



Morphometric and Meristic Analysis of *Pseudecheneissulcatus* (McClelland) from Garhwal Himalaya, Uttarakhand India

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ABSTRACT

Morphometric characters of *Pseudecheneissulcatus* (McClelland), a cat fish were measured for an interval of one year January 2001 to December 2002 in river Alaknanda in a stretch of about 65km from Srinagar to Karnprayag Garhwal. Ten morphometric characters were analysed of about 148 fish sample during the one year interval and statistical analysis were performed to know the variation in between the species. In spite of them the meristic analysis was conducted and the values obtained were as follows: Fin Formula – P= 13-14 (1/12 or 1/13), D1 = 6-7 (1/5 or 1/6), D2 = 0, V = 6-7, A = 6-9 (7.768 ± 0.813), C = 17-19. The Regression analysis were performed with three body parts in ratio of head length and fitted regression equation are Snout length = - 0.0665 + 0.82604HL (r = 0.826) , Maximum body depth = 0.5076 + 0.85717 HL (r = 0.9623), Eye diameter = -0.1178 + 0.1018 HL (r = 0.93358) were obtained from the species

KEYWORDS

Morphometric, *Pseudecheneissulcatus*, Alaknanda.

Introduction

Fish identification is a process of matching the diagnostic features with the specimens of a species, which is named thereafter. The fish is identified with a set of morphological characters taking into consideration the variations exhibited by each character. In some instances considerable biological information may be available and could further confirm the identification of fish in one way or the other. In general the identification is based on the morphometric characters, meristic characteristics and the body is called descriptive characters (Panday and Sandhu, 1992). Various body parts can be measured either in ratio or in percentage of some independent variables like the total length, standard length and the head length. Among all these the morphometric characters play most important role in the identification of a fish species. Such studies are essential for detecting minor variations within a species, which later may form an important basis in the taxonomy for the recognition of a sub-species, if any. Such intra-specific variations may occur due to different habitat conditions or due to difference in genetic makeup. The nature and composition of the commercially exploited species must be known before undertaking its biological studies. Thus by knowing the characters the fish species can easily be identified and distinguished from each other. Hamilton (1822) published an account of fishes found in the river Ganges and its branches. Based on the morphometric analysis, Day (1878, 1889) produced a monumental monograph on the fishes of India, Pakistan, Ceylon and Burma, and expressed the ratio of various body parts with the length of the fish. Some other workers who either reviewed the fishes and crustacean of India after Day (Op. Cit) or conducted some taxonomic studies were Srivastava (1968), Pillay (1952), Sarojini (1957), Banerjee and Venkateshwarlu (1968), Chocka (1974), Mishra (1982), Dhasmana (1990) and Nautiyal (1994). Kumar et al., (2004), Kumar et al., (2013). The present study deals with the morphometric study of *Pseudecheneissulcatus* produced from the river Alaknanda in a stretch of about 65km from Karnprayag to Srinagar Garhwal.

Methodology

The samples were collected from Alaknanda River from January 2001 to December 2002 at different station in the stretch of 65 km from Karanprayag to Srinagar. The morphometric parameters were measured with the help of Digital Vernier caliper with nearest 0.01 mm accuracy. Total length (X), Standard length (SL-Y1), Head length (HL-Y2), Pre dorsal length (PDL-Y3), Pre pelvic length (PPL-Y4), Pre anal length (PAL-Y5), Caudal length (CL-Y6), Snout length (Snt-Y7), Eye diameter (ED-Y8), Maximum body depth (MBD-Y9). Regression analysis was performed between dependent and independent variable. The relationships were determined by fitting the following straight line equation.

$$Y = a + bX$$

Where; Y= dependent variable, X= independent variable a and b are the intercept and slope respectively. The linearity of the regression was tested by the analysis of variance (F-test)

Observation

Summarized data on the different body measurements are presented in the Table 1. The fish were divided into 12 different length groups with a class interval of 1cm starting from a group of 9.0 – 9.9cm 20.0 – 20.9cm. The first group has only one frequency where as the group 12.0 – 12.9cm has maximum 29 frequencies. No fish was available in the size group 19.0 – 19.0cm. Three important parameters, viz., snout length, eye diameter and the maximum body depth were studied in relation of head length and are presented in Table 2. The ratio of head length to snout length was in a range of 1.19 ± 0.181 to 1.38 ± 0.136. Eye is small and placed in the posterior half of the head length. It had a ratio with head length from 8.34 ± 0.819 to 10.3 ± 0.0. Body depth of the fish was always more than the head length (with only one exception of the largest fish where it was less than head length) and had a ratio in between 0.764 ± 0.082: 1 to 1.07 ± 0.0

Regression Analysis of Body Measurements and Their Relationship

The linearity of the regression was tested by the analysis of variance (ANOVA,F test) for all the relationships and is given in Table 3. It showed that the growth of all the parameters is in accordance with the total length, standard length and the head length. In all the cases the correlation coefficient (r) was recorded by highly significant (p<0.05).

Meristic Analysis

The meristic analysis was conducted on 148 specimens and the values obtained were as follows:

Fin Formula – P= 13-14 (1/12 or 1/13), D1 = 6-7 (1/5 or 1/6), D2 = 0, V = 6-7, A = 6-9 (7.768 ± 0.813), C = 17-19. The only available record of meristic analysis is given by Day (1878). If we compare the present investigation with that of the previous available literature (Day, 1878). There is a great difference in the anal fin count which is 11 – 13 reported by Day. The holotype reported by Beaven (1990) also has 11 rays on anal fin. But all the 148 specimens studied in this case show anal fin count from 6 – 9 with or without one soft ray.

Discussion

In the present investigations it was observed that all the body parts grow in accordance with the total length of the body. The ratio of Head length: Snout length (1.19 ± 0.181 to 1.38 ± 0.136) clearly indicates that the eye is situated well behind the middle of the head length. Second important observation is that the body depth is slightly more than head length (head length is 0.764 ± 0.082 to 0.897 ± 0.204 to maximum body depth). Third observation is that the dorsal fin (D1) is originated little before the pelvic fin. The fish also has an adipose dorsal fin situated in between pelvic fin and the anal fin. According to Day(1878), the head length is 7.5, caudal length 6 and the maximum body depth is also 6 in total

length. The head length is equal to its maximum body depth. In comparison to this in the present study the head length is 7.11 ± 0.38, the caudal length is 6.39 ± 0.22 and the maximum body depth 5.37 ± 0.81 in total length. The meristic analysis was made for the first time in detail on 148 specimens. The meristic count of Pectoral fin (P= 13 – 14 (1/12 – 1/13), Dorsal fin (D1 = 6-7 (1/5, 1/6; D2. 0), Ventral/ Pelvic fin (V =6-7), and the caudal fin (C = 17-19) were almost similar to that of previous report Day (1878). But there is a great difference in the anal fin count, which is 11-13 reported by Day. The holotype reported by Beaven (1990) also has 11 rays on anal fin but all the 148 specimens studied in this case show anal fin count from 6-9.Sarojini (1957) observed no significant difference in *Mugilparsi* collected from, Bengal. Jayaram (1959) distinguished four populations *Rita chrysea* collected from river Mahanadi. Lal (1967) while studying *Rita rita* from Varanasi and Mirzapur, observed no significant differences. After studying the compiled data , it was observed that the standard length was 78.74 – 87.72, Pre anal length 51.28 – 56.18, Pre pelvic length 31.64 – 35.08, Pre dorsal length 28.4 – 33.22, caudal length 15.01 – 24.57, head length 13.12 –15.5, maximum body depth 14.51 – 16.1; Snout length 9.36 – 12.14, and eye diameter 1.02 – 2.08 in percentage of total length and snout length 72.46 – 84.74, maximum body depth 93.45 – 131.5 and eye diameter 7.49 – 11.98 in percentage of the head length. In all the cases the correlation coefficient was recorded high, indicating a high degree of correlation in growth between the independent and the dependent variables.

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Size group (cm)	Total length (cm)	Standard length (cm)	Head length (cm)	Snout length (cm)	M.B.D (cm)	Eye diameter(cm)	Pre dorsal length (cm)	Pre pelvic length (cm)	Pre anal length (cm)	Caudal length (cm)	Number of Fish
9 - 9.9	9.8 ± 0	8.0 ± 0	1.3 ± 0	1.0 ± 0	1.5 ± 0	0.1 ± 0	3.00 ± 0	3.1 ± 0	5.00 ± 0	1.8 ± 0	1
10 - 10.9	10.4 ± 0.208	8.20 ± 0.265	1.5 ± 0.1	1.1 ± 0.173	1.7 ± 0.265	0.16 ± .0577	2.97 ± 0.208	3.3 ± 0.577	5.57 ± 0.115	2.2 ± 0.450	3
11 - 11.9	11.44 ± 0.243	9.195 ± 0.293	1.515 ± 0.166	1.2 ± 0.121	1.785 ± 0.226	0.19 ± .031	3.375 ± 0.731	3.795 ± 0.422	6.115 ± 0.426	2.24 ± 0.179	20
12 - 12.9	12.5 ± 2.052	10.13 ± 0.265	1.64 ± 0.135	1.34 ± 0.153	2.03 ± 0.971	0.2 ± 0	3.67 ± 0.233	4.082 ± 0.265	6.87 ± 0.473	2.41 ± 0.111	29
13 - 13.9	13.4 ± 4.331	10.9 ± 0.362	1.809 ± 0.157	1.44 ± 0.159	2.05 ± 0.137	0.204 ± 0.021	3.98 ± 0.289	4.470 ± 0.241	7.182 ± 0.343	2.48 ± 0.15	22
14 - 14.9	14.5 ± 0.258	12.14 ± 0.207	2.12 ± 0.194	1.58 ± 0.215	2.28 ± 0.308	0.214 ± 0.356	4.27 ± 0.301	4.68 ± 0.389	7.43 ± 0.654	2.49 ± 0.210	28
15 - 15.9	15.39 ± 1.308	12.6 ± 0.84	2.21 ± 0.145	1.74 ± 0.116	2.49 ± 0.166	0.24 ± 0.016	4.66 ± 0.31	5.28 ± 0.307	8.33 ± 0.349	2.78 ± 0.264	6
16 - 16.9	16.49 ± 0.238	13.46 ± 0.250	2.37 ± 0.200	1.95 ± 0.143	2.71 ± 0.251	0.26 ± 0.052	4.98 ± 0.333	5.6 ± 0.474	8.87 ± 0.501	2.83 ± 0.191	10
17 - 17.9	17.4 ± 0.289	14.56 ± 0.314	2.433 ± 0.327	1.966 ± 0.524	2.766 ± 0.579	0.266 ± 0.516	5.416 ± 0.412	5.816 ± 0.331	9.53 ± 0.408	2.89 ± 0.266	6
18 - 18.9	18.1 ± 0.173	15.03 ± 0.351	2.6 ± 0.2	2.2 ± 0.1	2.83 ± 0.252	0.3 ± 0	5.56 ± 0.058	6.366 ± 0.289	9.76 ± 0.305	3.06 ± 0.208	3
19 - 19.9	0	0	0	0	0	0	0	0	0	0	0
20 - 20.9	20.10 ± 0	17.00 ± 0	3.1 ± 0	2.4 ± 0	2.9 ± 0	0.3 ± 0	6.0 ± 0	6.7 ± 0	10.5 ± 0	3.10 ± 0	1

Table1 Summarised data on the morphometric characters of *P.sulcates* in 2001-2002 from Alaknanda River Garhwal Himalaya

Table 2: Body parts in ratio of head length in *P. Sulcatus*

Length group (cm)	Snout length	Eye diameter	Maximum body depth
9 -9.9	1.2 ± 0	12 ± 0	0.8 ±
10 - 10.9	1.38 ± 0.136	9.83 ± 3.62	0.892 ± 0.101
11 - 11.9	1.28 ± 0.134	8.35 ± 2.68	0.826 ± 0.239
12 - 12.9	1.19 ± 0.181	8.34 ± 8.19	0.846 ± 0.132
13 - 13.9	1.28 ± 0.137	13.34 ± 2.08	0.764 ± 0.082
14 -14.9	1.25 ± 0.126	9.69 ± 1.21	0.825 ± 0.123
15 - 15.9	1.21 ± 0.0974	9.2 ± 0.979	0.965 ± 0.442
16 -16.9	1.22 ± 0.0796	9.41 ± 1.839	0.849 ± 0.204
17 -17.9	1.28 ± 0.207	8.69 ± 1.422	0.897 ± 0.125
18 -18.9	1.18 ± .04	8.67 ± 0.665	0.918 ± .0136
19 -19.9	0	0	0
20 -20.9	1.29 ± 0	10.3 ± 0	1.07 ± 0

Table 3: Analysis of variance (ANOVA) between independent and dependent morphometric characters in *P. Sulcatus*

Parameters	S2 B	S2 W	Observed 'F'	table 'F'	Remarks
TL x SL	3.645	11.17	0.326	F0.05 =5.12 (ndf=1, ddf=9)	NS
TL x HL	79.002	6.998	11.289	F0.05 =5.12 (ndf=1, ddf=9)	*
TL x PDL	52.706	7.396	7.126	F0.05 =5.12 (ndf=1, ddf=9)	*
TL x PPL	47.87	7.58	6.315	F0.05 =5.12 (ndf=1, ddf=9)	*
TL x PAL	23.67	8.472	2.794	F0.05 =5.12 (ndf=1, ddf=9)	NS
TL x CL	72.26	6.92	10.44	F0.05 =5.12 (ndf=1, ddf=9)	*
SL x HL	48.71	4.475	10.885	F0.05 =5.12 (ndf=1, ddf=9)	*
SL x PDL	28.629	4.87	5.878	F0.05 =5.12 (ndf=1, ddf=9)	*
SL x PPL	25.098	5.0587	4.96	F0.05 =5.12 (ndf=1, ddf=9)	NS
SL x PAL	8.736	5.949	1.468	F0.05 =5.12 (ndf=1, ddf=9)	NS
SL x CL	43.449	4.399	9.877	F0.05 =5.12 (ndf=1, ddf=9)	*
HL x SnT	0.089	0.258	0.344	F0.05 =5.12 (ndf=1, ddf=9)	NS
HL x ED	1.67	0.154	10.844	F0.05 =5.12 (ndf=1, ddf=9)	*
HLx MBD	0.0255	0.2759	0.0924	F0.05 =5.12(ndf=1, ddf=9)	NS

* Significant at 5% level, ndf= numerator degree of freedom (K-1), ddf = denominator degree of freedom, S2B and S2 W are two independent estimates of population variance.

ANOVA indicated that variance between larger length characters is non-significant and it is significant with the smaller length characters.

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