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Morphometry Of Fish *Aspidoparia Morar* (Ham.) Inhabiting River Tawi And Its Tributaries (J&K)

Vivek[1]*, Pitamber Singh[2], Talib Hussain Dar[3]

[1*,3]Assistant Professor, Department of Zoology, Sant Baba Bhagh Singh University, Jalandhar, India-144030
vivekzoolju22@gmail.com, stalibhd2011@gmail.com
[2] Research Scholar, Department of Zoology, Sant Baba Bhagh Singh University, Jalandhar, India-144030
singhpitamber350@gmail.com

*Corresponding author: - Vivek
*Assistant Professor, Department of Zoology, Sant Baba Bhagh Singh University, Jalandhar, India-144030
vivekzoolju22@gmail.com

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ABSTRACT
The study was carried on thirty morphometric characters of *Aspidoparia morar* collected in and around the Jammu city. All the characters showed a high degree of correlation and a linear relationship was found between them. Out of thirty morphometric characters six were environmentally controlled, five were intermediate and rest all nineteen characters were genitically controlled.

Keywords: Body measurements, *Aspidoparia morar,* Jammu city

INTRODUCTION

Morphometric and Meristic characters provide data that is useful for precise description of any differentiation among stock (Ihseen *et al.*, 1981). According to Bornte *et al.* (1999), morphological properties provide evidence for ecological function and form the basis for prediction of rich relationship. Morphometric analysis has also been applied to many stock identification and life history problems (Ridell and Leglett, 1981; Winans, 1984; Swain and Holtby, 1989). The relationship between linear growth and different body parts is an important aspect of growth biology. Huxley (1932) elucidated the nature of growth pattern in a wide variety of organisms and their body parts and suggested that the solution of many growth problems depends on identification of regions of different growth termed "morphogenetic fields". Morphometric differences are produced within a species and even within different sexes of a species due to interactive genetic and environmental effects (Cadrin, 2000).

MATERIAL AND METHODS

For the present study 200 specimens of *Aspidoparia morar* (Ham.) ranging between 2.9 cm to 13 cm, were collected from in and around the Jammu city. The calculations were made for mean, standard deviation (SD), standard error (SE), range, range difference, correlation coefficient, regression equation and graphs were plotted between independent variable (X) and dependent variable (Y). For measurement of various morphometric characters (Table 1) and the definitions

given by Jayaram (1999) have been followed. The fishes were collected using cast net at random from the collection sites. All the measurements are taken on left side of the body.
The standard version of computer program 'SPSS 10.0 for windows' has been used for the calculations of various statistical parameters and for plotting graphs.

RESULTS AND DISSCUSSION

During the course of present study, 30 morphometric characters (Table 1, Fig 1- 6) were studied. Out of these Twenty four characters were studied in the percentage of Total length and the rest six were studied in the percentage of head length. Many workers have earlier studied the morphometric characters in fishes, viz. Johal *et al.* (1994) and followed by Bhatt *et al.* (1998), Singh (1999), Esmaeili (2001), Johal *et al.* (2003), Johal & Kaur (2005), Ahmed (2007), Gandotra *et al* (2008), Gogoi R., Goswami U.C. (2015), Jan & Ahmad (2020) and Yadav and Paul (2023). The present study was conducted on 200 specimens of *Aspidoparia morar* (Ham.) with length ranging from 2.9 cm to 13 cm length. They were collected monthly using cast net. Thirty characters were studied that are shown in Table 1. The various morphometric measurements recorded as per the criteria of Jayaram (1981).
As shown in Table 1, it was observed that all the characters show higher values of correlation coefficient (i.e. r> 0.9). From the higher values of correlation coefficient (r) and linear relationship (Fig 1- 6), it is evident that all the characters increase in direct proportion.
Further, all the morphometric characters were divided into various morphometric categories proposed by Vladykov (1934) and later modified by Johal *et al.* (1994). The categories include: (1) Genetically controlled (<10% range difference) characters, Intermediate (10.1-14.9% range difference) and Environmentally controlled (>15% range difference) characters. These categories have already been followed by a number of workers viz. Bhatt *et al.* (1998), Singh (1999), Esmaeili (2001), Johal *et al.* (2003), Johal and Kaur (2005), Ahmed (2007) and Gandotra *et al.* (2008).

1. Genetically controlled characters (i.e. showing < 10% range difference):

They include Head length (HL), Head depth (HD), Body depth (BD), Pre-orbital length (Pr.OL) and Post-orbital length (POL), Eye-diameter (ED), Opercular Length (OL), Opercular Width (OW), Length of caudal peduncle (CPL), Caudal peduncle depth (CPD), Dorsal fin base (DFB), Dorsal fin height (DFH), Pectoral fin base (PFB), Ventral fin length (Pel.FL), Ventral fin base, Anal fin length (AFL) in the percentage of total fish length and Pre-orbital length (Pr.OL) in the percentage of head length (Table 1).

2. Intermediate characters (i.e. showing range difference between 10.1 - 14.9%):

They include Standard length (SL), Fork length (FL), Pre-Anal length (AL), Caudal fin length (CFL) and Pectoral fin length (PFL) in the percentage of total length.

3. Environmentally controlled characters (i.e. showing > 15% range difference):

They include Pre-dorsal length (Pr.DL) in the percentage of total length, Head depth (HD), Post-orbital length (POL), Eye-diameter (ED), Opercular Length (OL) and Opercular Width (OW) in the percentage of head length.
As per the findings of Vladykov (1934) the fish species showing restricted distribution, the majority of morphometric characters show narrow range and are genetically controlled. On the contrary, in the species having a wide zoogeographical distribution most of the morphometric characters are strongly influenced by the environment.
The present findings regarding the environmentally controlled characters viz. Pre-dorsal length (Pr.DL) in the percentage of Total length and Head depth (HD), Post-orbital length ((POL) and Eye diameter (ED) in the percentage of Head length, are in confirmation to the findings of Pivinicka &

Hensel (1978), Tandon *et al.* (1991), Johal *et al.*(1994), Johal *et al.(*2003), Johal and Kour (2005), Gandotra *et al.*(2008). Likewise, the findings that Standard length (SL) Fork length (FL), Annal length (AL), Pectoral fin length (PFL) and Caudal fin length (CFL) in the percentage of Total length to be intermediate characters are in accordance with the observations of Vladykov (1934), Esmaeli (2001), Johal *et al.* (2003) and Ahmed (2007). Finally, the observations regarding Head length (HL), Head depth (HD), Body depth (BD), Pre-orbital length (Pr.OL) and Post-orbital length (POL), Eye-diameter (ED), Opercular Length (OL), Opercular Width (OW), Length of caudal peduncle (CPL), Caudal peduncle depth (CPD), Dorsal fin base (DFB), Pectoral fin base (PFB),Ventral fin length (V.FL), Pelvic fin base(PFB), Anal fin length (AFL) in percentage of total fish length and Pre-orbital length (Pr.OL) in percentage of head length to be genetically controlled characters are in confirmation with the findings of Tandon *et al.* (1991), Johal *et al.* (1994), Esmaeli (2001), Johal *et al*. (2003), Ahmed (2007), Johal and Kour (2005) and Gandotra *et al.* (2008).

Table 1: Morphometry of *Aspidoparia morar.*

S.NO.	PARAMETERS	S.E.	S.D.	PERCENTAGE RANGE (MIN.-MAX.)	PERCENTAGE RANGE DIFFERENCE	MEAN	CORRELATION COEFFICIENT (r)	REGRESSION EQUATION (Y=a+bX)
IN THE PERCENTAGE OF TOTAL LENGTH								
1	Standard length (SL)	1.08	3.60	71.87-83.26	11.39 (I)	78.93	0.998	Y=-0.342+0.841X
2	Fork length (FL)	1.24	4.14	78.12-91.63	13.51 (I)	87.32	0.998	Y=-0.32+0.923X
3	Anal length (AL)	1.25	4.17	50-62.62	12.62 (I)	58.74	0.998	Y=-0.461+0.656X
4	Pre-Dorsallength (Pr.D.L)	1.22	4.07	37.5-53.09	15.59 (E)	43.95	0.988	Y=-0.194+0.469X
5	Post-dorsal length (Pt.D.L)	0.88	2.93	40.42-46.96	6.34 (G)	45.08	0.956	Y=-0.605+0.508X
6	Head length (HL)	0.36	1.22	15.32-19.23	3.91 (G)	17.31	0.985	Y=0.132+0.156X
7	Head Depth (HD)	0.20	0.69	10.95-13.46	2.51(G)	12.35	0.988	Y=0.048+0.117X
8	Body depth (BD)	0.28	0.93	15.62-19.23	3.61 (G)	17.62	0.994	Y=-0.021+0.180X
9	Pre-orbital length (Pr.O.L)	0.20	0.67	3.12-5.57	2.45 (G)	4.10	0.933	Y=0.022+0.039X
10	Post-orbital length (Pt.O.L.)	0.30	1.02	6.25-9.68	3.43 (G)	8.31	0.954	Y=0.019+0.081X
11	Eye diameter (ED)	0.20	0.66	3.84-6.25	2.41 (G)	4.71	0.973	Y=0.053+0.039X
12	Operculum length ()pc.L.)	0.25	0.84	3.84-6.65	2.81 (G)	5.59	0.952	Y=0.008+0.055X
13	Operculum width (Opc.W.)	0.23	0.78	7.66-10.21	2.55 (G)	8.77	0.973	Y=0.048+0.081X
14	Length caudal peduncle (L.Cd.Pd.)	0.75	2.49	3.12-12.84	9.72 (G)	9.27	0.928	Y=-0.025+0.099X
15	Depth of caudal peduncle (D.Cd.Pd)	0.21	0.71	6.25-8.46	2.21 (G)	7.78	0.987	Y=-0.024+0.082X
16	Dorsal fin base (D.Fn.Bs.)	0.27	0.89	6.25-9.40	3.15 (G)	7.81	0.981	Y=-0.050+0.086X

17	Dorsal fin height (Ds.Fn.Ht.)	0.34	1.13	11.53-14.64	3.11 (G)	12.98	0.980	Y=-0.076+0.141X
18	Length of pectoral fin (L.Pct.Fn.)	0.94	3.14	9.37-20.58	11.21 (I)	16.15	0.974	Y=-0.111+0.182X
19	Pectoral fin base (Pct.Fn.Bs.)	0.24	0.82	3.12-6.19	3.07 (G)	4.02	0.893	Y=0.040+0.035X
20	Length of pelvic fin (L.Pv.Fn.)	0.31	1.05	9.30-11.95	2.65 (G)	10.72	0.987	Y=-0.088+0.120X
21	Pelvic fin base Pv.Fn.Bs	0.14	0.47	1.92-3..56	1.64 (G)	2.85	0.942	Y=-0.002+0.029X
22	Length of anal fin (L.Anl.Fn)	0.47	1.57	6.25-11.30	5.05 (G)	9.01	0.969	Y=-0.095+0.105X
23	Anal fin height (Anl.Fn.Ht.)	0.32	1.07	7.69-11.76	4.07 (G)	9.25	0.970	Y=0.028+0.089X
24	Length of caudal fin (L.Cd.Fn.)	1.16	3.87	11.53-22.23	10.7 (I)	18.59	0.969	Y=-0.273+0.225X
IN THE PERCENTAGE OF HEAD LENGTH								
25	Head Depth (HD)	1.77	5.89	63.35-80	16.65 (E)	71.62	0.966	Y=-0.013+0.722X
26	Pre-orbital length (Pre.O.L.)	0.87	2.88	20.0-29.26	9.26 (G)	23.64	0.973	Y=-0.021+0.256X
27	Post-orbital length (Pt.O.L)	1.29	4.31	40.0-56.02	16.02 (E)	48.04	0.981	Y=-0.059+0.530X
28	Eye diameter (ED)	1.42	4.73	20.0-40.0	20 (E)	27.48	0.970	Y=0.026+0.249X
29	Operculum length (Opr.L)	1.72	5.72	20.0-40.13	20.13 (E)	32.79	0.966	Y=-0.043+0.359X
30	Operculum Width (Opr.W.)	1.47	4.89	40.0-60.0	20.0 (E)	50.86	0.987	Y=-0.027+0.529X

G = Genetically controlled characters, E = Environmentally controlled characters & I = Intermediate characters

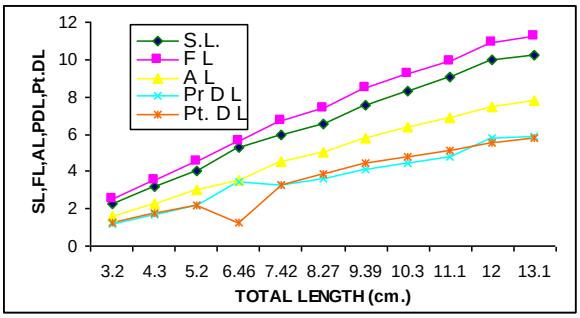

Figure 1: Relationship of Total length with Standard length (SL), Fork length (FL) Anal length (AL), Pre-dorsal length (Pr.DL) and Post-dorsal length (Pt.DL).

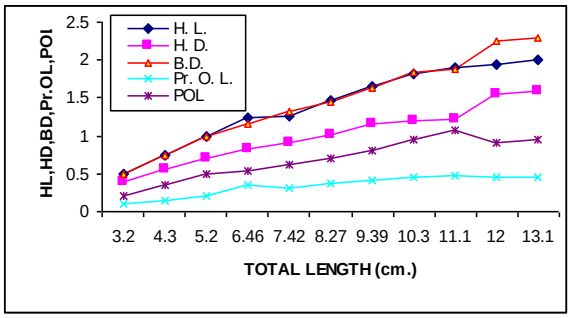

Figure 2: Relationship of Total length with Head depth (HD), Body depth (BD), Pre-orbital length (Pr.OL) and Post-orbital length (POL).

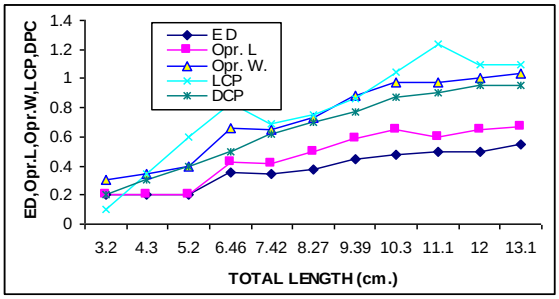

Figure 3 Relationship of Total length with Eye diameter (ED), Opercular length (Opr.L), Opercular width (Opr.W), Length of Caudal Peduncle (LCP) and Depth of Caudal Peduncle (DCP).

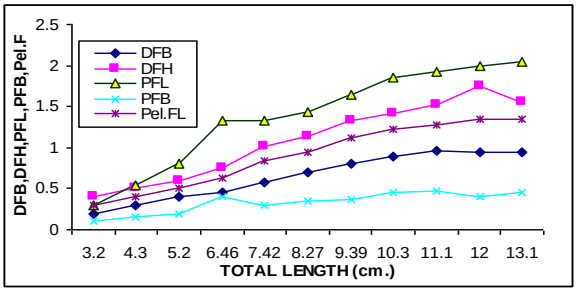

Figure 4: Relationship of Total length with Dorsal Fin Base (DFB), Dorsal Fin Height (DFH), pectoral Fin Length (PFL), Pectoral Fin Base (PFB), Pelvic Fin Length (Pel.FL).

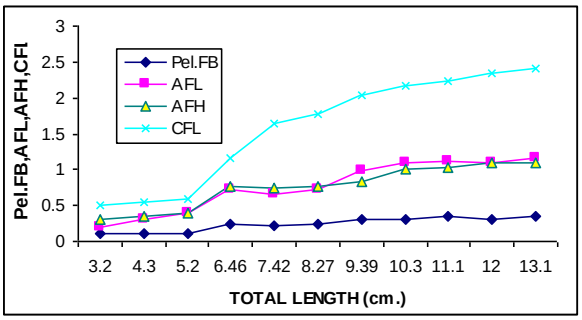

Figure 5: Relationship of Total length with Pelvic Fin Base (Pel.FB), Anal Fin Length (AFL), Anal Fin Height (AFH), Caudal Fin Length (CFL).

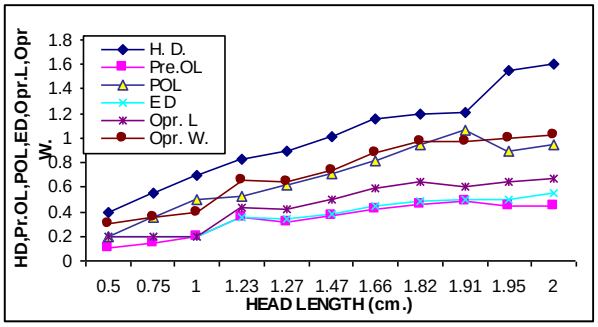

Figure 6: Relationship of Head Length with Head Depth (HD), Pre-Orbital Length (Pr.OL), Post-Orbital Length (POL), Eye Diameter (ED), Operculun Length (Opr.L), Operculun Width (Opr.W).

CONCLUSION

Thus, data generated during present investigations would help us to formulate further management policies to enhance and maintain fish population in this area.

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