Biometric assessment of *Cyprinus Carpio* var *communis* from Anchar Lake of Kashmir valley

Abstract

The morphometric study has been proven as useful tool for knowing about fish species, population and races. It is a basic fundamental tool for knowing about development of organisms, systematic, growth, variation and structure thus playing an important role to determine relationship between various parts of the body. The present study was carried out in Anchar lake of Srinagar Kashmir to analyze morphometric measurements of targeted fish *Cyprinuscarpio*var. *communis*. About 120 specimens of fish species was collected randomly from different zones of water body. Total twenty (20) morphometric characters were selected to conduct the present study. The morphometric characters were classified into genetically controlled (Narrow range), intermediate (Moderate range) and environmentally (Vast range) controlled characters. Out of 20 morphometric characters five (5) were genetically controlled, two (2) characters were intermediate and seven (7) characters were environmentally. Both the inferential and descriptive statistics were employed to analyse the data using SPSS version 16 and Microsoft excel. The relationship between the different morphometric characters were found linear and maximum characters were recorded to be highly significant ($P<0.01$).The study concluded that the environmentally controlled characters were observed highest, which indicates that these characters are less stable in nature; however, other characters were intermediate and genetically controlled due to higher stability in nature.

Key words: Biometric assessment, Common carp, *Cyprinus carpio*, morphometry, Anchar lake, Kashmir valley

Introduction

The environmental changes in the habitats of the fish due to anthropogenic activities results in pollution of the aquatic environment which causes morphometric characters to respond to changes in environmental factors (Hubbs, 1941)[7]. Basic fundamental tool for knowing about development of organisms, growth, systematic, variations and structure of population characteristics of fish is morphometric study (Kov and Copp, 1999)[11].It plays an important role for estimating relationship between various parts of body (Carpenter *et al*., 1996)[5]. Thus, studying morphometric characters form a useful tool to study morphometric measurement and identify fish stock (Turan *et al.*, 2004)[22].However, fish vary greatly in morphological traits in between the populations and within species than any other vertebrates (Allendorf *et al.*, 1987)[1]. Morphometric analysis provides an important tool to make sure of genetic and environmental stock identification of different fish population; the differences in populations arise due to changes in the environment factors or through genetic variations, which results from nature during long periods of geographical isolation (McHugh, 1954)[12]. So due to increased anthropogenic activities resulting in pollution of the aquatic environment by fertilizers and pesticides cause environmental changes in the habitats in turn results in morphological changes within species. Thus, morphometric characters respond to changes in environmental factors and these responses differ from species to species.

Material and Methods

A total number of 120 specimens of *C. Carpio* var *communis* were collected from Anchar lake of Kashmir Valley. The samples were collected from the Nov 2021 to March 2022. The samples were collected by using cast net by the help of local trained fishermen. The samples were brought to the laboratory *viz* bucket filled with water for further analysis. In laboratory fishes were washed under tap water in order to remove dust particles, mucus and other particulates and then dabbed with clean cloth. Total 20 morphometric characters were taken for present investigation by using vernier calliper nearest to 0.01mm. The readings were always taken on the left side of body. All the characters were calculated in

the percentage of total length. The morphometric characters were recorded following (Holden and Raitt, 1974; Jayaram, 2010)[6,8]. These measurements were subjected to both inferential and descriptive statistics using SPSS version 16 and Microsoft excel. The coefficient of correlation (r) and regression (b) were tested for significance. The data were then used to compute the regression equation for each dependent variable to fit the straight-line equation (Y=a+bX), where Y is the dependent variable, 'a' is intercept, b the slope of the regression line and X the independent variable (Snedecor and Cochran, 1967)[16]. The various morphometric characters were then classified on the basis of range into genetically (<10%), intermediate (<15%) and environmentally (>15%) controlled characters (Johal *et al*., 1994)[9].

Results

In the present study, the different morphometric characters were measured for biometric analysis of the fish samples of *Cyprinus carpio* var. communes collected from Anchar Lake and expressed in percentage of total length for statistical analysis like mean, standard deviation, range, range difference, correlation coefficient and regression equation (Table 1).On the basis of the present investigation, it was inferred that most of the morphometric characters of the sampled fish showed positive correlations between all the characters; however, the value of the correlation varied. Out of twenty characters, twelve characters showed high correlation values (0.75-0.95) indicating that these characters are directly proportional to each other, four were moderately correlated (0.50-0.75) and three were poorly correlated (0.25-0.50). However, linear relationships have been observed between all the independent and dependent characters (Fig. 1-2).The present study revealed that out of the total characters that have been studied in percentage of total length, five (5) were genetically controlled, two (2) were intermediate, and seven (7) were environmentally controlled. In the %age of head length all the characters were environmentally controlled.

Table 1: Morphometric characters of *Cyprinus carpio* var. *communis* measured for biometric analysis

S.No.	In% age of total length	Mean (mm)	S.D.	Range (mm)		Range difference (%)	r	Regression equation
				Min	Max			
1	Fork Length (FL)	128.11	21.95	84.26	180.00	47.89	0.944	-0.198+0.907x
2	Standard Length (SL)	115.66	20.62	71.38	165.00	24.77	0.912	-2.616+0.836x
3	Pre-Anal Length (PraL)	90.60	18.90	57.72	125.21	33.76	0.879	-0.527+0.644 x
4	Pre-Dorsal Length (PrDL)	61.60	14.81	40.47	83.73	21.64	0.910	4.126+0.406x
5	Pre ventral Length (PrVL)	61.03	9.51	40.30	88.00	23.86	0.744	-0.747+0.436x
6	Caudal Peduncle Length (CPL)	14.36	10.05	8.37	21.96	6.79	0.861	-1.714+0.113x
7	Body Depth (BD)	39.61	2.89	25.98	56.67	15.35	0.792	-1.050+0.287x
8	Dorsal Fin Length (DFL)	48.18	6.80	27.95	69.52	20.79	0.733	0.476+0.337x
9	Anal Fin Length (AFL)	19.82	8.32	11.66	29.43	8.88	0.806	-1.904+0.153x
10	Pectoral Fin Length (PFL)	21.94	3.93	13.88	30.82	8.47	0.767	-0.817+0.161x
11	Pelvic Fin Length (PelFL)	20.37	3.93	12.70	30.37	8.83	0.792	-1.504+0.154x
12	Caudal fin Length (CFL)	30.02	3.87	19.46	39.54	10.04	0.427	0.985+0.205x
13	Dorsal Fin Height (DFH)	17.95	5.06	9.40	31.03	10.82	0.441	1.475+0.116X
14	Ventral Fin Base (VFB)	5.41	3.90	1.37	8.45	3.54	0.766	0.396+0.035x
In the % of Head Length								
16	Snout Length (SnL)	10.51	4.87	12.15	15.94	26.88	0.766	0.906+0.067x
17	Eye Diameter (ED)	9.24	1.94	10.55	11.52	23.34	0.494	1.574+0.194x
18	Pre-Orbital Length (PrOL)	11.52	0.98	13.52	18.87	29.91	0.675	1.045+0.074x
19	Post Orbital Length (PoOL)	16.73	2.31	17.71	26.33	39.18	0.944	1.195+0.109x

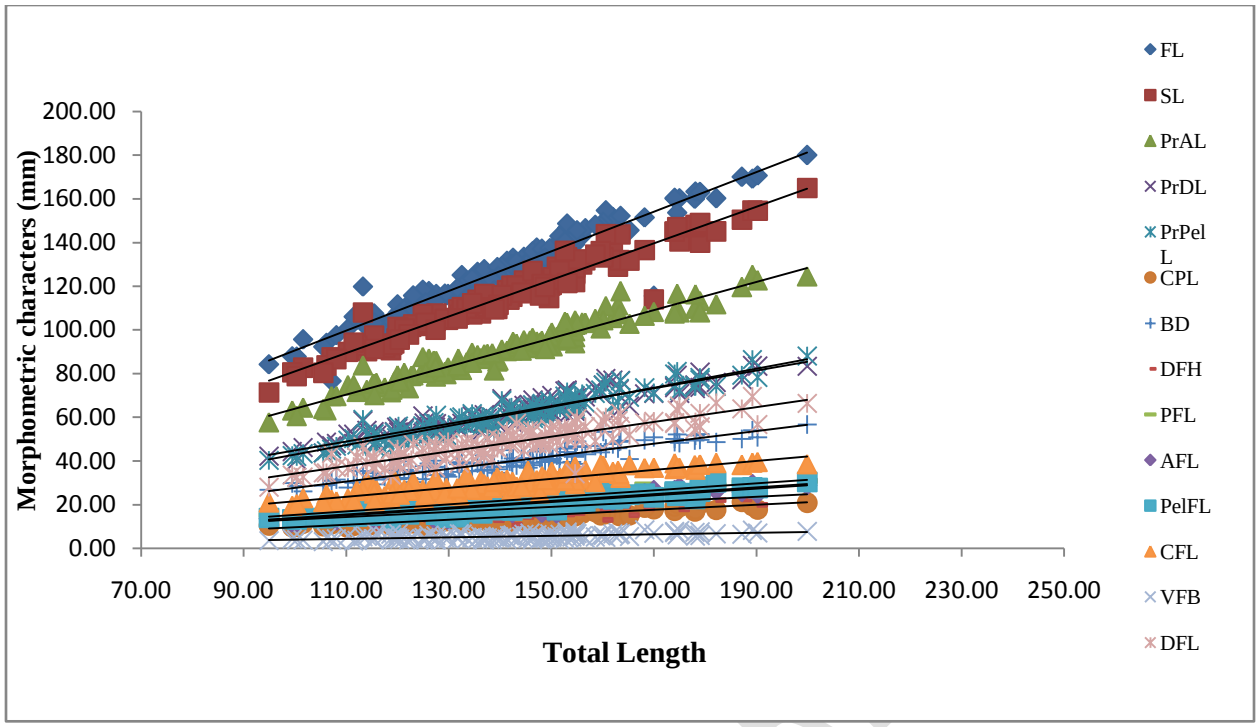

Fig. 1: **Relationship of different morphometric characters with Total Length in *C. Carpio* var. *communis* (Anchar Lake)**

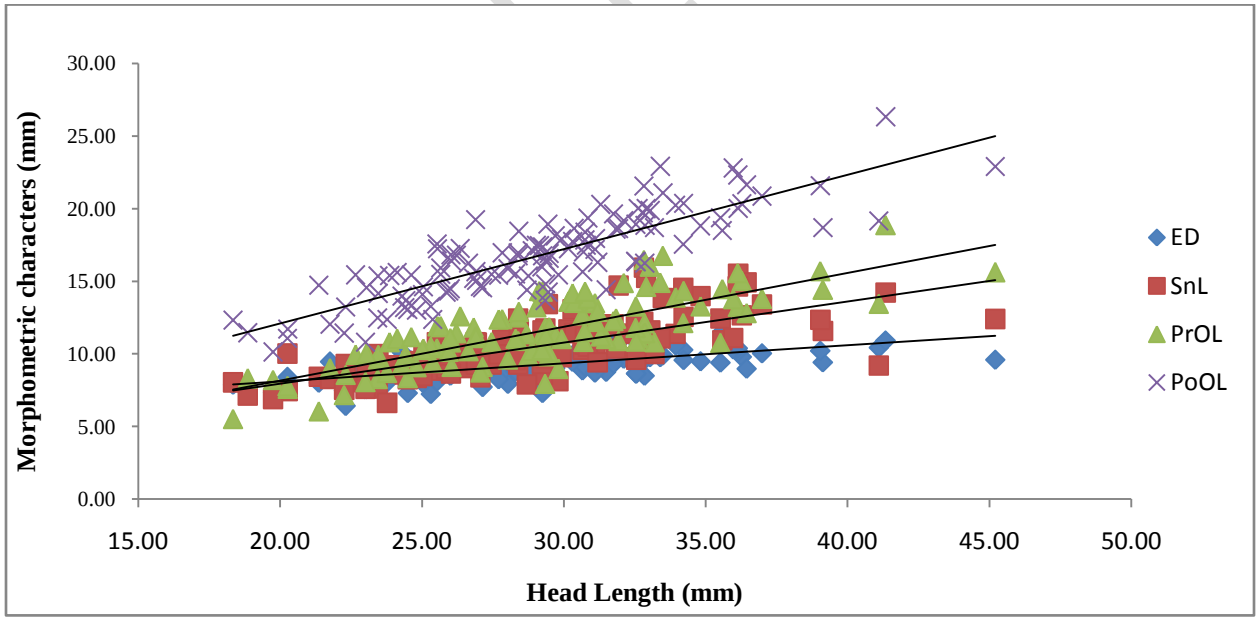

Fig. 2: **Relationship of different morphometric characters with Total Length in *C. Carpio* var. *communis* (Anchar Lake)**

Discussion

Morphometric characters on the basis of range difference can be categorised into genetically controlled, intermediate, and environmentally controlled characters. Thus, the characters which belonged to genetically controlled showed minimum range of variations, intermediate showed moderate range and the characters belonging to environmentally controlled showed maximum range of variation. Among the morphometric characters studied, 5 were genetically controlled, 2 were intermediate, and 6 were environmentally controlled in percentage of total length. While in the % of HL all the characters were environmentally controlled. These results are in conformation with Tandon *et al*. (1993)[21] reported 14 out of 19 and 13 out of 18 characters from the respective samples were exhibiting wide range differences hence were environmentally controlled in *Cirrhinus. reba and Gudusia chapra.*Brraich and Akhter (2015)[4] who conducted a study on *Crosocheilus latius latius* and revealed that out of eighteen characters, thirteen characters were genetically controlled. Negi and Tarana (2010)[13] recorded in their study on *Schizothorax .richardsonii* that out of 21 characters, 19 (genetically controlled) 1 character (intermediate) and 1 character (environmentally controlled). Sirj *et al*. (2017)[19] reported that in percent of total length out of 18 characters, 4 were genetically controlled, 12 characters were intermediate and 2 characters were environmentally controlled. Bhat *et al* (2016)[2] reported that 3 characters were genetically controlled, 13 were intermediate and 2 were environmentally controlled. Similar other studies have been conducted such as Bhat *et al*. (1998)[3] conducted a study on *Tor. putitora* and revealed that 12 characters were genetically controlled, two were intermediate and one was environmentally controlled with respect to body length. However, in case of head length three characters were intermediate and two were environmentally controlled. The maximum characters were environmentally controlled in the present study, which could be ascertained due to their unrestricted distribution and wide range of zoogeographical distribution. Same is supported by Khin *et al*. (2019)[10] who stated that fish species showing restricted distribution, showed narrow range in majority of morphometric characters hence genetically controlled. On the contrary, in species which have a wide range of zoogeographical distribution, maximum characters of fish species possess wide range in morphometric characters and are hence strongly influenced by the environment.

Further, the fish population of Anchar lake revealed that all the morphometric traits were highly significant ($p<0.01$) with total length and showed linear relationship between all the independent and dependent variables and all the variables showed positive correlation. The characters like standard length, fork length, pre pelvic length showed high correlation coefficient while minimum correlation coefficient was achieved for dorsal fin height, ventral fin base and pre-orbital length. It may be due to the fact that all morphometric characters change proportionally with the increase in total length of fish and the higher level of correlations of morphometric traits indicate that whole body of the fish grows in a proportionate manner (Pant *et al*., 2018)[14]. The same results are in line with the Sharma *et al*. (2014)[17] who studied the relationship of total length and external body parts while analysing the morphometric and meristic characteristics of *Botia birdie* in the Indus basin, Jammu & Kashmir and addressed a positive correlation in all parameters with respect to total length. The high correlation was observed with fork length and least correlation with post orbital length with the values of (R^2=0.99 and R^2=0.77). Bhat *et al*. (2016)[2] documented similar results in *Cyprinus* spp. and addressed that out of eighteen characters in relation to total length of fish, ten characters showed high values of correlation coefficient and rest parameters showed moderate correlation coefficient. Qadri *et al*. (2017)[15] reported high correlation (r) values for various morphometric characters with total length. Highest value was ascertained for standard length (R^2=0.88). Similarly, Shah *et al*. (2011)[18] studied morphometry of farmed rainbow trout in Kashmir and addressed high level of interdependence between the fourteen morphometric characters studied. Johal *et al*. (1994)[9] found standard length as most correlated body part in *Tor putitora* from Gobindsagar.

Conclusion

Twenty morphometric characters were studied in percentage of total length, of which nine were genetically controlled, four were intermediate, and seven were environmentally controlled. Surprisingly, the genetically controlled characters were observed highest which indicated that these characters are very much stable in nature from this place. However, other characters were intermediate and environmentally

controlled due to less stability in nature. So, there is a great impact on these characters to be controlled environmentally, which is because no proper conservation strategies have been planned for the fish. Among the twenty morphometric characters, 12 were highly correlated, thus indicating that they are directly proportional to one another, while three were moderately correlated and three were least correlated.

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