positive and significant correlation was found between gonad weight and liver weight of *Cirrhinus mrigala*. A good correlation (0.75-0.9) was found between body length and intestine weight, body length and liver weight, body length and total visceral weight, gonad weight and total visceral weight, intestine weight and liver weight, intestine weight and swim bladder weight, intestine weight, and total visceral weight, liver weight and swim bladder weight, swim bladder weight and total visceral weight with the value of 0.938**, 0.974**, 0.814**, 0.895**, 0.891**, 0.945**, 0.949**, 0.978**, 0.811** respectively, poor correlation (0.25-0.5) was observed between gonad weight and body length, gonad weight and liver weight, gonad weight and swim bladder weight with the correlation value of 0.492**, 0.335*, 0.474** respectively. Present studies will provide a basis for further advanced research in the future in the same field.

Keywords: *Cirrhinus mrigala*, body weight, body length, gonad weight, intestine weight

1. Introduction
The study of length and weight is significant to assess fish growth in different areas (Le Cren, 1951; Kalaycı *et al*., 2007) [1, 2]. Weight and length are often used to assess quantity (Steeby *et al*., 1991; Wootton, 1998; Ali *et al*., 2000) [3-5]. Many ichthyologists have explained the importance of the length and weight of all species of fish (Shakir *et al*., 2008; Hussain *et al*., 2009) [6, 7]. Little details about the relationship between body weight and length of the large indigenous major carps in Pakistan are available. Hence, there is a dire need to study such relationships of Carps found in Pakistan. Weatherley and Gill (1998) [8] observed that various organs and tissues such as the liver, intestines, skin, and visceral fat grow much faster than the whole body's weight. The condition of fish is affected by its gonad weight and visceral weight. However, the gonad increases isometrically with bodyweight (LeCren, 1951) [1]. Therefore, weight changes in other visceral organs, such as the liver, may contrast with oocyte growth in other species. Liver size in a fish sample is also generally expressed as a percentage of body weight without the weight of gonads. Fish processing produces visceral debris, as innards contribute to about 20-30% of fish weight.
The study aimed to determine the relationship between selected visceral organs and bodyweight of *Cirrhinus mrigala* and to observe the weight of visceral organs as per different body weights and body lengths of *Cirrhinus mrigala*.

2. Material and Methods
2.1 Study area
The study was carried out at Indus River Dera Ismail Khan from March 2021 to May 2021.

2.2 Sample Collection
Fish samples of *Cirrhinus mrigala* were collected randomly once a week. Fish samples were collected with the help of local professional fishers using drag nets and identified through a key by Jayaram (Jayaram, 1981) [9]. Fish was weighted in kg on digital balance, and length (in cm) was determined using scale and tagged using handmade anchor tags.

2.3 Fish preservation and dissection
The samples were immediately preserved in 10% formalin solution soon after weighing and tagging. Specimens were brought and dissected in the zoology lab of Government Girls College No. 2 Dera Ismail Khan. The organs of the fish were removed and put into the dissection tray containing water.

2.4 Visceral organs weighing and tagging
The weight of the total visceral organ was taken on a compact electronic scale (SF-400D). The desired organs, i-e gonads, intestine, liver, and swim bladder, were separated and weighed on a compact electronic scale (SF-400D).

Table 1: Distribution of individuals of *C. mrigala* per body weight was done as below:

Group-1	0.9-1.10kg	10 specimens
Group-2	1.9-2.10kg	10 specimens
Group-3	2.9-3.10kg	10 specimens
Group-4	3.9-4.10kg	10 specimens
Group-5	4.9-5.10kg	10 specimens

2.5 Statistical Analysis
The recorded data proceeded through correlation analysis, and Range, mean, standard error of mean and standard deviation, was calculated by descriptive statistics. Data were analyzed through SPSS (20).

3. Results
The total number of individuals for *Cirrhinus mrigala* was 50, BL ranges from 26.30-81.20, the mean value for the BL was 56.80 with the standard error of the mean was 2.42, and the standard deviation was 17.13 (Table 2).

Table 2: Descriptive statistics of different parameters of *Cirrhinus mrigala.*

	N	Range	Mean ± Std. Error	Std. Deviation
BL	50	26.30-81.20	56.80±2.42	17.13
GW	50	12.83-348.53	114.76±13.84	97.87
IW	50	54.90-416.82	214.03±14.92	105.47
LW	50	3.38-25.16	13.38±0.94	6.68
SW	50	6.40-38.01	21.28±1.45	10.27
TVW	50	81.44-800.63	363.46±28.39	200.71

Note: BL: Body length(cm), IW: Intestine weight(g), LW: Liver weight(g), SW: swim bladder weight(g), TVW: Total visceral weight(g).

Gonad Weight (ranging 12.83-348.53) of *Cirrhinus mrigala*, the mean value for the GW was 114.76 with the standard error of the mean was 13.84, and the standard deviation was 97.87 (Table 2).
Intestine weight of *Cirrhinus mrigala* (ranging 54.90-416.82), the mean value for the IW was 214.03 with the standard error of the mean was 14.92, and the standard deviation was 105.47 (Table 2).
The liver weight of *Cirrhinus mrigala* was ranged from 3.38-25.16, the mean value for the IW was 13.38 with the standard error of mean was 0.94, and the standard deviation was 6.68 (Table 2).
The swim bladder weight of *Cirrhinus mrigala* was ranged from 6.40-38.01, the mean value for the SW was 21.28 with the standard error of the mean was 1.45, and the standard deviation was 10.27 (Table 2).
The total visceral weight of *Cirrhinus mrigala* was ranged from 81.44-800.63, the mean value for the TVW was 363.46, with the standard error of the mean was 28.39, and the standard deviation was 200.71 (Table 2).

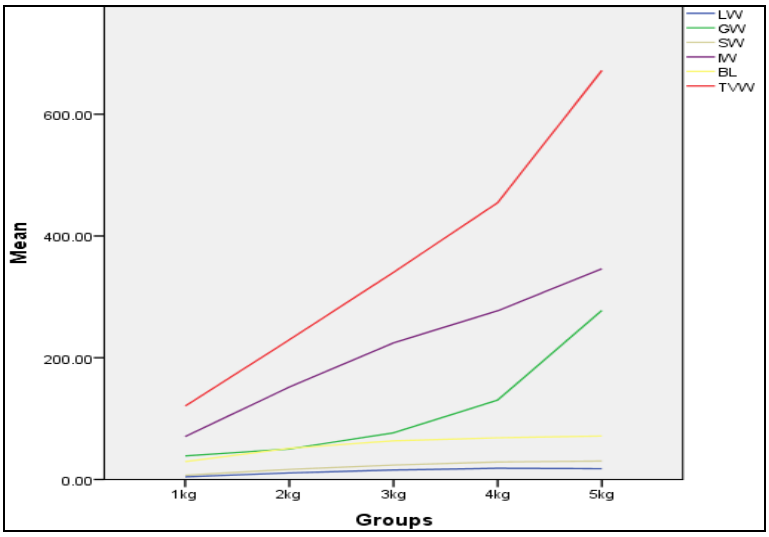

Fig 1: Descriptive statistics of different parameters of *Cirrhinus mrigala*.

Based on observation, it was concluded that all the studied parameters of *Cirrhinus mrigala* are positively correlated. Body length for *Cirrhinus mrigala* was observed highly significant and positively associated with gonad weight (GW), intestine weight (IW), liver weight (LW), swim bladder weight (SW), and total visceral weight (TVW) shown in table 2. The value of correlation is varied. The body length (BL) shows a good correlation (0.75-0.9) with intestine weight (IW), liver weight (LW), swim bladder weight (SW), and total visceral weight (TVW) but poor correlation (0.25-0.5) with gonad weight (GW) (Table 3).

Table 3: Correlations (Pearson) of different parameters of *Cirrhinus mrigala*.

	BL	GW	IW	LW	SW	TVW
BL	1	0.492**	0.938**	0.950**	0.974**	0.814**
GW	0.492**	1	0.708**	0.335*	0.474**	0.895**
IW	0.938**	0.708**	1	0.891**	0.945**	0.949**
LW	0.950**	0.335*	0.891**	1	0.978**	0.714**
SW	0.974**	0.474**	0.945**	0.978**	1	0.811**
TVW	0.814**	0.895**	0.949**	0.714**	0.811**	1

Note: BL: Body length(cm), IW: Intestine weight(g), LW: Liver weight(g), SW: swim bladder weight(g), TVW: Total visceral weight(g).

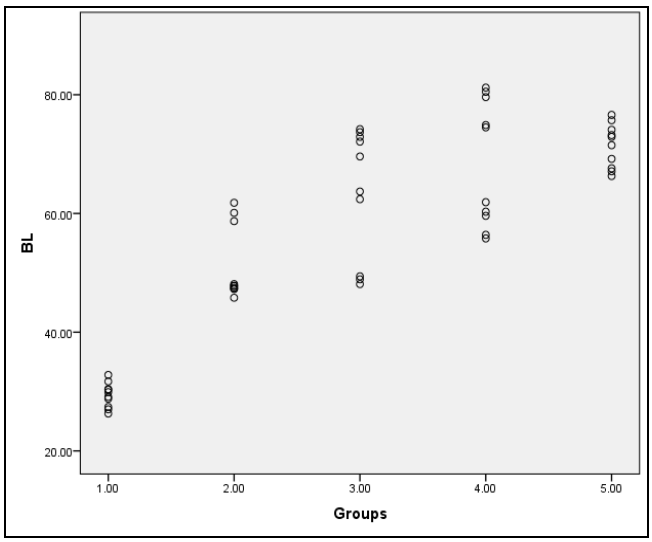

Fig 2: Scattered diagram showing the correlation between body length and different weight groups of *Cirrhinus mrigala.*

Gonad weight of *Cirrhinus mrigala* observed highly significant and positively associated with body length (BL), intestine weight (IW), swim bladder weight (SW), and total visceral weight (TVW), but the gonad weight (GW) is only significantly correlated with the liver weight (LW). The gonad weight (GW) shows a good correlation (0.75-0.9) with total visceral weight (TVW) and moderate correlation (0.5-0.75) with intestine weight (IW), but poor correlation (0.25-0.5) with body length (BL), liver weight (LW), and swim bladder weight (SW) (Table 3).

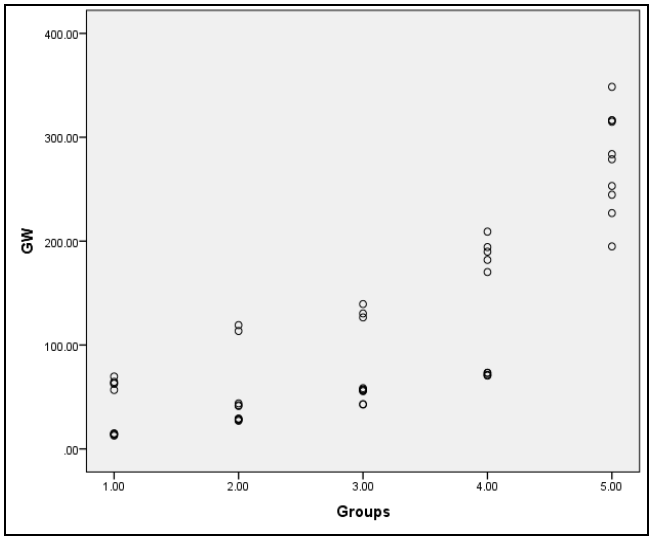

Fig 3: Scattered diagram showing the correlation between GW and weight groups of *Cirrhinus mrigala.*

Intestine weight of *Cirrhinus mrigala* was significantly high and positively associated with body length (BL), gonad weight (GW), liver weight (LW), swim bladder weight (SW), and total visceral weight (TVW). The intestine weight (IW) shows a good correlation (0.75-0.9) with body length (BL), liver weight (LW), swim bladder weight (SW), and total visceral weight (TVW), but moderate correlation (0.5-0.75) with gonad weight (GW) (Table 3).

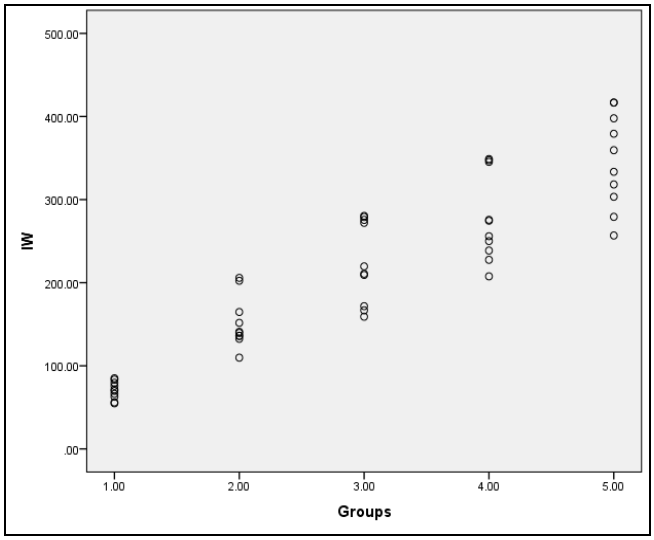

Fig 4: Scattered diagram showing the correlation between IW and weight groups of *Cirrhinus mrigala.*

Liver weight for *Cirrhinus mrigala* was observed highly significant and positively associated with body length (BL), intestine weight (IW), swim bladder weight (SW), and total visceral weight (TVW), but only a significant correlation was found between the gonad weight (GW) and liver weight (LW). The liver weight (LW) shows a good correlation (0.75-0.9) with body length (BL), intestine weight (IW), and swim bladder weight (SW), and moderate correlation (0.5-0.75) with total visceral weight (TVW), but poor correlation (0.25-0.5) gonad weight (GW) (Table 3)

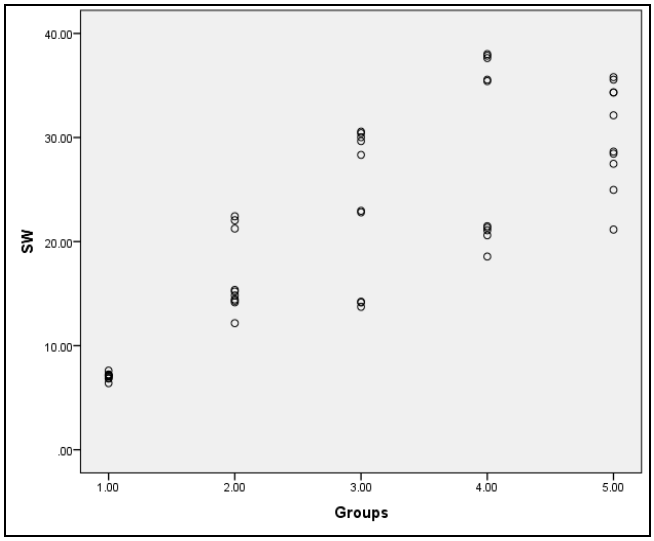

Fig 5: Scattered diagram showing the correlation between LW and weight groups of *Cirrhinus mrigala*

Swim bladder weight of *Cirrhinus mrigala* was highly significant and positively correlated with body length (BL), gonad weight (GW), intestine weight (IW), liver weight

(LW), and total visceral weight (TVW). The swim bladder shows a good correlation (0.75-0.9) with body length (BL), intestine weight (IW), liver weight (LW), and total visceral weight, but poor correlation (0.25-0.5) with gonad weight (GW) (Table 3).

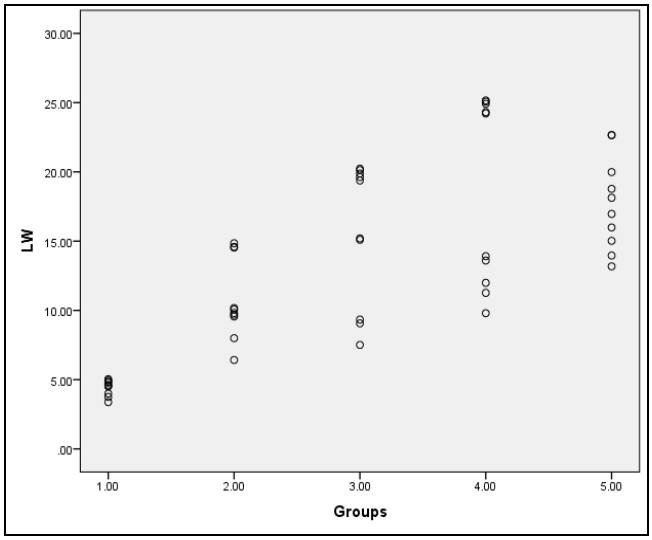

Fig 6: Scattered diagram showing the correlation between SW and weight groups of *Cirrhinus mrigala*.

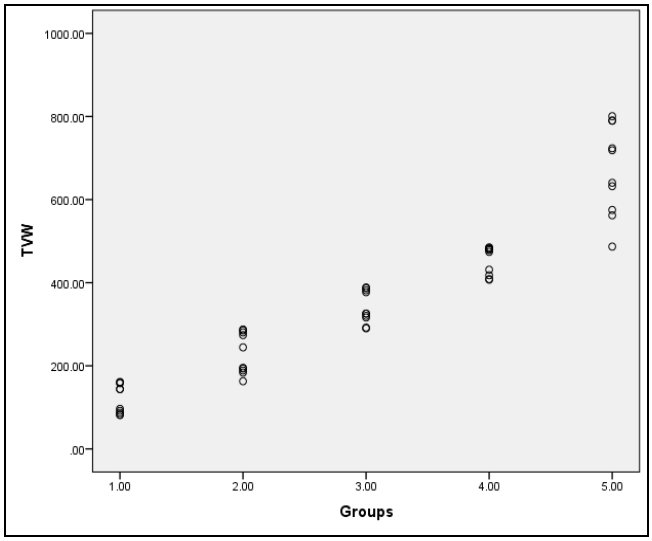

Fig 7: Scattered diagram showing the correlation between TVW and weight groups of *Cirrhinus mrigala.*

Total visceral weight of individuals for *Cirrhinus mrigala* was significantly high and positively correlated with body length (BL), gonad weight (GW), intestine weight (IW), liver weight (LW), and swim bladder weight (SW). The total visceral weight (TVW) shows a good correlation (0.75-0.9) with body length (BL), gonad weight (GW), intestine weight (IW), and swim bladder weight (SW), but a moderate correlation (0.5-0.75) with liver weight (LW) (Table 3).

4. Discussion

During the study, it was predicted that the length is gradually increased as the weight of the *Cirrhinus mrigala* increases, but when the weight is ranges to 3kg, there is a slow increase in the length of fish and (Hussain *et al*., 2017) [10] predicted that the growth rate was maximum in 1st year of the life and minimum in 9th year. The growth rate was slow in the second year due to the maturity stage during the second year of life. It is well known that the potential of growth is used for the development of gonads. A study also found that the weight of gonad increases with the increase of the bodyweight of fish. These findings are compensated with the results of (Delahunty & DeVlaming., 1980) [11], who predicted that the weight of the ovary in goldfish is increased with the body's weight. In studies on other species, *Perca jluviatilis* (Le Cren, 1951) [1], *Esox lucius* (Mann, 1976a) [12], *Mastacembelus armatus* (Gupta, 1974) [13], and *Rutilus rutilus* (Mann, 1973) [14], the relationship between gonadosomatic index and weight of the body was constant over the fish weight of a range of fish; thus, gonadosomatic index maybe showed a legitimate expression of the activity of gonads in other fish. Mann (1974) [15] also found GSI increases with age in the Leuciscus leuciscus at a specific point, and after a particular time, the gonadosomatic index remained constant. The two different populations of the Leuciscus cephalus was studied. Hellawell (1971) [16] found that the gonadosomatic index increased with the body's weight in both groups. These data may not match the findings of Mann (1976b) [17], who found that the GSI did not increase with the weight of the body in the different Populations of Leuciscus cephalus. Thus, the change of increasing gonad weight regarding body weight may vary between the population of the different species and between the same species. The weight of the intestine was observed positive and highly significant with the body length of *Cirrhinus mrigala*. (Ribble & Smith., 1983) [18] observed in the eleven fish species belonging to the seven families, the length of the intestine is significantly related to the length of the body. As the weight of fish increases, the volume of their food increases, which creates a need to increase the length of the intestine to maintain the digestion of food (Bagenal, 1978) [19].

5. Conclusion

The current study will provide further information about the relationship between selected visceral organs and the bodyweight of *Cirrhinus mrigala.* This study concluded that the length of *Cirrhinus mrigala* is highly dependent on the weight of fish; as the fish gains weight, its length also increases. The gonad and intestine weight increases as the body weight increases. It was found that the weight of gonads influences the weight of the liver; as the weight of gonads increases, the weight of the liver decreases in the viscera of fish. Although, other visceral organs such as the swim bladder and intestine showed a strong correlation with the gonad weight.

6. Acknowledgment

We are very thankful to Mrs. Ruqia Bibi (Associate professor in Zoology), Miss Najam Un Nisa (MSc Zoology), Mr. Inam Ullah (Ph.D. Wildlife), Mr. Muhammad Kashan Qureshi (Research Officer in Agricultural Research Institute), and Mr. Muhammad Haseeb Qureshi (M. Phil in Business Administration) for their help during data collection compiling data, analyzing data and write-up of the proposed study.

7. References

1. Le Cren ED. The length-weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*). The Journal of Animal Ecology 1951, 201-219.
2. Kalaycı F, Samsun N, Bilgin S, Samsun O. Length-

weight relationship of 10 fish species caught by bottom trawl and midwater trawl from the Middle Black Sea, Turkey. Turkish Journal of Fisheries and Aquatic Sciences 2007, 7(1).
3. Steeby JA, Busch RL, Tucker CS. A length–weight relationship for channel catfish grown under commercial conditions in Mississippi. The Progressive Fish-Culturist 1991;53(1):57-60.
4. Wootton RJ. Behavioral Ecology of Teleost Fishes J.-GJ Godin (ed.). Reviews in Fish Biology and Fisheries, 1998;8(4):493.
5. Ali M, Salam A, Iqbal F. Weight-length and condition factor relationship of wild Channa punctata from Multan. Punjab Univ. J Zool 2000;15(83);39.
6. Shakir HA, Mirza MR, Khan AM, Abid M. Weight length and condition factor relationship of *Sperata sarwari* (Singhari) from Mangla Lake, Pakistan. Journal of Animal and Plant Science 2008;18(4):158-161.
7. Hussain A, Qazi JI, Shakir HA, Mirza MR, Nayyer AQ. Length-weight relationship, meristic and morphometric study of *Clupisoma naziri* from the river Indus, Pakistan. Punjab Univ. J. Zool, 2009;24(1, 2):14-25.
8. Weatherley AH, Gill HS. The biology of fish growth. Academic Press. New York, 1998, 442.
9. Jayaram KC. Freshwater Fishes of the Indian Region. A Handbook of the Zoological Survey India, Calcutta; 1981.
10. Hussain A, Ali S, Khan AM, Hassan A, Qazi JI. Length-weight relationships of native Indian major carps from anthropogenically affected segment of the Ravi, Pakistan. Journal of Wildlife and Ecology 2017;1(1):1-7.
11. Delahunty G, De Vlaming. Seasonal relationships of ovary weight, liver weight and fat stores with body weight in the goldfish, *Carassius auratus* (L.). Journal of Fish Biology 1980;16(1):5-13.
12. Mann RHK. Observations on the age, growth, reproduction and food of the pike *Esox lucius* (L.) in two rivers in southern England. Journal of Fish Biology 1976a;8(2):179-197.
13. Gupta S. Observations on the reproductive biology of *Mastacembelus armatus* (Lacepede). Journal of Fish Biology 1974;6(1):13-21.
14. Mann RHK. Observations on the age, growth, reproduction and food of the roach *Rutilus rutilus* (L.) in two rivers in southern England. Journal of Fish Biology 1973;5(6):707-736.
15. Mann RHK. Observations on the age, growth, reproduction and food of the dace, *Leuciscus leuciscus* (L.), in two rivers in southern England. Journal of Fish Biology 1974;6(3):237-253.
16. Hellawell JM. The autecology of the chub, *Squalius cephalus* (L.), of the River Lugg and the Afon Llynfi: II. Reproduction. Freshwater Biology 1971;1(2):135-148.
17. Mann RHK. Observations on the age, growth, reproduction and food of the chub *Squalius cephalus* (L.) in the River Stour, Dorset. Journal of Fish Biology 1976b;8(3):265-288.
18. Ribble DO, Smith MH. Relative intestine length and feeding ecology of freshwater fishes. Growth 1983;47(3):292.
19. Bagenal T. Methods for assessment of fish production in fresh waters (No. 597.052632 M4; 1978).