



Assessment of Some Morphometric and Meristic Characters of *Schizopyge niger* from Two Lacustrine Populations of Kashmir, India

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Abstract: Morphometric studies were conducted using twenty quantitative body parameters of a Schizothoracid species *Schizopyge niger* collected from two lakes of Kashmir viz. Dal and Manasbal. 240 samples of the fish were studied for morphometric and meristic characters employing local fishing gears. Twenty conventional morphometric characters examined in the present study, showed high co-efficient of determination (R^2) values ranging from 0.70 to 0.92 for Dal lake and 0.53 to 0.93 for Manasbal lake signifying that the traits were highly correlated to each other. Out of eight meristic characters examined, three characters viz. Pectoral fin rays, Caudal fin rays and Pelvic fin rays were significantly different

Keywords: Schizothorax, Dal, Manasbal, Snowtrout, Ael gaad

The valley of Kashmir is endowed with vast potential of aquatic resources in terms of upland rivers, streams, high and low altitude natural lakes. The biological productivity of these aquatic resources is incredibly high. These habitats comprise essentially of indigenous and exotic fish species. The water within the water bodies of Kashmir is cold, crystal clear, has high oxygen content and also temperate climate provides exceptional habitats for a peculiar type of fish fauna. The Dal lake, situated in the northeast of Srinagar is one of the most beautiful lakes in India and the second largest lake in Jammu and Kashmir (Rather and Nazir 2015). The lake comprises of five basins viz.; Hazratbal, Nishat, Nehrupark, Nigeen and Brarinambal. Each basin maintains its individual character but these basins vary in their morphometry, water quality and biodiversity (Abubakr and Kundangar 2005). The lake is shallow with saucer shaped basin and has an open drainage i.e., regular inflow and outflow of water takes place (The lake is probably of fluvial origin, formed from the oxbows of river Jhelum. The total open water surface of the Dal lake is only 11.4 km² and the rest is under floating gardens most of which have now settled permanently (Qadri and Yousuf 2008). Fish like *Schizothorax curvifrons*, *Schizopyge niger*, *Schizothorax esocinus*, *Crossocheilus diplochilus*, *Carassius carassius*, *Puntius conchoniis*, *Gambusia holbrooki*, *Botia birdi*, *Cyprinus carpio* var. *communis*, *Cyprinus carpio* var. *specularis* have been encountered from Dal lake, Kashmir (Ahmed et al 2017).

The Manasbal lake is situated between the districts of Ganderbal and Bandipora of Kashmir valley. The lake is encircled by three villages viz. Jarokabal, Kondabal and Sumbal. This is the solitary lake in Kashmir that develops summer stratification and is categorised as warm monomictic lake (Dad et al 2008). The lake covers an area of 2.81 km² and its volume and maximum depth are 0.0128 km³ and 13 m respectively. It is primarily fed by precipitation (rain and snow fall) and springs. The lake water discharges into the Jhelum River through a regulated outflow channel (Dar et al 2015). Seven commercially important fish species namely, *Schizothorax esocinus*, *S. curvifrons*, *S. niger*, *S. plagiostomus*, *Tryplophysa* sp., *Cyprinus carpio* (*C. carpio* var. *communis* and *C. carpio* var. *specularis* and *Ctenopharyngodon idella* contribute to the commercial fisheries of this lake (Mehraj et al 2016). The exotics contribute to a great extent to the total fish production in the lake as in other lakes of the Kashmir valley. However, the endemic schizothoracids are fast diminishing as these fishes cannot thrive well in polluted water (Bhat and Yousuf 2004, Balkhi 2007).

Schizopyge niger locally known as 'Ael gad', inhabit both lentic as well as lotic water bodies of Kashmir. The fish is characterised by elongate, fusiform body with a short, blunt and slightly prognathous upper jaw. Barbels are shorter than eyes, sides with small blackish dots are present and scales are very small. *S. niger* differs from all the other

Schizothoracines in the combination of thick lower lip folds and few gill rakers. The fish population has declined to a large extent due to multiple factors especially habitat destruction, overfishing, competition for food and breeding grounds from exotic carps, water pollution etc (Mir and Channa 2010, Bhat et al 2010).

The long-term isolation of populations and interbreeding can lead to morphometric variations within populations, and this morphometric variation can provide a basis for population differentiation. As morphometric and meristic characters have key importance in the systematic classification of fish, the present study has been conducted to observe the phenotypic variation among lacustrine populations of this species.

MATERIAL AND METHODS

A total of 240 samples of *S. niger* were collected from two lakes of Kashmir namely Dal and Manasbal. Dal lake is known as the "Jewel of Kashmir". This is the second biggest lake of Jammu and Kashmir. The Dal having catchments of about 316 km² and is situated between geographical coordinates of 34.1106° N, 74.8683° E. Manasbal Lake, the urban valley lake has its own unique identity due to its natural view which attracts the tourists and is situated between geographical coordinates of 34.2561° N, 74.6763° E. 120 samples of *S. niger* were collected from Dal and 120 samples of *S. niger* were collected from Manasabal and examined for evaluation of body parameters from the period of 15 March 2021 to 15 March 2022. The samples were collected with the help of local fishers and carried to the laboratory containing ice packs. The samples were then thoroughly cleaned and dried. Examination of morphometric and meristic characters were carried out by following the methods given by Lagler et al (1962) and Laevastu (1965), Morphometric measurements were made using digital callipers. In the present study, 20 morphometric and 8 meristic characters of each fish sample were studied. Total length (TL) and all other measurements were taken in millimetres. Meristic counts were analysed following the conventional method as described by Hubbs and Lagler (1958). All the meristic counts were set up against incoming light direction in the room with the help of needle and small pins for easy counting. Statistical analysis was carried out with the use of MS Excel and SPSS software.

RESULTS AND DISCUSSION

Morphometry: Measurements of numerous morphometric traits of *S. niger*, are described in Table 1. Out of two sampling sites, caudal fin length displayed highest coefficient of variation (19.48%) and pre anal length displayed lowest

Table 1. Descriptive statistics of morphometric traits of *S. niger* (Pooled)

Morphometric measurement	Mean ±SE	CV%
Total Length (TL)	209.61±1.60	11.87
Standard Length (SL)	173.43±1.40	12.52
Fork Length (FL)	191.45±1.50	12.16
Head Length (HL)	37±0.33	13.81
Pre-Orbital Length (ProL)	14.36±0.14	15.17
Post-Orbital Length (PoOL)	26.8±0.30	17.40
Eye Diameter (ED)	11.00±0.09	13.32
Pre-Dorsal Length (PDL)	94.28±0.68	11.30
Pre-Pectoral Length (PPcL)	42.93±0.31	11.30
Pre-Pelvic Length (PPvL)	113.64±0.51	12.41
Pre-Anal Length (PAL)	141.79±0.95	10.40
Dorsal Fin Length (DFL)	32.72±0.27	13.02
Pectoral Fin Length (PCL)	32.53±0.45	21.89
Pelvic Fin Length (PVL)	30.75±0.32	16.34
Anal Fin Length (AFL)	28.15±0.26	14.51
Caudal Fin Length (CFL)	31.05±0.39	19.48
Body Depth (BD)	36.61±0.38	16.31
Caudal Depth (CD)	30.07±0.30	15.26
Dorsal Fin Base (DFB)	21.24±0.20	14.65
Anal Fin Base (AFB)	13.82±0.14	16.59

Table 2. Correlation between various morphometric traits of *S. niger* for Dal (Srinagar)

Morphometric characters	y=a+bx	R ²
Total length and standard length	6.70+0.79x	0.82
Total length and fork length	6.86+0.88x	0.88
Total length and head length	0.87+0.18x	0.77
Total length and pre orbital length	1.56+0.07x	0.80
Total length and post orbital length	10.46+0.17x	0.92
Total length and eye diameter	0.34+0.05x	0.81
Total length and pre dorsal length	18.08+0.36x	0.71
Total length and pre pectoral length	7.82+0.16x	0.72
Total length and pre pelvic length	30.66+0.31x	0.78
Total length and pre anal length	36.87+0.50x	0.71
Total length and dorsal fin length	1.86+0.14x	0.73
Total length and pectoral fin length	18.18+0.24x	0.71
Total length and pelvic fin length	7.64+0.18x	0.83
Total length and anal fin length	2.57+0.14x	0.80
Total length and caudal fin length	13.70+0.21x	0.77
Total length and body depth	7.18+0.20x	0.76
Total length and caudal depth	5.26+0.17x	0.83
Total length and dorsal fin base	1.28+0.10x	0.74
Total length and anal fin base	2.46+0.07x	0.70

coefficient of variation (10.40%). Coefficient of determination (R^2) values fluctuating from 0.70 to 0.92 for Dal and from 0.53 to 0.93 for Manasbal, implying that the traits were highly interrelated to each other.

Meristics: For meristics, Z test, number of pectoral fin rays, caudal fin rays and pelvic fin rays were significantly ($p < 0.01$) different amongst fish from these stocks and variance existed in other meristic traits (Lateral line scales: $Z = 2.42$, $p > 0.05$; Scales above the lateral line: $Z = 0.50$, $p > 0.05$; Scales below the lateral line: $Z = 0.91$, $p > 0.05$; Dorsal fin rays: $Z = 0.71$, $p > 0.05$; Pectoral fin rays: $Z = 5.2$, $p < 0.01$; Caudal fin rays: $Z = 6.4$, $p < 0.01$; Pelvic fin rays: $Z = 6.2$, $p < 0.01$; Anal fin rays: $Z = 0.4$, $p > 0.05$).

In the present study, numerous morphometric traits compared exhibited high coefficient of correlations (r) values,

which specify that the morphometric characters investigated are extremely correlated to each other. Akyol and Kinacigil (2001) establish that discriminate examination of seven morphometric characteristics in mature specimens of grey mullets demonstrated the fact that *Liza aurata* and *Liza saliens* were alike in forms. Research work done on morphological characteristics of *Cirrhinus reba*, *Gudusia chapra*, *Channa punctatus* have observed the similar result which was in agreement with our present findings (Lashari et al (2004), Narejo (2010) and Dars et al (2012).

Shah et al (2011) examined the morphometry of farmed female rainbow trout in Kashmir and testified great level of interdependence amongst the fourteen morphometric characters studied. Bhat et al (2016) documented similar results in *Cyprinus* sp. Out of eighteen characters in relation

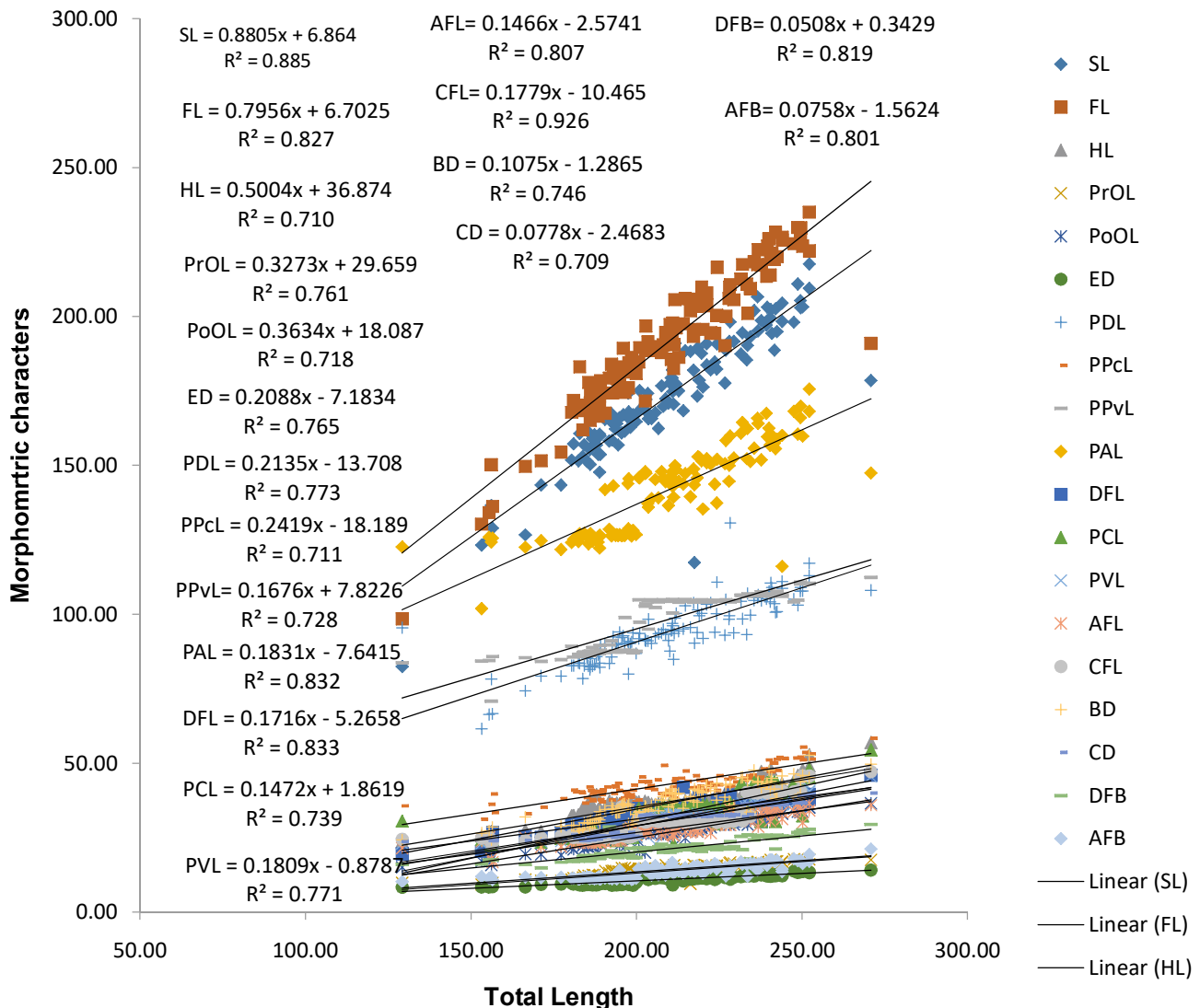


Fig. 1. Logarithmic relationship of different morphometric traits of *S. niger* from Dal

Table 3. Correlation between various morphometric traits of *S. niger* for Manasbal (Ganderbal)

Morphometric characters	y=a+bx	R ²
Total length and standard length	11.42+0.78x	0.80
Total length and fork length	11.12+0.85x	0.81
Total length and head length	1.06+0.15x	0.71
Total length and pre orbital length	3.55+0.05x	0.86
Total length and post orbital length	12.23+0.15	0.92
Total length and eye diameter	5.09+0.03x	0.83
Total length and pre dorsal length	37.20+0.28x	0.58
Total length and pre pectoral length	39.70+0.04x	0.84
Total length and pre pelvic length	29.04+0.32x	0.67
Total length and pre anal length	43.33+0.47x	0.54
Total length and dorsal fin length	29.62+0.04x	0.86
Total length and pectoral fin length	5.56+0.12x	0.53
Total length and pelvic fin length	7.71+0.04x	0.88
Total length and anal fin length	13.52+0.06x	0.89
Total length and caudal fin length	24.81+0.04x	0.80
Total length and body depth	12.07+0.10x	0.80
Total length and caudal depth	9.84+0.07x	0.92
Total length and dorsal fin base	3.04+0.05x	0.72
Total length and anal fin base	0.02+0.06x	0.89

to total fish length, ten characters showed high values of correlation coefficient and eight characters showed moderate correlation coefficient. Qadri et al (2017) observed high coefficient of correction (r) values for various morphometric traits with standard length showing highest degree of correlation (R²=0.88) with total length in *S. curvifrons*. The results of the present investigation for meristics revealed significant differences in three out of eight meristic characteristics. Hossain et al (2010) recorded substantial

Table 4. Representing Z test performed on various meristic traits of two lacustrine populations

Meristic characters	Z value	P value
LL vs LL	2.42	>0.05
SALL vs SALL	0.50	>0.05
SBLL vs SBLL	0.91	>0.05
DFR vs DFR	0.71	>0.05
PCFR vs PCFR	5.2	<0.01
CFR vs CFR	6.4	<0.01
PLFR vs PLFR	6.2	<0.01
AFR vs AFR	0.4	>0.05

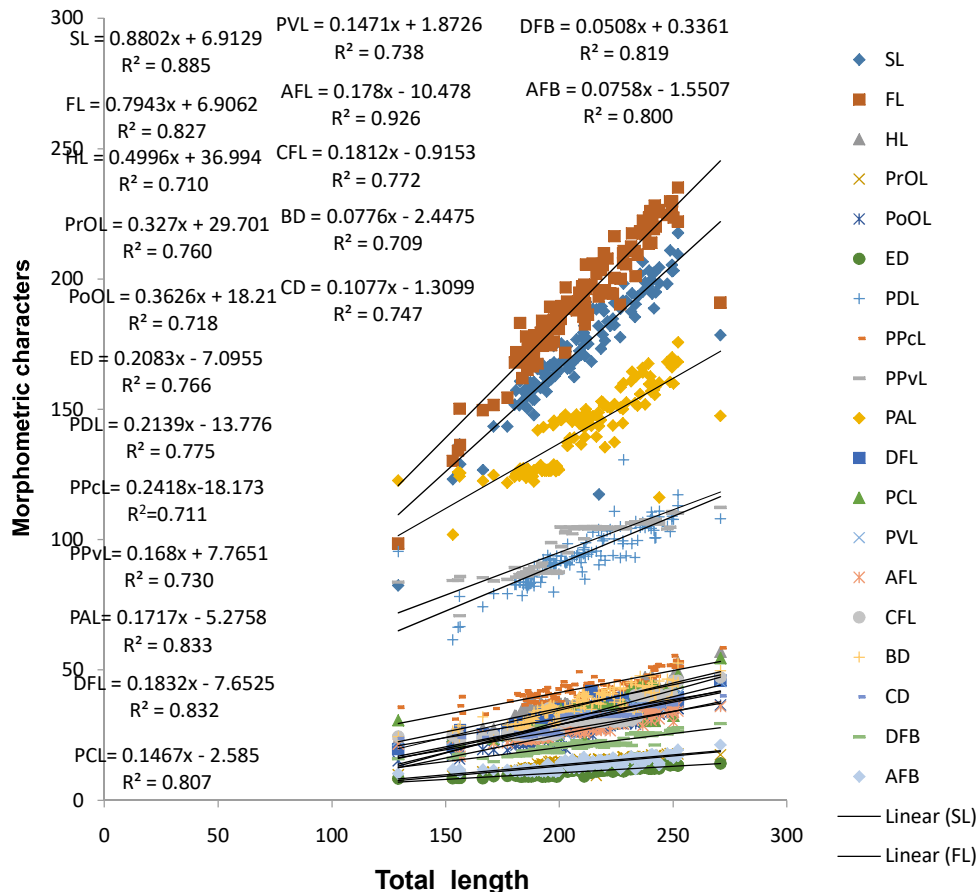


Fig. 2. Logarithmic relationship of different morphometric traits of *S. niger* from Manasbal

differences in two of 9 meristic counts in threatened carp, *Labeo calbasu* two isolated rivers, the Jamuna and the Halda and a hatchery in Bangladesh. Ample facts were shown to accept the statement that morphometry can distinguish between different species of fish and different populations

CONCLUSION

The populations of *S. niger* exhibit dissimilarity in morphometric and meristic traits in the studied locations. Twenty conventional morphometric characters examined in the present study, showed high co-efficient of determination (R^2) values ranging from 0.70 to 0.92 for Dal lake and 0.53 to 0.93 for Manasbal lake signifying that the traits were highly correlated to each other. Out of eight meristic characters examined, three characters (Pectoral fin rays, Caudal fin rays, Pelvic fin rays) were significantly different. However, a detailed study involving the molecular genetics and environmental aspects may further confirm the present findings explicitly. In order to have better conservational policy and restocking programs, further studies are recommended on determining other possible populations of this species in other regions of valley.

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