Morphometric and meristic study of *Amblypharyngodon mola* (Ham- Buch) from different habitats of Assam

Rimzhim Gogoi* and Umesh. C. Goswami

Department of Zoology, Fish Biology and Fisheries Sciences, DST- FIST (Govt. of India) & UGC- SAP Sponsored Department, Gauhati University, Guwahati, Assam , India

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ABSTRACT

The morphometric and meristic characters of Amblypharyngodon mola collected from culture pond and wetland of Jorhat district of Assam, was studied during the period from September 2011 to August 2013. The morphometric characters of different body parts of male and female were recorded. The correlation and regression analysis was carried out for some important characters in relation to total length and head length. The coefficients of correlation (r) for various characters ranged from 0.216 – 0.947 in males and 0.396 – 0.9524 in females. There was significant (p<0.05) difference between morphometric characters of mature male and female A.mola while there was no change in meristic counts with increase in body length.

Key words: *Amblypharyngodon mola*, morphometry, correlation, regression, meristic counts
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INTRODUCTION

Amblypharyngodon mola (Ham-Buch), commonly known as 'Indian carplet' or 'pale carplet', is widely distributed in fresh water habitats like ponds, streams, rivers, flood plain wetlands, canal, paddy fields etc. It belongs to the family Cyprinidae and order Cypriniformes. Though *A.mola* is a small indigenous fish species (SIS), it has tremendous importance as food fish due to its high content of vitamin-A. The studies on its nutritive value revealed that *A.mola* contains >2680 retinol activity equivalents per 100gm of raw and edible portions [1]. This fish is relished by the common man of the region in smoked, dried as well as pickle form. It also has good demand as an ornamental fish in the international market. Mowa is a self recruiting species and its culture is being encouraged among the farmers in N.E. India to overcome the nutritional deficiency.

Owing to the multifarious importance of *A.mola*, its morphometric and meristic study becomes essential. Comparing the anatomical features of organisms has been a central element of biology for centuries. The morphometric relationship study helps to identify a particular species and also to ascertain whether there is any homogeneity of characters or differences between their males and females. In fish, morphometric characters represent one of the major keys for determining their systematics, growth variability, ontogenetic trajectories and various population parameters [2]. Meristic characters are the body segments and other features, primarily fin rays and scales that once, in evolutionary history, correspond to the body segmentation. Such characters vary within and among species, so they are useful in describing or identifying fishes. Meristic counts usually become stable in number during growth, after a threshold body size has been attained but, mensural traits change continuously with size and age. This difference is particularly important for fishes because of their continuous growth. Hence forth, the present study has been carried out to analyze the different morphometric and meristic features of *A.mola*.

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MATERIALS AND METHODS

A total of 42 specimens (male and female) were taken for statistical analysis from Nimatighat wetland located at 26°86´ N latitude - 94°24´ E longitude in Jorhat district of Assam and culture pond of Fisheries Research Centre, Assam Agricultural University, Jorhat, Assam, located at 26°48′N; 296″ N latitude and 94°11′961″ E longitude. The measurements were based mainly on the works of Jayaram [3], Talwar and Jhingran [4], Nath and Dey [5]. All are straight point-to-point at a vertical direction where the height is greatest. A dial caliper (Mitutoyo, Japan) was used to measure the minimum length of 0.1 mm for the following 23 measurements: Head length; Head depth; Head width; Eye diameter; Pre orbital length; Post orbital length; Total length; Standard length; Body depth; Snout length; Inter-orbital width; Pre-dorsal length; Post-dorsal length; Pre-pelvic distance; Height of dorsal fin; Height of anal fin; Length of dorsal fin; Length of anal fin; Length of pectoral fin; Length of pelvic fin; Depth of caudal peduncle; Length of caudal peduncle; Length of longest fin rays. Mean, standard deviation and standard error of each morphometric character of male and female was calculated separately.

The linear regression equation was used to obtain the relation between the total length and each one of the different morphometric characters with the exception of head depth, head width, eye diameter, pre and post-orbital length which are related to head length.

$$Y\, a + b\, x$$

Where Y is the variable morphometric character, 'x' is the independent character (total length or head length) and 'a' and 'b' are constants.

RESULTS AND DISCUSSION

The morphometric features of *A.mola* showed striking difference between the mature males and females. In all the seasons the females were comparatively larger than the males. However, during the early stages of maturity, the male and female are difficult to be distinguished (Fig.1). In the present study, the total length of the males ranged from a minimum of 40.7 mm to a maximum of 69.7mm and their weights ranged from a minimum of 0.544 grams to a maximum of 3.08 grams (Fig.2). The total length of females on the other hand, ranged from a minimum of 54.3 mm to a maximum of 94.5 mm while their weights ranged from a minimum of 1.362 grams to a maximum of 9.86 grams (Fig.3).

Basically the body of *A. mola* is fusiform, deep and compressed. During the breeding season, the females acquire bulging abdomen. The eyes are large and centrally placed with diameter about 2.8-3 times its head length. The body depth is 2.98 to 3.29 times in standard length. The body colour is pale yellowish at the dorsal side with a broad silvery lateral band. Region below the lateral band is pale whitish in colour with strikingly bright abdomen. The dorsal fin is inserted slightly behind the insertion of pelvic fin. The last ray of the dorsal fin is un-branched.

A total of eleven meristic characters were analyzed in *A.mola* which is given in table 1. The number of dorsal fin rays was found to be 8. This is in concurrence with Gunther [6], while in disagreement with Talwar and Jhingran and Day [7]. The number of pelvic fin rays was computed to be 8 which is in accordance with Talwar and Jhingran but in contradiction with Day. Further, the number of anal fin rays was found to be 6-7, which is in partial agreement with Gunther, Day and Jhingran. The lateral line is incomplete. Scales below lateral line was found to be 19 instead of 9-10, as stated by Talwar and Jhingran. While scales along the lateral line was found to be 65-75 rather than 65-91 as declared by Jayaram and Talwar and Jhingran. However, the number of scales along lateral line is in agreement with Day. The eye diameter of *A.mola* was recorded to be covering more than one fourth part of its head length.

The scales of *A.mola* are cycloid, very minute, delicate and regularly arranged. Lateral line is incomplete, consists of 65-75 scales and there are 19 scales between it and the base of the ventral fin and 11-12 scales between it and dorsal fin. The fin formula for *A.mola* can be delineated as: D_8, P_{15}, V_8, A_{6-7}, C_{19}, L. lat.$_{65-75}$, L.tr.$_{12/19}$. The meristic characters can be influenced substantially by environmental factors especially by temperature during early development [8]. Variation of this nature has been noted for many species ([9-14]). Meristic features may also be size-dependent within or among species [15].

Table 1: Meristic counts of _A.mola_

Meristic data	Number
Dorsal fin rays	8
Anal fin rays	6-7
Pectoral fin rays	13-15
Pelvic fin rays	8
Caudal fin rays	19
Scale before dorsal fin	30-32
Caudal peduncle scale	13-14
No. of barbel	Nil
Scale along lateral line	65-75
Scale above lateral line	11-12
Scale below lateral line	19

The morphological characters of _A.mola_ were studied sex wise i.e. in mature male and female and shown in Table 2. Variation was observed in all the parameters in mature male and female except in inter orbital width. Significant difference was observed in the total length and standard length of the body of male and female. The female fishes were found to be larger in size than the male in all the seasons. Difference was also observed in the body depth as because the gravid female had enlarged belly during the breeding season. Baishya _et.al.,_ [16] found non homogeneity in case of the pelvic fin. The length of pelvic fin of male was reported to be slightly more than that of the female. But such instance was not recorded in any of the specimens in the present study. This might be because of the smaller size of the male than the female.

The correlation and regression analysis was carried out for some important characters in relation to total length and head length. In the females of _A.mola_, the higher values of coefficient of correlation (r) of standard length, body depth, post dorsal length, length of dorsal fin and depth of caudal peduncle showed high degree of correlation in relation to total length while the value of inter orbital width (0.396) indicated low degree of correlation in both male and female. In relation to head length, no such the higher values of coefficient were observed in case of females. On the other hand, in case of males of _A.mola_, standard length, body depth, pre pelvic distance, height of dorsal fin and height of anal fin, showed high degree of correlation in relation to total length while in relation to head length, the head depth showed high correlation (Table.3).

Table 2. Morphometric characters of male and female _Amblypharyngodon mola_

Sl no	Parameter (mm)	Mean		Std Deviation		Std Error		t- value	Inference
		Male	Female	Male	Female	Male	Female		
	HEAD REGION								
1	Head length	13.07368	16.51429	0.602626	1.16717	0.046095	0.070676	11.8723	Significant
2	Head depth	10.14737	13.3	0.553141	1.003992	0.054511	0.075488	12.4518	Significant
3	Head width	5.384211	7.404762	0.512362	1.191418	0.09516	0.160899	7.081565	Significant
4	Eye diameter	4.610526	5.314286	0.334821	0.523723	0.072621	0.09855	5.11079	Significant
5	Pre-orbital length	6.8	8.433333	0.574456	0.878256	0.084479	0.104141	7.022341	Significant
6	Post-orbital length	6.342105	8.114286	0.77195	0.627922	0.121718	0.077385	7.914438	Significant
	BODY REGION								
7	Total length	63.08421	79.59048	1.776783	4.189261	0.028165	0.052635	16.49089	Significant
8	Standard length	50.98947	63.3	1.819614	3.530581	0.035686	0.055775	14.04892	Significant
9	Body depth	15.12632	20.94762	0.690283	2.27258	0.045635	0.108489	11.18215	Significant
10	Snout length	2.515789	3.304762	0.37898	0.72971	0.150641	0.220806	4.348738	Significant
11	Inter-orbital width	2.638421	2.681429	0.112757	0.124871	0.042736	0.046569	1.144661	Non Significant
12	Pre-dorsal length	25.99474	33.6381	1.413614	1.849183	0.054381	0.054973	14.76427	Significant
13	Post-dorsal length	18.41053	23.85238	1.225604	2.034851	0.066571	0.08531	10.35407	Significant
14	Pre-pelvic distance	23.32105	30.67619	1.110845	2.767473	0.047633	0.090216	11.22097	Significant
15	Height of dorsal fin	13.31053	15.82381	1.067653	1.072336	0.080211	0.067767	7.419297	Significant
16	Height of anal fin	8.768421	10.57619	0.843967	1.565537	0.096251	0.148025	4.603661	Significant
17	Length of dorsal fin	5.852632	7.742857	0.60495	0.865778	0.103364	0.111816	8.063234	Significant
18	Length of anal fin	7.436842	9.152381	0.80084	0.95374	0.107686	0.104207	6.179557	Significant
19	Length of pectoral fin	9.515789	11.6381	0.93051	1.141261	0.097786	0.098063	6.470155	Significant
20	Length of pelvic fin	8.973684	10.8619	0.715574	0.808379	0.079741	0.074423	7.835834	Significant
21	Depth of caudal peduncle	6.021053	8.214286	0.639078	0.938768	0.106141	0.114285	8.706197	Significant
22	Length of caudal peduncle	11.06842	13.67619	0.867981	1.762074	0.07842	0.128842	6.022308	Significant
23	Length of longest fin rays	14.57368	17.78095	1.216024	2.038534	0.08344	0.114647	6.1081	Significant

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Table 3. Results of statistical analysis of morphometric characters

Sl no	Parameter (mm)	Correlation		Regression	
		Male	**Female**	**Male**	**Female**
	Head length				
1	Head depth	0.873938	0.698054	0.763767	0.487279
2	Head width	0.712901	0.665135	0.508227	0.442405
3	Eye diameter	0.722836	0.53787	0.522491	0.289304
4	Pre-orbital length	0.691672	0.717509	0.47841	0.51482
5	Post-orbital length	0.623518	0.687395	0.388774	0.472512
	Total length				
6	Standard length	0.947105	0.9524	0.897008	0.907067
7	Body depth	0.895418	0.933516	0.801774	0.871453
8	Snout length	0.64145	0.647885	0.411458	0.419755
9	Inter-orbital width	0.216163	0.396974	0.046727	0.157588
10	Pre-dorsal length	0.772797	0.75637	0.597215	0.572096
11	Post-dorsal length	0.82335	0.832484	0.677905	0.693029
12	Pre-pelvic distance	0.843476	0.806109	0.711452	0.649812
13	Height of dorsal fin	0.857885	0.761802	0.735967	0.580342
14	Height of anal fin	0.863614	0.806024	0.745829	0.649675
15	Length of dorsal fin	0.82159	0.851931	0.675011	0.725787
16	Length of anal fin	0.731323	0.745476	0.534834	0.555735
17	Length of pectoral fin	0.826446	0.715719	0.683013	0.512254
18	Length of pelvic fin	0.802781	0.733977	0.644457	0.538722
19	Depth of caudal peduncle	0.772849	0.835331	0.597296	0.697778
20	Length of caudal peduncle	0.828913	0.739016	0.687097	0.546145
21	Length of longest fin rays	0.770413	0.729315	0.593535	0.5319

Fig. 1: Maturing stage of female (A) and male (B)

Fig.2: Mature male of *A.mola*   **Fig.3: Mature female of *A.mola***

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CONCLUSION

The morphometric studies of *A.mola* revealed that though there is no discerning character between male and female during stages of early maturity, there is significant difference in size and body depth between both the sexes upon maturity. However, there is no change in meristic counts with increase in body length

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