RESEARCH PAPER

Assessment of morphometric and meristic characteristics of *Pomadasys maclatum* of Karachi coast

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Abstract

This paper aims to explore the graphical spotlight in morphometry and meristics characteristics of *Pomadasys maculatu*m using various statistical measures. To assess the characteristic 15 variables are including Total length, Body weight , Head length, Snout length , Eye diameter, Standard length, Body depth, Fork length, Body breath, Pre-orbit length, Caudal peduncle length, Anal fin rays, Lateral line scales, Caudal fin rays, Dorsal fin rays length scales are measured . A comparison of male and female body structure were made. The total body length in female average total length was 175. 22, while total length was 163.50mm in males. Average body weight in female was 87.32g whereas male was 69.78g. In case of female the average measurement of Head length in percentage of total body length was found to be 25.94 and the snout length was found to be 08.34, average eye diameter was found at 07.71 and average measurement of caudal peduncle length was recorded as 10.24mm. Average measurement of Head length in percentage of total body length was found to be 25.57mm and snout length was found to be 07.99mm, Average measurement of eye diameter was found at 07.61mm and average measurement of caudal peduncle length was recorded as 10. 26mm in male. In the contrast, the average total length of females was 175. 22mm and the average total length of males were 163.50mm. The consistency of female total length is found more stable than male total length.

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Introduction

Grunts (*Pomadasys maculatum* (Bloch) (family: Pomadasyidae)) are edible marine fishes known for their Grunting sounds which they sometimes make when disturbed. Importance of fisheries typology has increased tremendously in the recent years because of their statistical diversity and for their nutritional value. Exploration of fish species distributions is most important in environmental science and conservation biology. In order to understand the taxonomy of the selected *Pomadasys maculatum* concerned with the literatures (Branch *et al.*, 2000, Smith & Heemstra, 1986). Meristic characters can be influenced substantially by environmental factors, especially by temperature during early development. A Variation of this nature has been noted for many species (Hubbs 1922, Taning 1952, Weisel 1955) and should be taken into account in studies involving meristic characters. Meristic features may also be size-dependent within or among species (Strauss 1987).

Statistical models may play an important role in order to compare morphometric and meristic variables. However, researchers prefer descriptive statistics to analyze these variables. Statistical approach methodologies have gained tremendous interest in the recent years however limited comparative studies have been carried out in this regard.

Recently, marine scientists have more information available than is provided by the snapshot of the age structure. It is possible that required fish class is not available for the study year. This may be due to environmental change or may be other reasons such as hunting by other fish or caught by humans during the early stage. The grants are small to standard sized fish, typically living in shallow coastal waters. They found in coral or reef areas, as well as in muddy or weedy waters. Quite a lot of the species belonging to this family are rather common in Pakistan. Much information on various biological aspects of Pomadasyidae is available from various countries of southeast Asia, America, Australia, U.A.E, China, Coera, India, etc. (Le-CERN 1951, Karakar and Bal 1960, Hakima, 1988, Hussain *et al.* 2002, Banchi 1985).

For Pakistan only limited works have been done on different *Pomadasys* species. Sex ratio of striped piggy fish, *Pomadasys stridens* (Forsskal, 1775) (family; Pomadasyidae) of Karachi Coast, Pakistan was studied by (Khan *et al.* 2013, Khan 2013). Whereas, (Amtyaz *et al.* 2013, Amtyaz *et al.* 2014,) studied on sex ratio, gonadsomatic index, stages of gonadal development and fecundity of saddle grunt fish, *Pomadasys maculatum* (Bloch, 1793) of the Karachi coast and also discussed feeding Habits of Striped piggy, *Pomadasys stridens* (Forsskal, 1775) by (Amtyaz *et al.*, 2013). These research on *Pomadasys maculatum* provided information about reproductive biology of *Pomadasys maculatum* family. However, on Morphometric and meristic characteristics of *Pomadasys maculatum* has not been documented widely in literature. This study will increase the knowledge about *Pomadasys maculatum* to understand its *morphometric, meristic characteristics* with the help of descriptive statistics. It will also helpful researcher to get the information about the morphometric variable.

Material and methods

Study area

The selected fish of the study is *Pomadasys maculatum*. The sample of fishes was collected from Karachi fish harbour, West Wharf Karachi coast and Korangi Creek of Karachi coast. The study area of West Wharf Karachi is located at 240° 48' N latitude and 660° 58' E longitude on the north eastern border of the Arabian Sea. Whereas, the study area of Korangi Creek of Karachi coast is located at 24° 47' N latitude 67°5'E longitude.

Fish sampling and data collection

Monthly data for fish measurements, morphometric variables, have been collected taking the year 2013, Jan of 2014, Dec. The samples of 553, female fishes and 503 male fishes of *Pomadasys maculatum* (Bloch) (family: Pomadasyidae) were collected from different local fish harbour at the Karachi Coastal area. For each fish 15 variables measurements are taken using weight machine for body weight, millimetre scale for length and vernier caliper for body depth. These fifteen variables of male and female including morphometry and metrics are as follows.

The morphometry variables including; Total length (TL), Body weight (Bwt), Head length (HL), Snout length (Sn.L), Eye diameter (ED), Standard length (SL), Body depth (BD), Fork length (FL), Body breath (BB), Pre-orbit length (PO), Caudal peduncle length (CPL). Whereas, the Meristic characteristics are Anal fin rays (ASL), Lateral line scales (LL), Caudal fin rays (CFRL), Dorsal fin rays length (DSL) scales.

Data analysis

Basic statistical methods are employed to explore the significant difference of these variables measurements gender wise. These methods including descriptive statistics, correlation coefficient and graphical analysis. Descriptive statistics helps to describe and understand the feature of a specific data such as mean, standard deviation, skewness and kurtosis. The coefficient of correlation measure the relationship of among these variables. Furthermore, SPSS software was used for analyzing the data.

Result and discussion

From table 1, the arithmetic mean of all morphometric variables of the total sample 1056 (including male and female) are TL (169.63), Bwt (78.97), HL (43.72), Sn.L (13.88), ED (13.00), SL (134.08), BD (50.33), FL (159.25) ,BB (23.42) ,PO (20.38), CPL (17.39). Whereas, meristic variable ASL (88.97), LL (107.11), CFRL (36.43), DSL (55.45).

Average of morphometric and meristic of female

For the female the average of *morphometric* variables for the sample of 553 are TL (175.22), Bwt (87.32), HL (45.46), Sn.L (14.61), ED (13.50), SL(138.83), BD (52.19), FL (164.85), BB (24.29), PO (21.19), CPL (17.94). However, meristic measurements are ASL (92.15), LL (110.36), CFRL (37.81), DSL (57.64).

Average of morphometric and meristic of male

In case of male the average of *morphometric* variables for the sample of 503 are TL (163.50), Bwt (69.78), HL (41.81), Sn.L (13.07), ED (12.45), SL (128.86), BD (48.27), FL (153.10), BB (22.45), PO (19.48), CPL (16.78). The meristic variables measurement ASL (85.47), LL (103.53), CFRL (34.92) ,DSL (53.04).

Over all, it is found that female average measurements of the variables are higher than male. However, the larger variance or standard deviation explains more spread of observations. The variability of the variables measurements is quite high in male than female. Moreover, most of the variables for female are negatively skeweed except Bwt and CPL. On the other hand, in case of male except Bwt all variables are negatively skewed (asymmetry). This asymmetry shows that mean is less than the median and mode (Table 1). Furthermore, the Kurtosis of combined sample is below or approximately 3 except ED and LL variables.

Table 1. Descriptive Statistics of morphometric and meristic variables of *Pomadasys maculatum*

Descriptive Statistics						
Gender		N	Mean		Std. Deviation	Skewness	Kurtosis
		Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic
Female	T.L(mm)	553	175.22	.969	22.792	-1.195	3.807
	S.L(mm)	553	138.83	.757	17.793	-1.111	3.433
	B.Wt(gm)	553	87.32	1.295	30.448	.384	.436
	B.D(mm)	553	52.19	.344	8.098	-.642	1.892
	F.L(mm)	553	164.85	.903	21.223	-1.196	3.701
	H.L(mm)	553	45.46	.276	6.492	-1.143	3.230
	Sn.L(mm)	553	14.61	.099	2.331	-.336	2.023
	E.D(mm)	553	13.50	.095	2.230	1.849	13.938
	B.B(mm)	553	24.29	.166	3.906	-.300	1.180
	CPL(mm)	553	17.94	.127	2.989	.190	3.967
	P.O(mm)	553	21.19	.143	3.371	-.593	1.969
	L.L(mm)	553	110.36	.739	17.381	-2.021	8.299
	D.S.L(mm)	553	57.64	.352	8.270	-1.451	4.476
	ASL(mm)	553	92.15	.546	12.846	-.975	2.974
	CFRL(mm)	553	37.81	.244	5.743	-.677	2.517
Male	T.L(mm)	503	163.50	1.085	24.336	-1.155	2.371
	S.L(mm)	503	128.86	.870	19.518	-1.014	1.829
	B.Wt(gm)	503	69.78	1.173	26.318	.178	.543
	B.D(mm)	503	48.27	.386	8.666	-.545	3.159
	F.L(mm)	503	153.10	1.083	24.295	-1.604	4.992
	H.L(mm)	503	41.81	.288	6.467	-1.029	2.173
	Sn.L(mm)	503	13.07	.106	2.383	-.601	1.411
	E.D(mm)	503	12.45	.081	1.825	-1.464	3.885
	B.B(mm)	503	22.45	.169	3.796	-.545	1.060
	CPL(mm)	503	16.78	.127	2.845	-.623	.018
	P.O(mm)	503	19.48	.153	3.432	-.469	1.127
	L.L(mm)	503	103.53	.749	16.805	-1.357	3.334
	D.S.L(mm)	503	53.04	.376	8.434	-1.276	2.529
	ASL(mm)	503	85.47	.614	13.772	-1.170	2.204
	CFRL(mm)	503	34.92	.272	6.092	-.793	1.255
Combine	T.L(mm)	1056	169.63	.746	24.246	-1.119	2.771
	S.L(mm)	1056	134.08	.593	19.281	-1.024	2.308
	B.Wt(gm)	1056	78.97	.919	29.856	.384	.595
	B.D(mm)	1056	50.33	.264	8.595	-.591	2.334
	F.L(mm)	1056	159.25	.722	23.475	-1.402	4.483
	H.L(mm)	1056	43.72	.207	6.729	-.969	2.257
	Sn.L(mm)	1056	13.88	.076	2.476	-.422	1.537
	E.D(mm)	1056	13.00	.065	2.112	.824	11.678
	B.B(mm)	1056	23.42	.122	3.961	-.361	1.084
	CPL(mm)	1056	17.39	.092	2.977	-.131	2.390
	P.O(mm)	1056	20.38	.108	3.504	-.498	1.315
	L.L(mm)	1056	107.11	.537	17.438	-1.604	5.310
	D.S.L(mm)	1056	55.45	.266	8.655	-1.238	2.962
	ASL(mm)	1056	88.97	.422	13.701	-1.033	2.450
	CFRL(mm)	1056	36.43	.187	6.084	-.717	1.745

A picto diagram is image that are used to represent data, the presentation of data is a fun and new way which can be very effective for communicating a conclusion in an expressively evocative way. The average measurements of both male and female are represented by picto diagram.
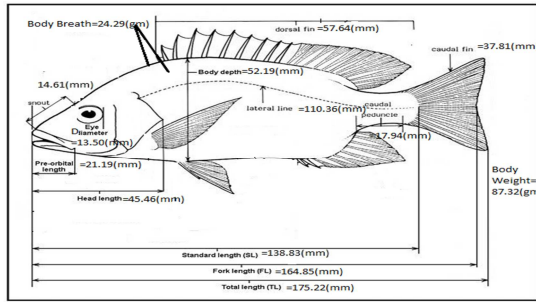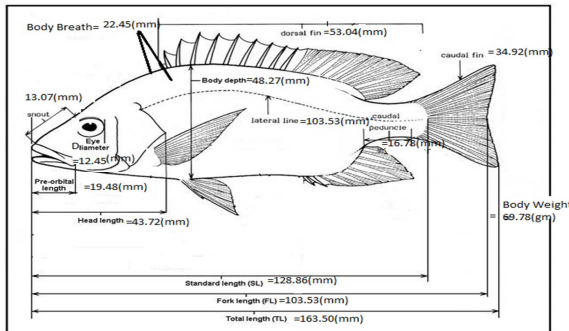
Fig .1. Picto diagram for Female.

Fig .1. Picto diagram for Male.

Table 2. Correlation of morphometric and meristic variables of *Pomadasys maculatum*.

Table 2, Correlation matrix has a list of all the morphometric variables across the top, and the same list down the side. The diagonal is always all 1's, because that's the correlation between each variable and itself. They all have values within the range from −1 to +1, where ±1 indicates the strongest possible agreement and 0 the strongest possible disagreement (Taylor, John R. 1997).

Correlation for the whole sample1056 (including male and female) are for TL-SL(0.999), TL-Bwt (0.929), TL-HL (0.951), TL-Sn.L (0.911), TL-ED (0.771), TL-BD (0.912), TL-FL (0.950), BB (0.791), TL-PO (0.916), TL-CPL (0.703), TL-ASL (0.971), TL-LL (0.888), TL-CFRL (0.879) and TL-DSL (0.931). All the correlation coefficients are high shows a balance body structure.

Coefficient of Correlation of female

For the female the correlation of *morphometric* and *meristic* variables for the sample (553) are TL-SL (0.999), TL Bwt (0.924), TL-HL (0.925), TL-Sn.L (0.881), TL-ED (0.697), TL-SL (0.950), TL-BD (0.913), TL-FL (0.972), TL-BB (0.758), TL-PO (0.920), TL-CPL (0.630). Whereas, meristic TL- ASL (0.958), TL-LL (0.825), TL-CFRL (0.871), TL-DSL (0.896). All the correlation coefficients are high except TL-CPL and TL-ED which shows in female body caudal peduncle length and eye diameter have moderate relationship with total length. This imbalance is due to larger sex in female.

Coefficient of Correlation of male

In case of male the correlation of *morphometric* and *meristic* variables for the sample (503) are TL-SL (0.999), TL-Bwt (0.938), TL-HL (0.974), TL-Sn.L (0.931), TL-ED (0.845), TL-SL (0.983), TL-BD (0.915), TL-TL-FL (0.926), TL-BB (0.803), TL-PO (0.902), TL-CPL (0.756). Whereas, TL-ASL (0.980), TL-LL (0.949), TL-CFRL (0.872), TL-DSL (0.958) which shows high dependency and explain a balance body structure.

Conclusion

This study explores the dynamics *morphometric and metrics* variables of *Pomadasys maculatum* of (Baloch) of Karachi coast, Pakistan using statistical analysis. Furthermore, the study also provides valuable information about the body structure of female and male *Pomadasys maculatum* which will be helpful for the researchers. Empirical analysis shows that there is a strong relationship between the selected morphometric and metrics variables. All female average measurement is higher than male because female *Pomadasys maculatum* has larger sex. The correlation between total length and the remaining variables for the male is high which suggests that

overall body structure of male *Pomadasys maculatum* is large. However, in case of female the pair of correlation between TL-CPL and TL-ED are moderate show to some imbalance. Based on the female total length of coefficient of variation is 13% whereas male has 15% coefficient variation. Therefore, it is concluded that *morphometric and metrics* variables is more consistent in female than male. Over all, the combine morphometric variables and meristic characters (both male and female) are also comparable.

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