

## Morphometry and Length-weight Relationship of Goby, *Parachaeturichthys ocellatus* (Day 1873) from Malad creek, Mumbai.

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**ABSTRACT:** The morphometric, meristic and length weight relationship of goby fish *Parachaeturichthys ocellatus* (Day1873) (Perciformes: Gobiidae) was studied from Malad creek, Mumbai for a period of fourteen months from July2010-Aug2011. A total of 145 fishes of which 82 males of length range between 57-160mm and 63 females of length range between77-140mm were collected from local fishermen of Malad creek in live condition. The morphometric relationship showed a higher correlation value of 0.97between total length and standard length of males and 0.93 in females. The standard length was found to be the fastest growing character and eye diameter was the slowest growing character in both males and females with b value ranging between 0.01-0.75 in males and 0.02-0.72 in females. Meristic characters observed showed limited variation in their range. The results of length weight relationship showed negative allometry with  $b = 2.88$  and  $r = 0.93$  for males and  $b = 2.18$  and  $r = 0.54$  for females.

**KEYWORDS:** morphometry, meristic, length, weight, allometry

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### Introduction

Morphometric and meristic characters of a species is a powerful tool for characterizing strains of the same species, which involves detection of subtle variation of shape, independent of size (Strauss and Bond, 1990). Length-Weight Relationship as a growth concept is of attraction to numerous biologists (Lawson, 2011) to study biology, physiology, ecology, population dynamics and general condition of the species.

*Parachaeturichthys ocellatus* is a goby fish belonging to Family Gobiidae. It is native to Mumbai and Ratnagiri coast. Its occurrence in the muddy creeks of Mumbai coast was reported by Mutsaddi and Bal (1973). There is no report on study of biology of this species in the literature survey carried out by the authors. Therefore the present study on morphometric, meristic characters and length weight relationship was undertaken to derive some information about population characteristic of the species.

### Materials and methods

A total of 145 specimens (82 males, 63 females) of *P. ocellatus* were collected from Malad creek twice in a month ranging from July 2010 to August 2011. The live and gasping fishes were directly collected from the fishermen of Malad creek and were brought to the laboratory in icebox. Fresh specimens were measured to the nearest mm using divider and the measuring board and meristic characters were counted after fixing fish in formalin. Nineteen morphometric and ten meristic characters were studied by following the standard procedures described by Appa Rao (1966), and Dwivedi and Menezes (1974).

Relationship between the various body measurements to the total length and some with head length has been determined. Mean, mode, standard deviation, co-efficient correlation and regression co-efficient were calculated for the characters under study.

For studying length-weight relationship, the total length was measured to the nearest millimeter and weight was measured to the nearest grams in fresh condition. The cubic relation between total length and weight was calculated by the formula:

$W = aL^b$  Where W= weight of an individual fish in grams, L= length of individual fish in mm, a and b are constants.

The data were statistically analyzed by the method of Le Cren (1951) as  $\log W = \log a + b \log L$  where a and b are constants estimated by linear regression of the log transformed varieties. Length weight relationship was determined separately for both sexes.

### Results

The statistical analysis of various morphometric characters of males and females are presented in (Table 1) and (Table 3). During the present study of morphometry of *Parachaeturichthys ocellatus*, the coefficient of correlation (r) for various characters compared with total length for males ranged from 0.74-0.97

while in females ranged from 0.56-0.93 indicating high degree of relationship between characters of males and females. The correlation of head length with snout length, inter orbit length and eye diameter ranged from 0.66-0.78 in males and 0.62-0.76 in females (Table 2) and (Table 4).

The higher and lower value of correlation coefficient in males was for standard length  $r=0.97$  and pelvic length  $r=0.74$  while the same in females were  $r=0.93$  and  $r=0.56$  respectively, though the lowest value in females was  $r=0.46$  for pectoral length. Among all the characters compared value of regression coefficient  $b = 0.7582$  in males and  $b= 0.7242$  in females for standard length and  $b= 0.0890$  in males and  $b=0.1067$  in females for pelvic length .But in females pectoral was found to be lowest with value  $b= 0.759$ . All the morphometric characters showed negative allometry as the  $b<1$ .

The meristic counts of *P.ocellatus* are summarized in Table 5. They show a very limited variation in their range. It was compared with the meristic counts of Day (1878) and was found to be almost in accordance. A slight variation was observed in caudal fin counts.

The length weight relationship was studied for male in total length range of 57-160mm and weight of 2.06-38.8g. The logarithmic transformation of the LWR for males is given in Fig.1 and expressed as:

$$\log W = -4.83088 + 2.883525 \log TL \quad (n=82, r=0.9300, b=2.8835)$$

The females varied in total length range of 77-140mm and weight range of 4.54-22.49g. The logarithmic transformation for females is given in Fig.2 and expressed as:

$$\log W = -3.3889 + 2.18082 \log TL \quad (n=63, r=0.5453, b=2.1808)$$

The value of regression coefficient  $r$  was higher in males indicating an increase in total length with corresponding increase in weight, but in female the value was found to be lower since length does not increase much with weight.

**Table1: Statistical estimates of various morphometric characteristics of *P.ocellatus* male n=82**

Sr. no.	Characters	Min	Max	Mean	Median	Mode	Std.dev	Std.err
1	Total length	57	160	104.75	103	100	20.3	2.2288
2	Standard length	48	131	85.21	85	75	15.74	1.6772
3	Head length	14	45	22.3	20	21	4.47	0.4907
4	Snout length	4	11	5.81	6	6	1.33	0.1464
5	Inter orbit length	4	11	5.9	6	6	1.41	0.1548
6	Eye diameter	2	4	3.13	3	3	0.51	0.0565
7	First pre dorsal length	18	50	30.58	30	30	6.08	0.6677
8	First dorsal length	4	22	11.74	11	11	3.25	0.3571
9	Second pre dorsal length	21	77	45.95	45	45	9.77	1.0724
10	Second dorsal length	11	27	21.32	21	21	4.42	0.4860
11	Pre pectoral length	15	44	26.15	26	25	5.23	0.5745
12	Pectoral length	11	29	15.04	15	14	2.75	0.3021
13	Pre pelvic length	13	46	25.07	25	25	5.36	0.5883
14	Pelvic length	10	29	12.01	12	11	2.44	0.2663
15	Pre anal length	27	85	52.02	51	51	10.78	1.1833
16	Anal length	9	30	15.82	16	17	3.49	0.3836
17	Body depth	10	32	18.31	18	14	4.6	0.5057
18	Caudal depth	6	18	10.67	10.5	10	2.25	0.2469
19	Caudal length	9	31	19.84	20	15	5.78	0.6345

**Table 2: Values of constants ‘a’ and ‘b’ in the linear regression of various morphometric characteristics as function of total length and head length with the respective correlation ‘r’ value in *P.ocellatus* male.**

Sr.no.	Characters	Intercept a	Regression b	Correlation r
1	SL to TL	5.8010	0.7582	0.9777
2	HL to TL	2.3130	0.1908	0.8667
3	SnL to TL	0.1493	0.0541	0.8233
4	IOL to TL	0.2698	0.0537	0.7739
5	ED to TL	1.0616	0.0197	0.7793
6	FPDL to TL	0.5107	0.2871	0.9583
7	FDL to TL	-2.1674	0.1328	0.8287
8	SPDL to TL	-2.2782	0.4604	0.9569
9	SDL to TL	1.9411	0.1851	0.8488

10	Ppec L to TL	1.8357	0.2322	0.9008
11	Pec L to TL	3.7110	0.1082	0.7984
12	Ppel L to TL	-0.6365	0.2454	0.9297
13	Pel L to TL	2.6809	0.0890	0.7454
14	PAL to TL	0.9153	0.4878	0.9187
15	AL to TL	1.7429	0.1344	0.7812
16	BD to TL	-0.4492	0.1791	0.7895
17	CD to TL	1.5094	0.0874	0.7892
18	CL to TL	-2.4281	0.2126	0.7467
19	SnL to HL	0.6027	0.2337	0.7832
20	IOL to HL	0.6210	0.2367	0.7504
21	ED to HL	1.4173	0.0769	0.6676

Table 3: Statistical estimates of various morphometric characteristics of *P.ocellatus* female. n=63

Sr. no.	Characters	Min	Max	Mean	Median	Mode	Std.dev	Std.err
1	Total length	77	140	186.22	108	105	12.99	1.6370
2	Standard length	65	110	88.31	87	82	10.02	1.2634
3	Head length	17	32	23.04	23	22	2.9	0.3657
4	Snout length	4	8	6.34	6	6	1.07	0.1349
5	Inter orbit length	4	10	6.41	6	6	1.1	0.1395
6	Eye diameter	3	4	3.38	3	3	0.48	0.0611
7	First pre dorsal length	24	42	32.2	32	32	3.9	0.4919
8	First dorsal length	8	17	12.73	13	14	2.19	0.2769
9	Second pre dorsal length	36	65	49.41	48	48	6.26	0.7894
10	Second dorsal length	14	27	21.6	21	21	3.44	0.4344
11	Pre pectoral length	19	39	27.92	27	27	3.72	0.4689
12	Pectoral length	12	18	15.6	16	17	2.11	0.2670
13	Pre pelvic length	19	32	26.22	26	26	3.4	0.4285
14	Pelvic length	9	20	13.15	13	12	2.41	0.3046
15	Pre anal length	39	70	55.3	53	50	8.34	1.0514
16	Anal length	11	24	16.28	16	17	2.68	0.3377
17	Body depth	12	31	20.9	21	19	4.17	0.5258
18	Caudal depth	7	15	11.26	11	12	1.91	0.2407
19	Caudal length	12	35	20.87	21	20	5.13	0.6465

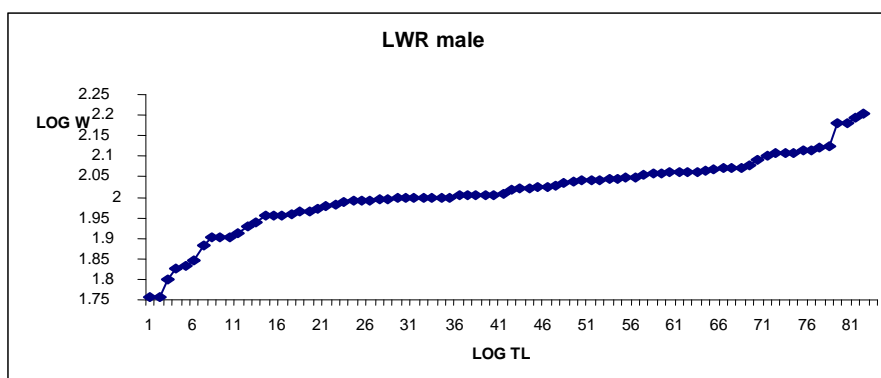
Table 4: Values of constants a and b in the linear regression of various morphometric characteristics as function of total length and head length with the respective r value in *P.ocellatus* female

Sr.no.	Characters	Intercept a	Regression b	Correlation r
1	SL to TL	9.2141	0.7242	0.9308
2	HL to TL	1.5792	0.1965	0.8727
3	SnL to TL	-0.6955	0.0645	0.7759
4	IOL to TL	-0.7584	0.0656	0.7641
5	ED to TL	0.8278	0.0233	0.6204
6	FPDL to TL	5.0010	0.2490	0.8223
7	FDL to TL	-1.2087	0.1276	0.7483
8	SPDL to TL	2.4006	0.4304	0.8854
9	SDL to TL	-3.1649	0.2267	0.8476
10	P pec L to TL	2.0301	0.2370	0.8209
11	Pec L to TL	7.3119	0.0759	0.4615
12	P pel L to TL	4.9672	0.1946	0.7374
13	Pel L to TL	1.4946	0.1067	0.5692
14	PAL to TL	-3.2261	0.5358	0.8276
15	AL to TL	0.2783	0.1465	0.7045
16	BD to TL	-4.5497	0.2330	0.7197

17	CD to TL	-1.6719	0.1184	0.8056
18	CL to TL	-8.3531	0.2675	0.6721
19	SnL to HL	0.9242	0.2353	0.6377
20	IOL to HL	-0.1761	0.2858	0.7641
21	ED to HL	0.9992	0.1033	0.6204

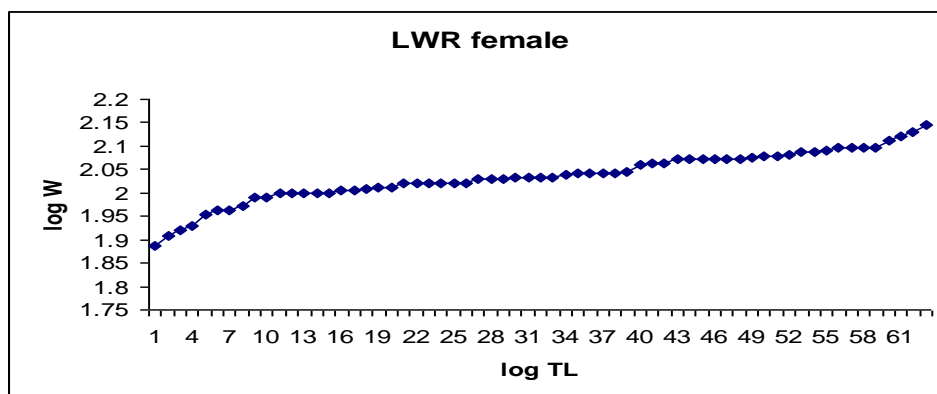
**Table 5: Variation in meristic characters in *P. ocellatus* n=50**

Sr.no.	Characters	Day 1858	Present study 2010-2011						
			Range		Mean	Median	Mode	Std dev	Std error
			Min	Max					
1	First Dorsal Fin	6	6	6	6	6	6	0	0
2	Second Dorsal Fin	10	10	11	10.56	11	11	0.506	0.1013
3	Pectoral Fin rays	20	18	21	19.36	20	18	1.22	0.2044
4	Pelvic Fin rays	10	10	10	10	10	10	0	0
5	Anal Fin rays	10	10	11	10.76	11	11	0.435	0.0871
6	Caudal Fin rays	12	18	21	21.08	21	21	0.702	0.1404
7	Vertebrae	---	22	27	24.96	25	24	1.206	0.2413
8	Longitudinal Scales	33	28	36	31.4	32	32	2.415	0.4830
9	Transverse Scales	8	7	8	7.48	7	7	0.509	0.1019
10	Gill rakers	---	14	14	14	14	14	0	0



**Fig 1: Length -weight relationship male**

Log W vs. Log TL  
 Intercept a = -4.8308  
 Slope b= 2.8835  
 Correlation r= 0.9300



**Fig2: Length-weight relationship female**

Log w vs. Log TL  
 Intercept a= -3.3889  
 Slope b= 2.1808  
 Correlation r= 0.545

### Discussions

The present study for *P. ocellatus* indicated a higher regression value for standard length ( $b=0.75$ ) and lower in eye diameter ( $b=0.019$ ) in males and standard length ( $b=0.72$ ) and eye diameter ( $b=0.02$ ) in females. Hence standard length is the fastest growing parameter and eye diameter is the slowest growing parameter in both male and female. This was in accordance with study conducted by Gore (2007) on mudskipper *Boleophthalmus boddaerti*.

The correlation value of morphometric characters were in the range of 0.74 to 0.97 in male and 0.46 to 0.93 in female. This range of variations may be due to the robustness in males as compared to females. The pelvic fin showed correlation value of 0.74 in male and 0.56 in females as the pelvic fin does not increase in size with the corresponding increase in total length but in depth so as to form a sucking disc. In females pectoral fins showed the lowest value of 0.46. It does not increase in length with corresponding increase in total length compared to male. Thus the present study on morphometric characters of *P. ocellatus* gives a significant relationship about the growth pattern of the species. Hossain *et al* (2009 b) reported that in goby *Glossogobius giuris* the morphometric relationships were highly correlated.

The meristic characters showed limited variation in their range. When these characters were compared with Day (1878) it did not show much variation other than caudal fins which were in range 18-21 in present study and 12 according to Day (1878). This increase in the number of caudal fin may be an adaptation to swim in the muddy creeks. The meristic characters showed homogeneity in the population.

The present study of length-weight relationship in *P. ocellatus* from Mumbai showed regression value of 2.88 for males and 2.18 for females. This was not in agreement with the length-weight relationship of other species of goby like *Boleophthalmus dussumieri* (Mutsaddi 1964) with value 3.71 for male and 3.44 female and *Bathygobius soporator* (Adeboyejo, 2011) with a value of 4.58 for males and 3.98 for females which was positive allometry.

The regression coefficient value  $b=3$  for length weight relationship indicates that the fish grows symmetrically or isometrically. They maintain body shape throughout their life (Day F 1958, Bal D.V and Rao K.V 1984). Values other than three indicate allometric growth. The value of  $b>3$  indicate positive allometry and  $b<3$  indicate negative allometry. Thus the present study showed that *P. ocellatus* has negative allometry. The logarithmic relationship between length and weight was a straight line in both males and female and hence growth rate is quite satisfactory in Malad creek.

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