

# Studies on Morphometric Characteristics of a Hill Stream Fish *Chela bacaila* from Ubeshwar Stream in Udaipur District (Rajasthan) India



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## Abstract

Morphometric characters of a hill stream fish *Chela bacaila* has been collected and studied from Ubeshwar stream in Udaipur district. A total of fifteen specimens were collected for the morphometric analysis and 23 characters were taken for morphometric measurements. The range difference (difference between maximum and minimum) was used to determine genetically controlled, intermediate and environmentally controlled characters. Eighteen characters in percentage of total fish length were genetically controlled, four characters in percentage of head length were intermediate and one character in percentage of head length was genetically controlled. Positive correlation has been observed between total length and external body parts. Linear relationships have been observed between all the independent and dependent characters. Further it can be said that this fish is a typical hill stream fish and thrives well even in fast flowing waters.

The value of correlation coefficient was fairly high in almost all the characters so it can be concluded that all the dependent characters increase in direct proportion to each other.

**Keywords:** Morphometric Characters, *Chela bacaila*, Hill Stream Fish

## Introduction

Morphometric measurements and meristic counts are considered as easiest and authentic methods for the identification of specimen which is termed as morphological systematics (Nayman, 1965). Morphometric measurement is measurements of different external body parts of an organism and meristic counts mean anything that can be counted (Talwar and Jhingran, 1991).

Morphometric and meristic characters are helpful in easy and correct identification of fish species in laboratory as well as at natural places (Jayaram, 1999). Morphometric characters are important for identifying fish species and their habitat as well as ecological criteria in any stream, lake or sea. Morphometric study is a powerful tool for characterizing strains / stocks of the same species, which involves detection of subtle variation of shape, independent of size. The complete set of measurements used to describe a form is a morphometric character set (Strauss and Bond, 1990). The studies of morphological and meristic characters of a fish give substantial information with regard to exact identification key of the species (Dhanya *et al.*, 2004) and such identification is prerequisite for cytogenetic and molecular investigations.

The present study was designed to generate data on morphometric characters of the fish *Chela bacaila* from Ubeshwar stream in Udaipur District (Rajasthan).

## Objective of the Study

The present investigation was proposed as the morphometric characters are important for identifying fish species and their habitat as well as ecological criteria in any stream, lake or sea. Morphometric study is a powerful tool for characterizing strains / stocks of the same species, which involves detection of subtle variation of shape, independent of size.

## Review of Literature

Morphometric characters of the freshwater fishes have been studied by Godsil (1948), Marr (1955), Krumholz and Cavanah (1968), Pillay(1975b), Berg(1979), Singh (2002), Hossain *et al* (2009), Krishan and Tarana (2010), Hazarika *et al* (2011) , Kanwal and Pathani (2011) ,

Sedaghat *et al* (2012), Saroniya *et al* (2013), Brraich and Akhter (2015), Edwin Prabakaran *et al* (2016), Sameera *et al* (2017) and Akinrotimi *et al* (2018).

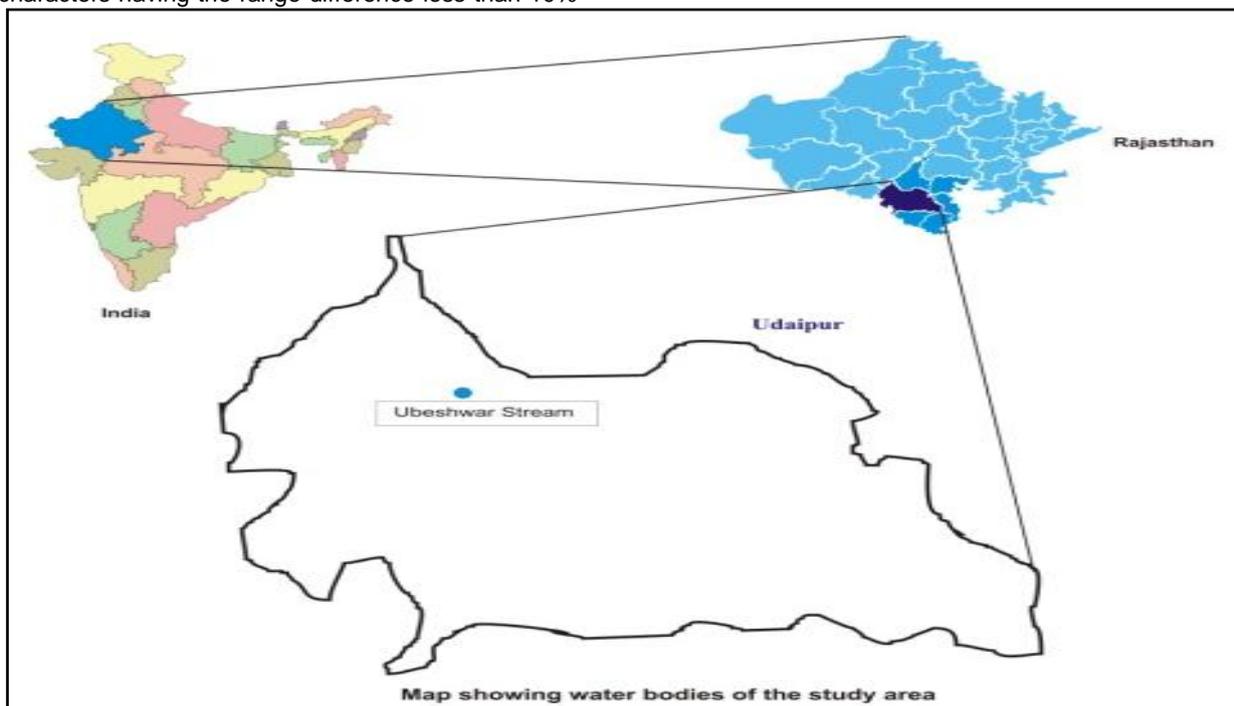
### Concept and Hypothesis

The difference between, maximum and minimum is used to determine genetically controlled, intermediate and environmentally controlled characters. On the basis of range difference the characters are divided into two categories. Those characters having the range difference less than 10%

are considered as genetically controlled whereas those having range difference more than 15% are regarded as environmentally controlled characters.

### Study Area

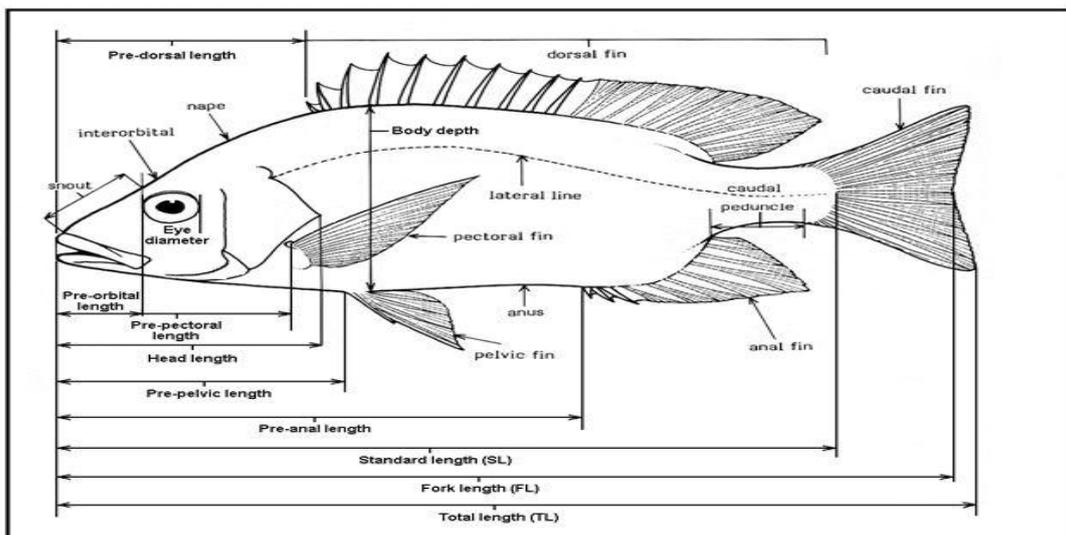
The Origin of Ubeshwar stream (73°36'30 E and 24°37'0"N) is from Ubeshwar plateau near Shankar khera Village. It meets in lake Bari. It is also known as Morwania Ki Nadi. It meets in Bari Tank near village Morwania.



### Materials and Method

Fish specimens were collected on a monthly basis from Ubeshwar stream in Udaipur District (73°36'30 E and 24°37'0"N) from April 2016 to March 2017 period. A total of 15 specimens of *Chela bacaila* ranging in size from 6.0 to 14.5 cm in total length (TL) were used for the morphometric measurements. Divider and measuring board, having graduations in millimetre have been used for various measurements.

The rate of growth of different morphological body parts of fish in relation to its total length was studied. Twenty three morphometric characters were studied following the standard procedures described by Holden and Raitt (1974) and Jayaram (1981a). Statistical calculations such as regression equation and correlation coefficient have been calculated after Snedecor and Cochran (1967).



### Abbreviations Used In Morphometric Studies

TL	Total Length	LCP	Length of Caudal peduncle
FL	Fork Length	LDF	Length of Dorsal fin
SL	Standard Length	LPF	Length of Pectoral fin
DPVF	Distance between Pectoral fin & Ventral fin	LAF	Length of Anal fin
DVAF	Distance between Ventral fin & Anal fin	MBD	Maximum body depth
DDF	Depth of dorsal fin	MiBD	Minimum body depth
ED	Eye diameter	PrDD	Predorsal distance
HL	Head length	PsDD	Postdorsal distance
HD	Head depth	PrAD	Preanal distance
IOD	Interorbital distance	PrOD	Preorbital distance
LAF	Length of Anal fin	PsOD	Postorbital distance
LCF	Length of Caudal fin		

### Results and Discussion

A total of fifteen specimens were collected for the morphometric analysis and the data are given in the table-1. On the basis of range difference the following characters viz. Standard Length(SL), Head Length(HL), Pre-Dorsal Distance(PrDD), Post Dorsal Distance (PsDD), Length of Dorsal Fin (LDF), Depth of Dorsal Fin(DDF), Length of Anal Fin(LAF), Depth of Dorsal Fin(DAF), Pre-Anal Distance (PrAD), Length of Pectoral Fin (LPF), Length of Anal Fin (LVF), Minimum Body Depth(MiBD), Maximum Body Depth(MBD), Distance between Pectoral and Ventral Fin (DPVF), Distance between Ventral and Anal Fin (DVAF), Length of Caudal Fin (LCF), Length of

Caudal Peduncle(LCP) and Fork Length(FL) in percentage of Total Length(TL) have been considered as genetically controlled characters. The characters like head depth(HD), preorbital distance(PrOD), Eye diameter(ED) and Inter Orbital Distance (IOD) in percentage of head length were found to be intermediate characters whereas post orbital distance(PsOD) in percentage of head length was genetically controlled character.

The value of correlation coefficient was fairly high in almost all the characters so it can be concluded that all the dependent characters increase in direct proportion to each other

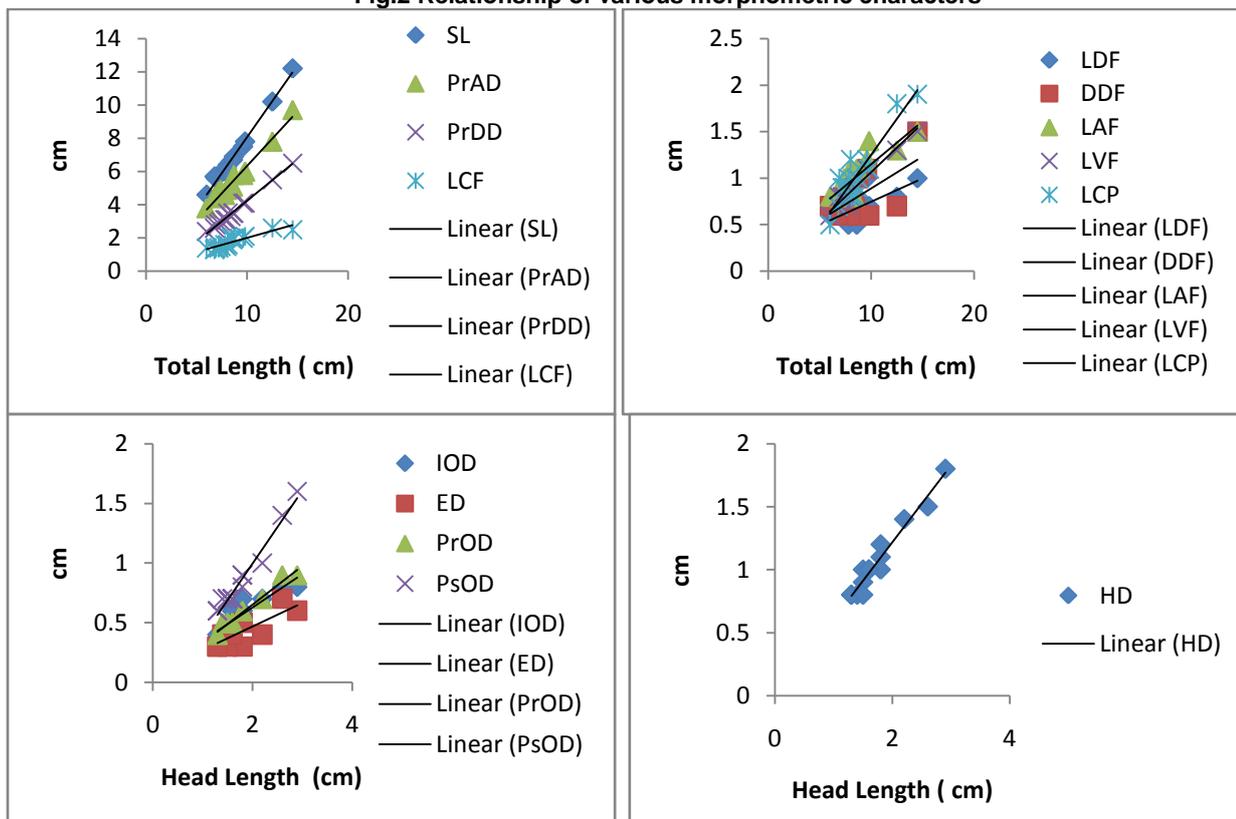
**Table 1**  
**Morphometric Characters of *Chela bacaila***

N= 15	Min.	Max.	Mean	SD	Correlation	Intercept (a)	Slope (b)	Regression Equation
<b>In % of TL</b>								
SL	76.667	84.138	79.6409	2.275289	0.996**	-0.551	0.862	Y= -0.551 + 0.862X
HL	18.367	22.917	20.2761	1.394968	0.967**	0.010	0.201	Y= 0.010 + 0.201X
PrDD	38.235	44.828	40.9948	1.926681	0.996**	-0.680	0.492	Y= -0.680 + 0.492X
PsDD	14.400	22.989	18.1700	2.041148	0.893**	-0.044	0.187	Y= -0.044 + 0.187X
LDF	5.814	10.417	7.9783	1.428194	0.717**	0.243	0.050	Y= 0.243 + 0.050X
DDF	5.600	11.667	9.3652	1.945284	0.639*	0.206	0.068	Y= 0.206 + 0.068X
LAF	9.524	14.286	11.9282	1.459922	0.859**	0.224	0.092	Y= 0.224 + 0.092X
DAF	8.333	13.265	9.93272	1.371746	0.886**	-0.042	0.104	Y= -0.42 + 0.104X
Pr AD	58.974	66.897	62.9696	2.927960	0.984**	-0.232	0.656	Y= -0.232 + 0.656X
LPF	17.442	22.069	19.6011	1.246014	0.988**	-0.378	0.241	Y= -0.378 + 0.241X
LVF	8.974	11.628	10.6617	.770801	0.966**	0.013	0.105	Y= 0.013 + 0.105X
MiBD	7.292	11.594	9.84127	1.319080	0.865**	0.152	0.079	Y= 0.152 + 0.079X
MBD	15.000	23.077	18.2900	2.014686	0.918**	0.223	0.156	Y= 0.223 + 0.156X
DPVF	28.333	33.793	30.3395	1.411965	0.989**	-0.391	0.350	Y= -0.391 + 0.350X
DVAF	13.333	18.605	15.7399	1.836391	0.960**	-0.379	0.203	Y= -0.379 + 0.203X
LCF	17.241	23.810	20.7111	1.802132	0.922**	0.323	0.168	Y= 0.323 + 0.168X
LCP	8.333	15.000	11.8794	1.952669	0.924**	-0.296	0.154	Y= -0.296 + 0.154X
FL	86.047	92.800	89.3770	1.926266	0.996**	-0.091	0.904	Y= -0.091 + 0.904X
<b>In % of HL</b>								
HD	53.333	66.667	60.9634	3.730909	0.976**	-0.001	0.610	Y= -0.001 + 0.610X
PrOD	30.769	35.714	32.5647	1.516612	0.984**	0.003	0.324	Y= 0.003 + 0.324X
PsOD	43.750	55.172	47.4983	3.578756	0.983**	-0.230	0.612	Y= -0.230 + 0.612X
ED	16.667	28.571	24.0717	3.697704	0.805**	0.071	0.198	Y= 0.071 + 0.198X
IOD	26.667	38.889	31.917	3.840100	0.892**	0.069	0.278	Y= 0.069 + 0.278X

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

**Fig.2 Relationship of various morphometric characters**



Fish adapt quickly by modifying their physiology, morphology and behavior to environmental changes. In general fish demonstrate greater variances in morphological traits both within and between populations than any other vertebrates and are more susceptible to environmentally induced morphological variations (Stearns, 1983 and Wimberger, 1992). In *Gudusia chapra* from Gobind Sagar 13 characters in relation to total length to be genetically controlled (Tondon *et al.*, 1993). Johal *et al.*, 1994 reported 13 characters in relation to total length to be genetically controlled in *Tor putitora* from Gobind Sagar reservoir in Himachal Pradesh and 12 out of 22 morphometric characters were genetically controlled and 5 were environmentally controlled characters in *Tor putitora* from Pongdam reservoir in Himachal Pradesh. Bhatt *et al.*, 1998 observed 12 characters in relation to total length which have considered as genetically controlled characters, two are intermediate and only one character has been found to be environmentally controlled in *Tor putitora* from foothill section of Ganga and in relation to head length three characters have been found to be intermediate and two are environmentally controlled characters. Out of 18 characters, 11 characters were found to be genetically controlled, 5 characters were intermediate and 2 characters were environmentally controlled in *Tor putitora* from Pong reservoir in Himachal Pradesh (Johal *et al.*, 2003). During the present investigation, Eighteen characters in percentage of total fish length were genetically controlled, four characters in percentage of head length were intermediate and one character in

percentage of head length was genetically controlled. It gives clear indication that Ubeshwar Stream is still undisturbed from environmental point of view. Further, the correlation coefficient has been found to be very high in relation to total length. The characters like standard length, predorsal distance and head length in relation to total fish length shows high value of correlation coefficient. Dube and Dubey (1986-87) reported high value of correlation coefficient between total length and head length, snout length, height of caudal peduncle, minimum body girth and maximum body girth and low value between total length and eye diameter and length of caudal peduncle in a population of *Tor tor* from Narmada River. Nautiyal *et al.* (1998) showed postdorsal distance as the most significantly correlated variable where as Johal *et al.* (1994) found standard length as most correlated body part in *Tor putitora* from Gobindsagar. Bhatt *et al.* (1998) observed the eye diameter as a least correlated variable and the results are comparable with the present studies. Johal *et al.* (2003) showed that almost all the characters show high degree of correlation coefficient.

**Conclusion**

The morphometric measurements confirmed that the test organism *Chela bacaila* has very little impact of environment because this area is still undisturbed from environmental degradation point of view. Eighteen characters have been studied in percentage of total fish length from which thirteen characters were genetically controlled, four characters were intermediate and one character was environmentally controlled. In percentage of head

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length all characters were to be genetically controlled. Positive correlation has been observed between total length and external body parts. Linear relationships have been observed between all the independent and dependent characters. Further it can be said that this fish is a typical hill stream fish and thrives well even in fast flowing waters. The rampant removal of boulders from stream as well as river beds should be stopped if this fish is to be conserved, otherwise it will slip into threatened category of fishes.

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