

## Studies on Measurement of Morphometric and Meristic Characters of *Schizothorax niger*

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### Abstract

The study dealt with the measurement of morphometric and meristic characters of *Schizothorax niger*. The samples of fish were collected from Dal lake, Srinagar Kashmir. Specimen of *Schizothorax niger* were collected with the help of local fisherman by using the gill net gears and all the morphometric and meristic characters were measured and counted. The maximum total length was 30cm and the smallest length of the sample of *Schizothorax niger* was 17cm. Eye diameter ranges between 0.6-1cm. The number of scales varied between 93 to 105. The condition factors obtained in this study varied slightly with them which show that the *Schizothorax niger* was in good and healthy condition.

**Keywords:** Morphometric, meristic, *Schizothorax niger*, Dal Lake, gill net gears and scale

### Introduction

Fishes are considered to be the inexpensive sources of protein throughout the world containing important and essential nutrition for body. With the increase in the population of all the countries, fish play an important role in the nutrition and economic development of countries in both aquaculture and production of ornamental fish (Davies, 2009). Fish play an essential part in aquatic ecosystems that have been providing beneficial reserves to mankind. Fishes are very important economically and are considered one of the most important sources of animal protein for humans, thus many fishes are used as food. Other products which include nitrogenous fertilizers, fish scraps and also the oil that is extracted from liver of the fish is an important source of vitamin D. Fish scales are sometimes used in making artificial pearls. Isinglass which is a form of gelatin is a fish product prepared from the swim bladders of various species and also glue that is produced from fish offal.

Morphometric and meristic studies are the vigorous tools for measuring discreteness of the same species. Morphometric refers to the measurable study of form, an approach that encompasses size and shape. Morphometric analysis is commonly performed on organisms, and is beneficial in analyzing their fossil record, the effect of mutations on shape, changes in development, co-variances between ecological factors and shape, as well for estimating quantitative-genetic parameters of shape. Morphometrics can be used to determine features of progressive significance and finding difference in the shape, activity and also in their evolutionary relationships. A major objective of morphometrics is to statistically test assumptions about the factors that affect shape.

Similarly, meristics is that element of fish science which relates to counting calculable characters of fish, viz the number of fins or scales. A meristic (countable trait) can be used to illustrate a specific species of fish or used to identify an unknown species. Meristic characters are the countable trait that occur in particular pattern (e.g. myomeres, vertebrae, fin rays) in fish. These traits are among the characters which are most commonly useful in

differentiation of species and populations. In case of salmonids, scale counts have been most widely used for the differentiation of populations within species. In rainbow and steelhead trout the major differences among their populations occur in number of their scales. Indeed, a mathematical data of length-weight relationship gained from investigation of different sizes from a specific area is very beneficial tool for research of biology, physiology, ecology, stock assessment, health management and population dynamics (Avsar, 1994). The species of genus *Schizothorax* are one of the largest and most discrete group of the Asian sphere and its pattern of evolutionary mechanism and biogeography are very complicated. They are specialized for high elevation rivers and show wonderful adaptation. They dominate the torrential mountain streams and plateau lakes of central Asia, the Himalayas and Tibetan Plateaus. The members of the genus *Schizothorax* are greatly distributed in Kashmir, Punjab, Afghanistan, Tibet and also in Indian subcontinent. They mostly prefer fast hill streams and mostly feed on the chironomid larvae. There has been a difference of opinion regarding the number of species included in the genera viz, *Schizothorax* Heckel, *Orenius* McClelland and *Schizothoraichthys* Misra, due to overlapping of many morphological and meristic characters. This species belong to the subfamily *Schizothoracinae*. The genus *Schizothorax* is included in the basic *Schizothoracinae* group. According to some systematics specialists, 39 species and sub species can be included in the group that is the largest genus of the subfamily (Gharaei, 2012). Heckel (1838) established genus *Schizothorax* and included ten species from Kashmir Waters.

Identification of a species is a primary step towards any research work and plays a key role for the behavioural study. Morphometric measurements and meristic counts are considered as easiest methods for identification of species. Heckel (1838) described 10 species of *Schizothorax* from Kashmir. Some of them were indicated to come from Jhelum river.

Considering the importance of the morphometric and meristic studies in the field of research the present study was undertaken to have the knowledge of morphometric and meristic characteristics of native fish *Schizothorax niger*.

## Material and Methods

### Collection of samples

Samples of fish collected from Dal Lake (**Figure 1**), Srinagar Kashmir. A total no. of 10 specimens of *Schizothorax niger* were collected with the help of local fisherman by using the gill net gears and cast nets. Fresh fish specimen were collected and then transferred to the laboratory, where all the morphometric and meristic characters were measured and counted with the help of measuring scales, thread, bow compass and magnifying lens (**Figure 2 & 3**). Specimen was weighed with the help of a sensitive electronic balance up to the nearest 0.01g. The temperature while collecting the samples varied between 4°C - 18°C. All the specimens of *Schizothorax niger* were collected within a period of one and a half month at different intervals of days.

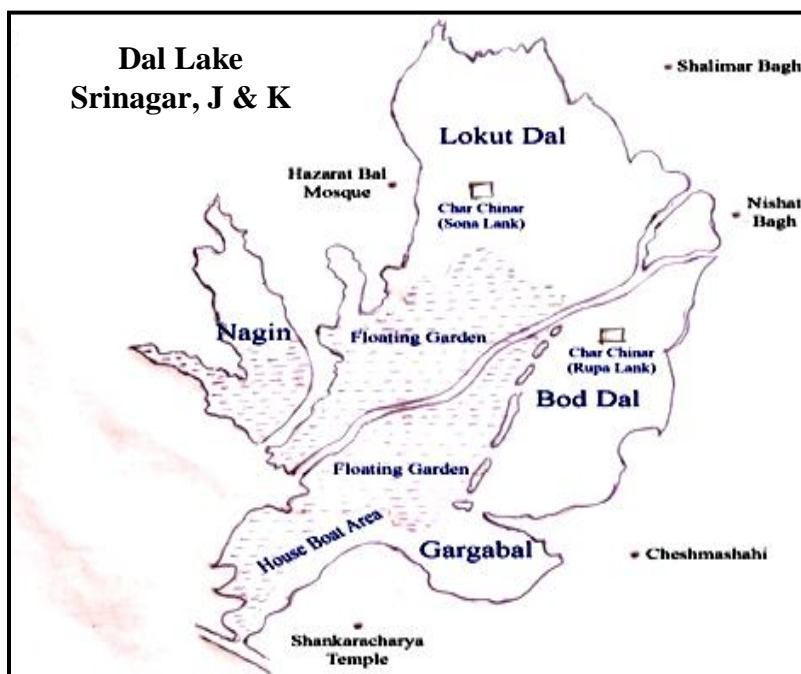


Figure 1: Showing the collection site



Figure 2: Morphometric measurements



Figure 3: Morphometric measurements

**Morphometric measurements:** Morphometric measurements (Figure 4) were carried out as per following description:

- **Total length:** The total length means the maximum elongation of the body from end to end. It is measured from the tip of snout to the tip of caudal fin.
- **Standard length:** This is the measured from the tip of snout to the base of caudal fin.
- **Fork length:** It is measured from the tip of snout to the start of fork.
- **Caudal fin length:** It is measured from the base of caudal fin to the tip of caudal fin.
- **Dorsal fin height:** It is measured from the base of dorsal fin to the maximum height of dorsal fin.
- **Dorsal fin base length:** It is measured from one end of dorsal fin to the other end.
- **Anal fin base length:** It is measured from one end of anal fin to the other.

- **Depth of the body:** The distance between the dorsal surface where its height is greatest, to a straight line to the ventral surface.
- **Caudal peduncle length:** It is the measurement of the area extending between the base of anal fin upto the end of the vertebral column i.e. base of caudal fin.
- **Caudal peduncle least depth:** It is the straight measurement of the least vertical distance from the dorsal to ventral profile at the narrowest part of caudal peduncle.
- **Length of head:** It is measured from the tip of snout up to the edge of the opercular bone.
- **Pre-dorsal length:** It is measured from tip of snout to the base of first dorsal fin ray.
- **Pre-pectoral length:** It is measured from tip of snout to the base of pectoral fin.
- **Pre-pelvic length:** It is measured from the tip of snout to the base of first pelvic fin ray.
- **Pre-orbital length:** It is measured from the tip of snout to the anterior end of eye orbit.
- **Post-orbital length:** It is measured from posterior end of eye orbit to the end of operculum.
- **Snout length:** It is measured from the tip of snout to the anterior end of eye orbit.

#### Meristics measurements:

- **Dorsal fin rays:** This is the total number of fin rays in dorsal fin.
- **Pectoral fin rays:** This is the total number of fin rays in each pectoral fin.
- **Pelvic fin rays:** This is the total number of fin rays in each pelvic fin.
- **Caudal fin rays:** This is the total number of branched fin rays in caudal fin.
- **Gill racers:** This is the number of gill racers in each specimen.
- **Lateral line scales:** It is the total number of scales found on lateral line.

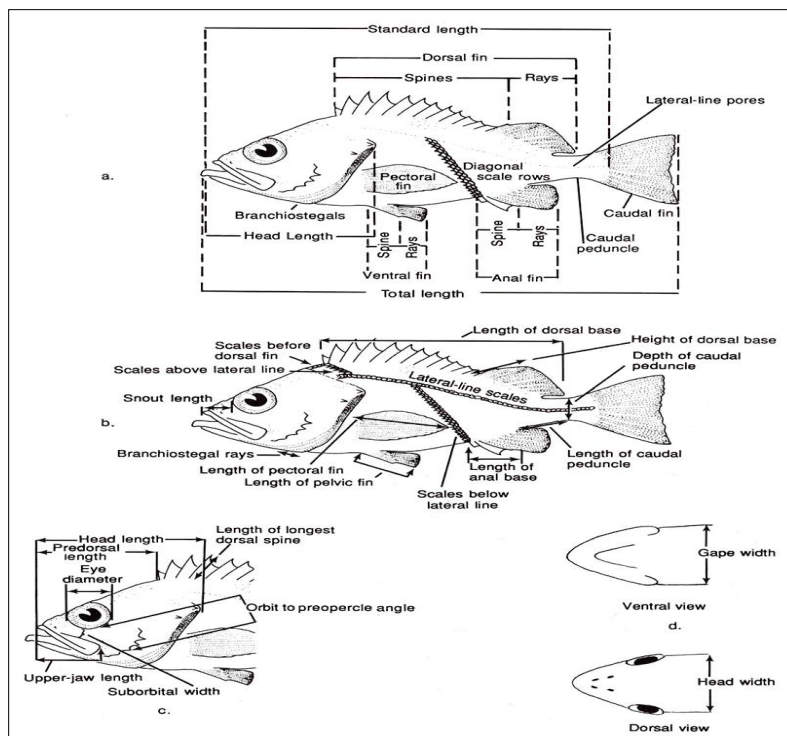


Figure 4: Morphometric measurements of a fish (Scheme).

## Result and Discussion

Study of morphometric and meristic characteristics were measured in total of 10 samples of *Schizothorax niger*, total length ranging from 17 cm – 30 cm and body weight ranging from 160g–290g body weight. All the data of morphometric and meristic factors are listed in the **Table 1 & 2**.

**Table 1: Morphometric characters of *Schizothorax niger***

Parameters	I	II	III	IV	V	VI	VII	VIII	IX	X	Mean±S.D.
Total length (cm)	30	26	27	26	27	21	21	18	17	17	23.00±4.76
Standard length (cm)	22	22	23	23	23	17	17	15	14	14	19.00±3.94
Fork length (cm)	26	24	25	24	25	19	19	17	16	14.	20.95±4.29
Caudal fin length (cm)	4	4	4	3	4	4	4	3	3	3	3.60±0.51
Dorsal fin height (cm)	3	3.5	3	4	3	3	3	3	2.8	2.8	3.11±0.36
Dorsal fin base length (cm)	3	3	3	3	2.5	2	2	1.5	1.5	1.5	2.30±0.67
Anal fin base length (cm)	2	2	2	2	2	1.5	1.3	1	0.8	1	1.56±0.49
Depth of the body (cm)	9	9	10	8	8.5	7	6.5	6	6	4	7.40 ±1.82
Caudal peduncle length (cm)	4	3.5	3.5	3.2	3	3	2	2	2	2	2.82±0.76
Caudal peduncle least depth (cm)	3	2.5	3	3	3	2	2	1.5	1.3	1.3	2.26±0.73
Length of head (cm)	7	6	6.5	5	5	4.5	4.5	4	4	3.8	5.03±1.11
Pre dorsal length (cm)	14	12	12	11	12	9	8	8	8	7	10.15±2.40
Pre pectoral length (cm)	7	6	6	5.5	5	4.5	4	4	3.5	4	4.95±1.14
Pre pelvic length (cm)	14.	12	12	12.	12	9	10	9	8	8	10.70±2.20
Pre orbital length (cm)	2	1.5	2	2	2	1.5	1	1	1	1	1.50±.47
Post orbital length (cm)	4.5	3.3	4	3	3.5	2.5	2	2	2	2	2.88±.92
Snout length (cm)	2	1.5	2	2	2	1.5	1	1	1	1	.85±.16
Eye diameter (cm)	0.7	0.6	1	1	1	1	1	0.8	0.7	0.7	1.50±.47
Inter orbital distance (cm)	3	2.5	2.5	2	2	2	2	1.7	1.5	1.5	2.07±.47
Inter nostril distance (cm)	2	1	1	1	1	1	0.5	0.5	0.5	0.5	0.90±.45
Length of upper jaw (cm)	2	1	1.5	1.5	1.5	1	1	1	0.7	0.7	1.19±.41
Length of lower jaw (cm)	1	0.5	1	1	1	0.5	0.5	0.5	0.5	0.5	0.70±.25
Mouth width (cm)	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.49±.03
Mouth gap (cm)	1.1	1	1.2	1	1	0.5	0.7	0.5	0.6	0.7	0.83±.25
Weight of specimen (gms)	290	280	260	220	210	195	200	180	170	160	216.50±45.70

**Table 2: Meristic characters of *Schizothorax niger***

Parameters	I	II	III	IV	V	VI	VII	VIII	IX	X	Mean ± SD
Dorsal fin rays	8	9	8	8	8	7	8	8	8	8	8.00±.47
Pectoral fin rays (each)	16	15	14	14	14	14	14	14	14	14	14.30±.67
Pelvic fin rays (each)	10	10	9	9	9	9	10	10	10	10	9.60±.51
Anal fin rays	6	7	6	6	6	6	6	6	6	6	6.10±.31
Caudal fin rays	19	20	19	19	19	19	19	19	19	19	19.10±.31
Lateral line scales	105	102	102	101	101	97	96	100	93	95	99.20±3.76

The various morphometric characters have been categorized on the basis of range difference into genetically (<10%), intermediate (10-15%) and environmentally (>15%) controlled characters (Johal *et al.*, 1994). Vladykov (1934) considered that morphometric and meristic characters can be divided into three categories viz.:

- Characters which do not appear to be modified by the environment such as number of fin rays of caudal and ventral fins. These characters are genetically controlled
- Characters which appear to be slightly modified by environment such as pectoral fin rays and gill rakers on the first brachial arch
- Characters which appear to be strongly modified by the environment.

It includes morphological characters, metamerism, number of vertebrate, rays in the dorsal and anal fin and size of the fish

In general, characters belonging to the first category show minimum range of variation, second category moderate and the third category maximum range of variation of characters. On the basis of present investigations more characters could be included in each Vladykov's (1934) category. During the present investigation, the following characters such as head length, Pre dorsal length, Post dorsal length, dorsal fin base length, Pre pelvic length, Length of dorsal fin, depth of the body, minimum caudal peduncle length have been found to be genetically controlled. The characters like standard length and pre-anal distance in the percentage of total length are included in the environmentally and intermediate category respectively. Whereas the other characters like head depth, eye diameter, pre-orbital and post orbital distance are included in the genetically controlled category of characters. In a similar study, Johal *et al.* (1994) reported 13 characters in relation to total length to be genetically controlled in *Tor putitora* from Gobindsagar reservoir in Himachal Pradesh. Vladykov(1934) maintains that in the fish species showing restricted distribution, the majority of morphometric characters show narrow range and are genetically controlled. On the contrary, in species which have a wide range of zoogeographical distribution, most of the characters are strongly influenced by the environment. *S. niger* has a restricted zoogeographical distribution, because the majority (90%) of their morphometric characters show narrow range differences and are genetically controlled while the environmentally controlled characters are few (10%). In a similar study, Negi and Nautiyal (2002) have revealed that in the *Barilius bendelisis* and *Barilius vagra*, the majority of their morphometric characters showed narrow range and were genetically controlled.

## Conclusion

Thus, *S. niger* is characterized or differentiated from other species of *Schizothorax* from mouth which is having prognathous upper jaw, a lower jaw with wide lip folds. Body scales are very small and breast is naked or sparsely scaled in some specimen. The colour of the *Schizothorax nigeris* bit faded light yellow and bit shinny on the upper side and under belly is having very white colour. The condition factors obtained in this study varied slightly with them which show that the *Schizothorax niger* was in good and healthy condition. This species is mostly found in the upper areas of river Jhelum and also in the Dal lake but is not found everywhere in the Kashmir valley. As per the local fisherman at Dargah, Gulshana, a local resident quoted that this species of *Schizothorax axniger* which is commonly called as 'Aalegaad' in Kashmiri is getting lesser in number because of so many factors viz; over fishing, environmental degradation, its habitat occupied by carps, its eggs eaten by carps, spread of diseases, pollution within Dal lake and more importantly lack of management. Thus, the aim of studying morphological characters helps in defining or characterizing fish stocks units and has therefore been a strong interest in ichthyology.

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