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Morphometry and length weight relationship of *Schizothorax niger along* River Jehlum at Sangam Anantnag, Jammu and Kashmir

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Abstract
Schizothoracid fishery in Jammu and Kashmir is supported by *Schizothorax niger*. It is exploited mostly by cast nets throughout the year with peak during March-May. The comparison between various morphometric characters revealed a high degree of correlation. Standard length (0.983), followed by pre-anal length (0.855), pre-pelvic length (0.532) and pre-pectoral length (0.328). There for specimen of *S. niger* ranging from 195 mm to 359 mm in mean total length found 294.52 mm and 242.67 gm in mean total weight was calculated using the given formula and depicted in length weight relationship. The LWR equation worked out as Y=1.0462 X – 65.456.

Keywords: *Schzithorax niger*, morphometric characters, Length-weight relationship, GSI, fecundity, sex ratio

Introduction
The natural water bodies of Kashmir Himalaya exhibit various degrees of trophic evolution ranging from oligotrophy through mesotrophy which is generally understood to the result of anthropogenic pressures. Recently there has been a great concern about the fast deteriorations of lacustrine water bodies of Kashmir but very less attention has been given to riverine conditions. As river Jehlum is considered as a lifeline of Valley which is showing now-a-days again process due to human activities, untreated sewage and solid garbage from the dense population.The importance of fisheries sector has been highlighted as a major food source. As an important activity allied to agriculture, it strengthens the productive base of agricultural economy and generates self-employment. The population of snow trout, *Schizothorax niger* has declined considerably in Kashmir waters during the past few decades. In order to restore the aquatic systems with this priced food fish, culture techniques including induced breeding have become inevitable. For such culture techniques, it is very important to understand the hormonal milieu in relation with ovarian development of the species [12]. Ovarian function is closely regulated by a feedback system involving hypothalamus and anterior pituitary, which determines the length of the cycle [1]. There occurs dynamic interplay of hormones along (hypothalomo-hypophyseal-gonadal axis) HHCG. High circulating levels of ovarian steroids especially Progestrone and Estradiol 17 beta at various stages of ovarian development proved a milestone in this direction.

2. Materials and Method
The present study was conducted on *Schizothorax niger* Heckel in River Jehlum at Sangam Anantnag and the investigations were carried in Department of Industrial Fish and Fisheries, Govt. Degree College, Kokernag Laboratory after the below methodology.

2.1 Collection of fish specimens
Every month nearby 60 sample of *Schizothorax niger* were collected from River Jehlum at Sangam Anantnag, over a period of 05 months extending from (January 2019-May 2019). The samples were cleaned and surface moisture was removed using tissue paper. The sex of individual specimens was determined by observing the gonads after dissecting the specimens as there is no clear sexual dimorphism in fish except at the time of spawning season where males were found to have whitish tubercle like structures on their snout.

2.2 Morphometry
Morphometric characters were measured by using fish measuring board and Vernier Calliper for accuracy to the nearest millimeter as described by [7, 6, 9, 5].

2.3 Length-weight relationship
The length-weight relationships were estimated from the allometric formula proposed by Le-Cren (1951), separately for both the sexes and significant differences in the slopes of the regression lines for males and females were ascertained by ANOVA [15]. Following formulae were used:

$W = a L^b$ or $\log W = \log a + b \times \log L$

Where, W is total body weight (g), L is the total length (mm), a and b are the coefficients of the functional regression between W and L.

3. Statistical analysis
The data for morphometric characters were analyzed on the basis of correlation and regression analysis. The characters compared were checked for significant relationship between them and the values were considered as significant at $P<0.05$. The data for length-weight relationship. Fecundity and Gonadosomatic index were analyzed by ANOVA using SPSS (20).

4. Results and Discussion
The results of the present study which extended from December 2013 to November 2014 on morphometry, length-weight relationship, growth parameters and some reproductive biology of *Schizothorax niger* Heckel are as under:

4.1 Morphometry
Morphometric study forms an important tool for measuring discreteness of the same species [5]. In *Schizothorax niger*, maximum growth with respect to total length was shown by standard length (0.983), followed by pre-anal length (0.855), pre-pelvic length (0.532) and pre-pectoral length (0.328) [Table 1].

In the present study, various morphometric characters compared showed high coefficient of correlation (r) values, which indicate that the morphometric characters investigated are highly correlated to each other. The 'b' values obtained showed highest degree of correlation between the total length and standard length. There was a significant positive correlation between all other parameters with respect to total length [3].

4.2 Length-weight relationship
The present investigation is based on 300 specimens taken from the commercial catches of the location Sangam Anantnag. The sampled fishes weight ranged between 60gm to 339gm for *S. niger* in Sangam Anantnag area (Table 3).There for specimen of *S. niger* ranging from 195 mm to 359 mm in mean total length found 294.52 mm and 242.67 gm in mean total weight was calculated using the given formula and depicted in length weight relationship (Table 4, Fig.1). The LWR equation worked out as Y=1.0462 X – 65.456.

The relationship between fish length and weight is considered to be of prime importance. This relationship is often used to compute the standing stock biomass [14] and also to estimate fish weight by knowing its length. Growth rate is a critical component of the life history of all species [11]. The Length-weight relationship of fish has got significant role in fishery management and is used in estimating the average weight at a given length group [2] as mentioned in [Table 2,3and 4 and Fig I]

Table 1: Morphometric characters of *Schizothorax niger*

Morphological parameters	N	Minimum	Maximum	Mean	Std. Error	Std. Deviation
Total length (mm)	300	195	359	294.52	1.9882	34.437
Standard length (mm)	300	171.00	339.00	234.34	1.8104	31.766
Total weight	300	60	339	242.67	2.7728	48.026
Pre-dorsal length	300	43.00	210	143.01	2.44	28.34
Pre-pectoral length	300	23.00	194.00	62.43	1.043	14.43
Pre-pelvic length	300	55.00	270.00	164.40	1.837	23.778
Pre-anal length	300	45.00	312.00	195.9	2.084	36.226
Post-orbital length	300	29.00	1280.00	64.22	.8710	11.85
Head length	300	32.00	96.00	53.391	.505	9.583
Snout length	300	7.00	75.00	18.9544	.3534	5. 772
Body depth	300	3.10	123.00	52.499	1.148	21.26
Dorsal fin length	300	09.00	89.00	58. 983	.6173	9.5563
Pectoral fin length	300	11.00	75.00	45.369	.7034	11.947
Pelvic fin length	300	22.00	63.00	47.886	.4713	6.168
Caudal fin length	300	9.50	84.00	64.67	.926	9.43
Anal fin length	300	17.00	45.00	43.093	.6357	9.048
Eye diameter	300	2.00	6.6	7.85	.312	3.3732

Table 2: Normal L-W data Results

Generalized linear model			
Normal distribution, identity link			
Dispersion phi:	**1011.9 (estimated)**		
Slope a:	1.0462	Std. err. a:	0.053422
Intercept b:	-65.456	Std. err. b:	15.841
Log likelihood:	-149		
G:	383.51	p(slope=0):	2.14E-85

Table 3: Summary

	TL	WT
N	300	300
Min	195	60
Max	359	339
Sum	88357	72800.4
Mean	294.5233	242.668
Std. error	1.988206	2.772776
Variance	1185.889	2306.486
Stand. dev	34.43674	48.02589
Median	300	250
25 prcntil	268	218.625
75 prcntil	321	279
Skewness	-0.28999	-0.85959
Kurtosis	-0.62919	0.620831
Geom. mean	292.443	236.9052
Coeff. var	11.69236	19.79078

Table 4: Normal L-W data Result

Slope a:	**1.0462**	**Std. error a:**	**0.053422**
Intercept b:	-65.456	Std. error b:	15.841
Slope a:	(0.91878, 1.1639)		
Intercept b:	(-101.68, -26.119)		
Correlation:			
r:	0.75016		
r2:	0.56274		
t:	19.583		
p (uncorr.):	1.82E-55		
Permutation p:	0.0001		

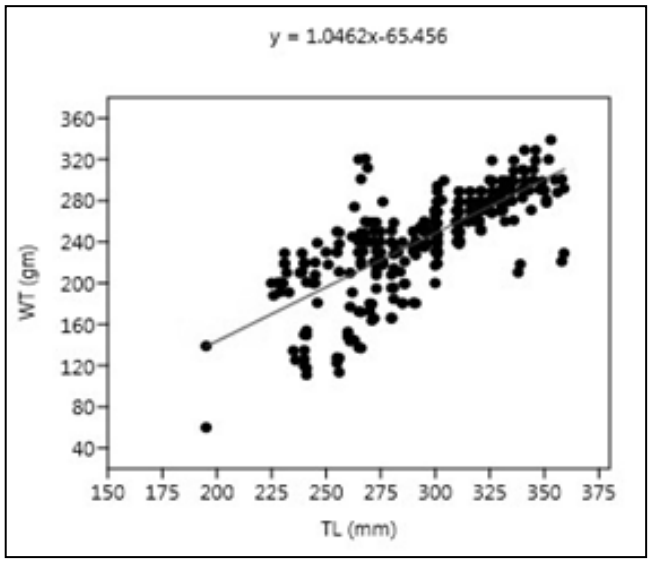

Fig 1: Length weight relationship

5. Conclusion

The assessment of the present state of the *S. niger* resource indicates that *S. niger* showed negative isometric growth pattern and low number of older age groups which referred to drastic/deteriorating condition of River Jehlum at Sangam Anantnag. Adding to that the current exploitation rate is lower than the estimated maximum exploitation level but raising the exploitation rate to this value is unreasonable. On the other hand, it is higher than the exploitation rate, which will maintain 50% of the unexploited stock biomass. Also, the estimated length at first capture is lower than the length at first sexual maturity. Besides, there is a selective mortality towards smaller fish sizes. This implies that juvenile individuals are the target of the fishery and the stock dynamics of this species in the area of study would be seriously affected.

Finally, River Jehlum at Sangam Anantnag lake represents economically and environmentally an important aquatic ecosystem and must be in protection against pollution and reduction of its aquatic area. More efforts are required in terms of scientific academic and social projects and economic and political strategic plans in concern with its fisheries, the social life of fishermen, the water quality drained in and conservation of its biodiversity.

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